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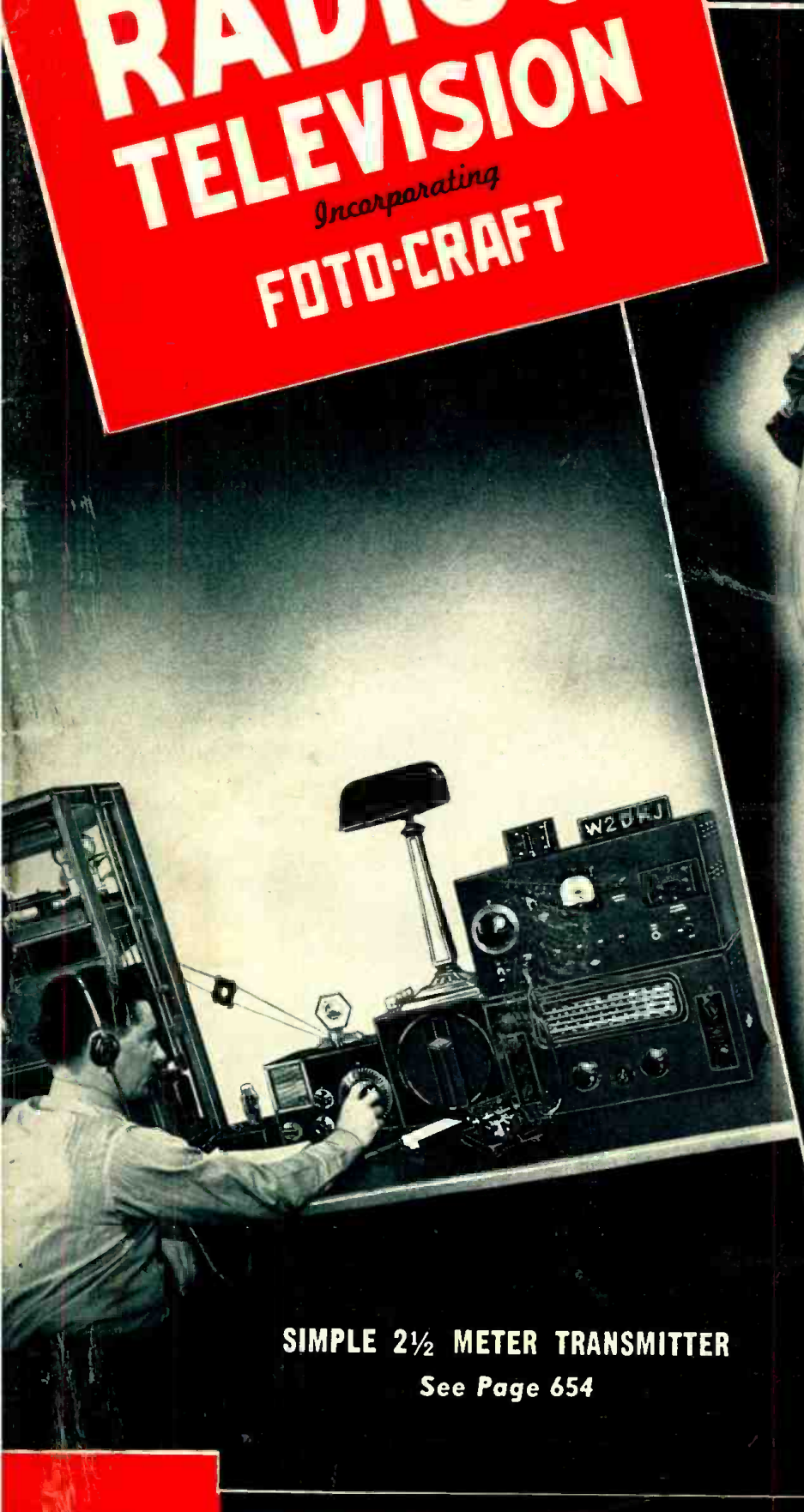

SIMPLE 2½ METER TRANSMITTER

See Page 654

See Page 691

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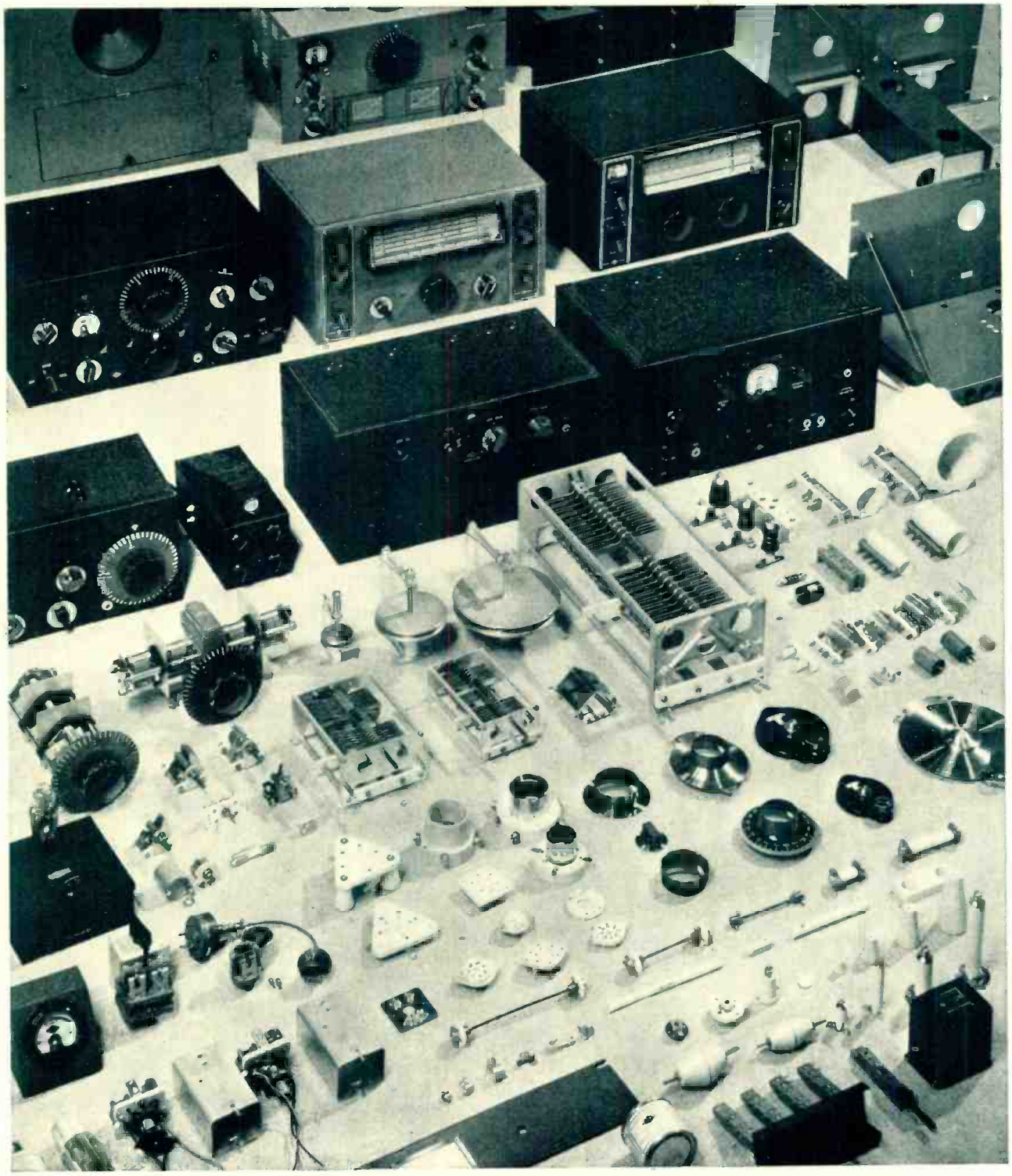

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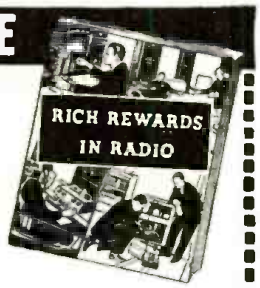

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March — 1940
Vol. X No. 11

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

In April Issue

Low-Cost Television Receiver—Conclusion; Sweep Circuits and Power-Supply—Howard C. Lawrence, W2IUP/3

Modulator for C-M Transmitter—Harry D. Hooton, W8KPX

5-Meter Mobile Transmitter and Receiver—Howard G. McEntee, W2FHP

Tips for the Short-Wave Radio Beginner—H. G. Cisin, M.E.

Getting Started in Amateur Radio—Receiver Circuits—C. W. Palmer, E.E.

"Debunking Photo Fallacies"—and many other Fotocraft features

In This Issue

RADIO — TELEVISION — FOTOCRAFT

Cover Composition by Hugo Gernsback and Thomas D. Pentz. 2½ Meters Transmitter—see article page 654. Girl on cover—Senorita Elba Valladres of the Havana-Madrid, N. Y. Photo by Murray Korman. See article, page 691.

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TECHNICAL SPECIFICATIONS

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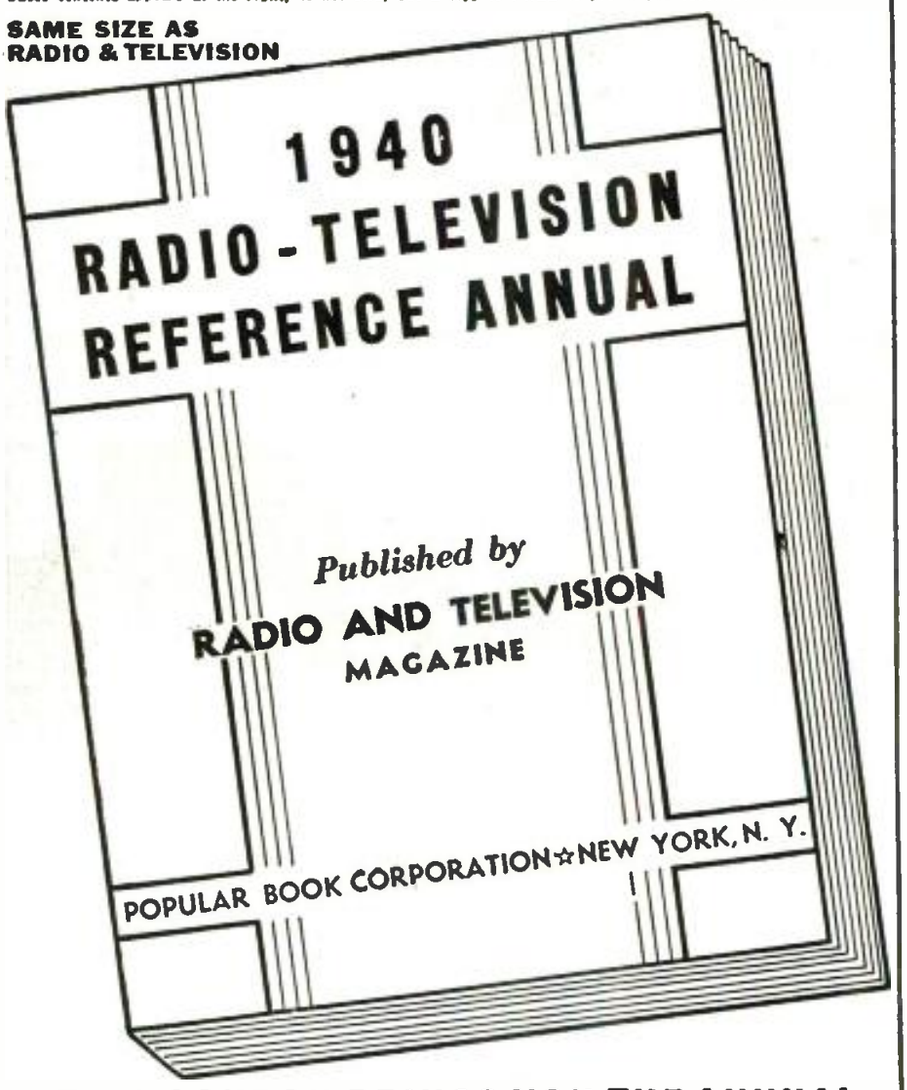

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Bass Tone Control—Simplified Variable Selectivity—Practical Servicing Pointers—Servicing Universal A.C.-D.C. Receivers—Killing the "Intermittent" Bug—A Service Shop A.C.-to D.C. Power Supply—Sideline Money for Servicemen—Adding A.V.C. to any Screen-Grid T.R.F. Receiver—Iron Particles in Speaker Air Gap.

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HUGO GERNSBACK, EDITOR H. WINFIELD SECOR, MANAGING EDITOR

Vol. X March, 1940 No. 11

FREQUENCY MODULATION STATIONS MULTIPLY

Perry Ferrell, Jr.

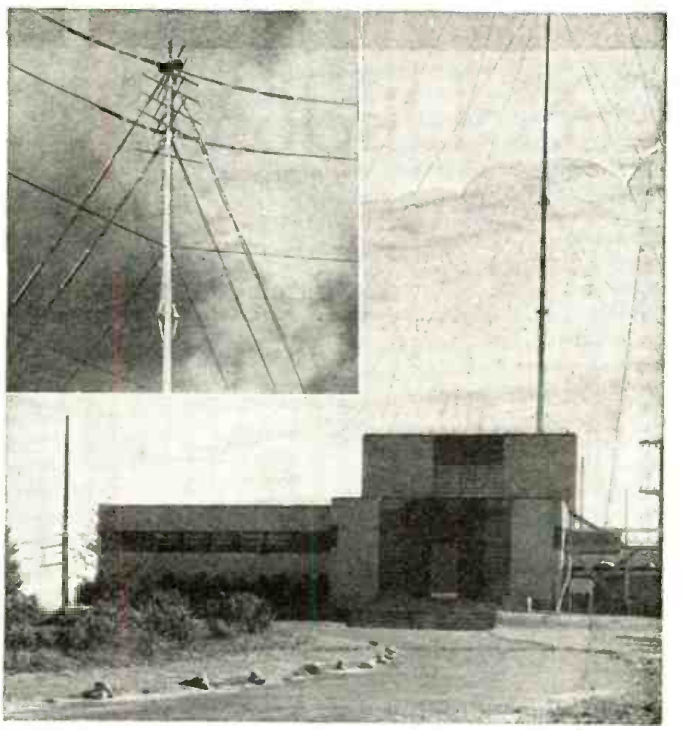


Photo at left shows Harry Whitemore at the transmitter panel of W1XOJ, frequency modulated station at Paxton, Mass. Photos at right show transmitter building at Paxton; 50 kw. equipment under construction. Insert shows transmitter antenna mast, with 4 bay turnstile aerials and vertical aerial on the peak.

● *"THEY' can reproduce silence,"* said Henry M. Lane, Engineer and Radio Editor of the Boston *Post*, when he first tuned in W1XOJ, the new *frequency modulated* transmitter of the Yankee Network.

Well may that be said, for by our own observations, no one can help but be impressed by the absolute quiet of the background, the trueness of high fidelity and the naturalness of any sound, whether it be a glass of water being poured, a match being struck or yesterday's newspaper torn in half.

W1XOJ, the first step in providing broadcast service to New England using the system of frequency modulation developed by Major Armstrong, is now in daily operation from 8:00 a.m. to 12 midnight, E.S.T.

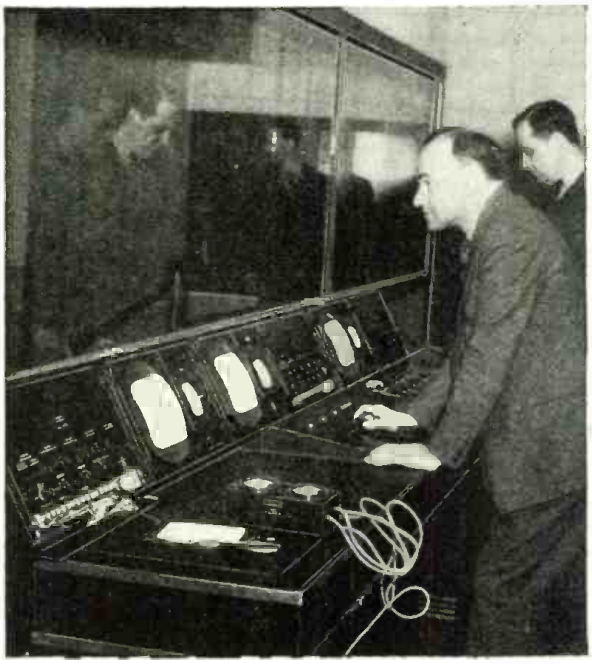
This station is the outcome of a meeting with Major Armstrong by Paul A. deMars, the Yankee Network's Technical Adviser. Mr. deMars was immediately convinced that Major Armstrong had an invention that would some day revolutionize the broadcasting art, so he proposed to John Shepard, 3rd, president of the Yankee Network, that they begin experiments with the Major's system, as their previous experience with the conventional methods of broadcasting in the ultra-high frequency bands had shown them that little or no improvement could be made, at this time.

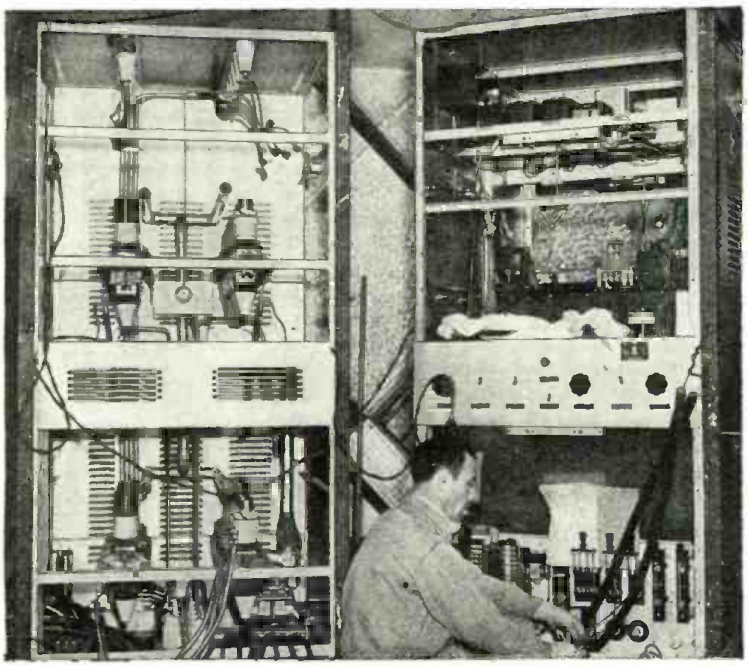
Before action and plans along these lines could be carried out, the Federal Communications Commission called a general hearing in connection with the allocation of the UHF (ultra-high frequency) where deMars was alone with Major Armstrong in realizing the possibilities of F-M as applied to broadcasting in the UHF; together they urged the Commission not to promulgate an allocation scheme which did not include ample opportunity to demonstrate the system.

Mr. Shepard heard the Major's system first in the fall of 1936 over C. R. Runyon's 250 watt transmitter on 110,000 kc. (now W2XAG, 5,000 watts), in Yonkers, N. Y., and was impressed to the extent that he then authorized the project to be built on Asnebumskit Hill in the town of Paxton, near Worcester, Mass.

The transmitter site selected is 1400 feet above sea-level and was far remote from any roads, power lines and water supplies, so that it was necessary to build over a mile of road up the hill, to extend power lines through woodlands and pastures, and then

(Continued on page 666)

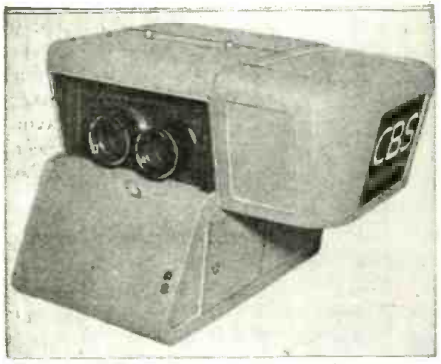




Left—CBS director of television programs, Gilbert Seldes, is shown in front of the studio control desk, at CBS television studios in the Grand Central Terminal Building in New York. Above an expert is shown adjusting the video transmitter of the CBS telecaster in the Chrysler Tower in New York City.

CBS Discloses Television Plans

Dr. Peter C. Goldmark
Chief Television Engineer, Columbia Broadcasting System



Here is CBS's latest television studio camera. It incorporates a number of special features, including a non-inverting view-finder, minimum parallax and a newly designed head-amplifier.

● AT the present time the Columbia Broadcasting System is completely revising and to a large extent replacing its initial studio equipment in preparation for actual television broadcasting in 1940. Work is going forward on three fronts: a new type mobile unit for covering outside events is being developed, more sensitive studio cameras have been ordered and major revisions are being made in the present studio facilities in the Grand Central Terminal Building in New York.

This is the result of studio experimentation. Early in October, CBS began to send out test patterns from its transmitter, and for the past three months the high power television transmitter, just below the burnished needle of the Chrysler Tower, has

(Continued on page 667)

Dr. Peter C. Goldmark, chief television engineer for CBS, shown at the transmitter control desk in the Chrysler Tower. Signal lights and transmitter controls are seen at lower left. The sound transmitter is in the background.

NBC Television Activities

Alfred H. Morton
Vice-President in charge of Television, National Broadcasting Company

● TELEVISION broadcasting being in its infancy, it is a little difficult to foretell the shape of things to come within the twelve months of 1940. We expect to do many things. We expect new and striking technical advances and corresponding improvements in the organization of television as a medium of expression. Exactly what the technical innovations will be in the near future, I am not at this time at liberty to state. And of course it is impossible to forecast the improvements the year will bring in television program production.

Much will depend on the public's attitude toward television. Indications are that our audience will be multiplied several times through the sale of *home* television receivers. A briskly rising curve of receiver sales might bring an increase in the program schedule. For the weeks immediately ahead, however, we shall continue our present basis of operations, i.e., a minimum of ten hours a week over our New York outlet, Station W2XBS. I am sure that we shall succeed in adding greater variety and showmanship to our telecasts, which, I may be pardoned for pointing out, have become smoother in presentation with every passing week. As I have had occasion to remark on several occasions, every week in television at this stage of its development is the equivalent of a year or more in older arts of education and entertainment.

The new streamlined "vestpocket" field equipment recently delivered to the National

(Continued on page 667)

AIRPLANE PASSENGERS will be able to hear their favorite radio programs and pilot comments direct from the cockpit, through the use of a master receiving unit operated by the hostess, fitting into individual "hush-a-tone" speakers fastened under the seat cover. TWA pilot announcements are attracting great interest.

WORLD WIDE RADIO DIGEST

New Aviation Radio

● FIFTEEN Western Electric radio receivers, interference-free to a degree unprecedented in aviation radio, have been installed to serve New York's newly opened LaGuardia Field. The ears of dispatchers are spared the sound of receivers constantly turned on by a device known as an *automatically operated "codan."* In the absence of a signal the receiver appears "dead"; as soon as a carrier wave comes in, the receiver "comes to life."

A receiver is constantly tuned to 4495 kc., the frequency for Army aircraft. The voices of private fliers come in over a daytime frequency of 3105 kc. and a nighttime frequency of 6210 kc. Other day and night channels are assigned to five air lines, and two additional receivers are maintained as emergency spares.

The receivers and antennas for the Municipal Airport are installed on Rikers Island in New York's East River, whence the signal is transmitted over wire lines to the control tower at the field. The new receivers were manufactured in the Specialty Products Shop at the Kearny Works of the Western Electric Company.

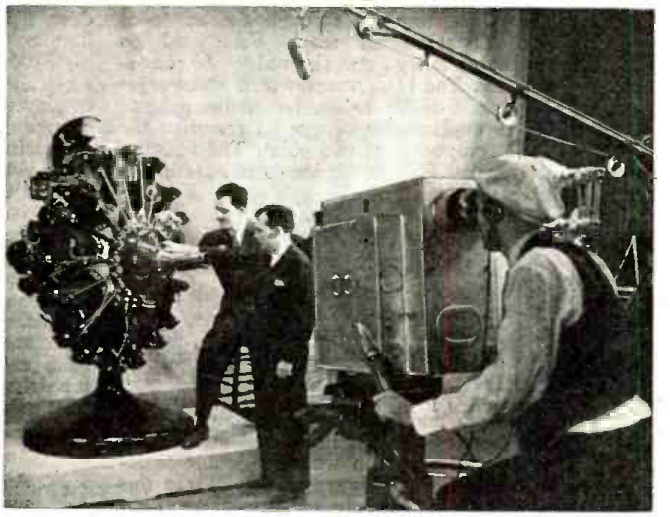
TWICE AS BIG as usual are the images produced on the new DuMont 20-inch tube. Picture size is approximately 11½" x 14½". The illustration below shows the new tube as compared with DuMont's previous largest tube—the 14" dia. type. Other innovations are also appearing in the DuMont tubes and include a higher persistence screen, which is said to make it possible to use lower frame frequencies without flicker. The DuMont circuit is also unique in that the number of frames per second and the number of lines per frame can be varied from the transmitter. The DuMont tubes are also equipped with an exclusive intensifier feature said to produce brighter images without increasing anode voltages.

Images were demonstrated to the press with frame frequencies of 15 per second and with definition up to 625 lines per image. The R. & T. observer was favorably impressed. Rival engineers maintain that the large tube has several disadvantages.

TEN CHANNEL radio equipment for transmission and reception has been devised by the Western Electric Company. The transmitter, which has an output of 125 watts, functions as a telephone, telegraph or facsimile unit and may be operated from a remote spot by an electrically activated control panel.

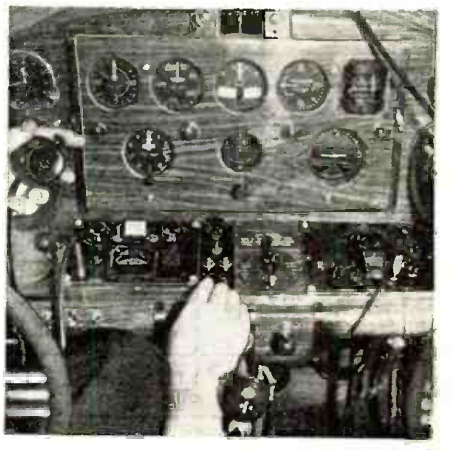
The receiver, which will pick up any of the previously mentioned services, is also adapted to remote operations. The motor-generator units which supply the power to this equipment have an ingenious plug-in arrangement to operate on either 24 or 12 volts without circuit change. Where both transmitter and receiver are simultaneously controlled from a small switching panel located on the plane's instrument board, one dial gives the pilot the choice of any of 10 frequencies.

TELEVISION FOR EDUCATION was foreshadowed by the dynamic demonstration presented over NBC station W2XBS by Announcer Gilbert Martyn, and Ronald S. Gall of the Wright Aeronautical Corp. An electrically operated cutaway model of 1100 H.P. Wright Cyclone engine was televised.



N. Y. POLICE PLANES have been equipped with Western Electric transmitters and receivers. These police adjuncts, which include one land plane and one sea plane, both 5-passenger ships, using their new equipment can transmit to and receive from radio patrol cars, patrol boats and emergency trucks.

Most of their work consists of checking aviators who fly too low, who stunt over the city or who operate unlicensed planes.



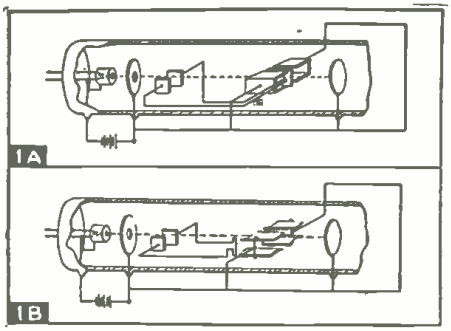
"MUTUAL'S MIKE-MITTER" is shown in use below, as WOR's Special Featuresman Dave Driscoll conducts an interview with a fair wayfarer. It weighs but 8 lbs. complete with microphone and transmitter capable of radiating several hundred yards on 2/10 of a watt.

GIANT TELEVISION IMAGES may be projected on screens if a new tube invented by two Englishmen and assigned to RCA is put into production. Accordingly, the New York *Times* reported the new receiving system would eliminate the use of fluorescent screens. Instead, there is used a glass prism with a surface that totally reflects light. On the polished surface are tiny particles of carbon or mica, adhered by electrostatic electricity.

The prism face is the "screen" in the television receiving tube. When it is scanned by the electron beam which "paints" the image, the tiny crystals are caused to fly away from the prism surface in proportion to the lights and shadows of the image being broadcast.

A beam of light thrown against another face of the prism now is not totally reflected, but some of the light passes through the reflecting face in accordance with the movement of the crystals.

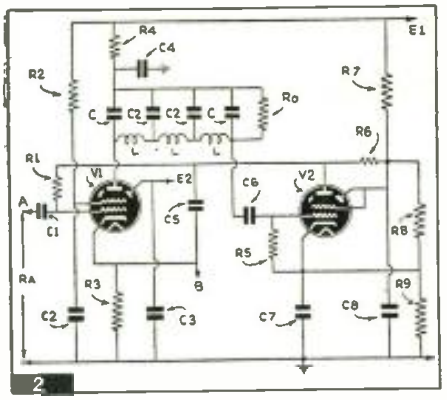
The light, now projected on the screen, has proper highlights and shadows.



Electronic Amplifier

1 A NEW type of cathode ray tube utilizes the cross-field principle of induced displacement currents. Figs. 1A and 1B show two methods of arranging the electron structure to secure the desired effect. The tube, to be used for television work, includes an anode, a means of producing an electron beam, a pair of opposed electrodes and a single inductance loop; a method of feeding back a portion of the currents produced by induced charges is supplied. The usual deflecting electrodes are incorporated to afford sweep.

International Radio Review

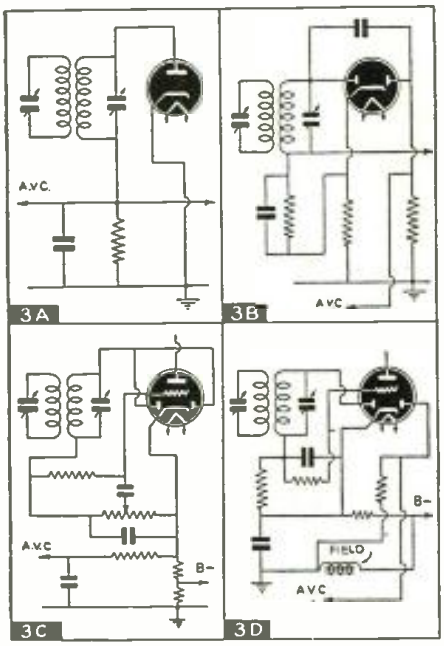


Improved D.C. Restoring Circuit

2 THE E.M.I. Laboratories of England have designed an improved circuit for restoring the D.C. component of a television signal, as described in *Electronics and Television & Short-Wave World*. Incoming signals are fed with synchronizing signals positive to the grid of tube V1, as shown in Fig. 2; amplified voltages from the anode of this tube are fed to the grid of V2 while those from the cathode of V1 are taken from C5 through the anode of V2. Those which reach V2's grid go through a delay network in about 10 microseconds. The D.C. component is restored at the anode of V2 and is fed to the grid of V1 through the impedance R1 restoring the D.C. component at this point. The addition of R1 and C5 are the improvements in the original circuit.

New A.V.C. Circuits

3 THE operation of various A.V.C. circuits is described in an article appearing in *Practical and Amateur Wireless*, diagrams from which appear in Fig. 3. The type of A.V.C. which uses a diode appears in Fig. 3A. Delayed A.V.C., in which a blocking voltage retards A.V.C. action until a desired signal level has been reached, is illustrated in Fig. 3B. Another method, in which a double-diode-triode is used, is shown in Fig. 3C. In this circuit the single tube operates as rectifier, A.V.C. and audio amplifier, and makes use of the triode section's bias as the delay voltage. This amplified A.V.C. is especially desirable in sets where few tubes are used. Fig. 3D illustrates still another method—a form of amplified and delayed A.V.C. The previously described A.V.C. methods tend to accentuate background noise when tuning between stations. A muting circuit, known as "Quiet A.V.C.," solves this problem by cutting sensitivity when no signal is received. Shown in Fig. 3E, this circuit was designed by a leading British tube manufacturer. The large voltage drop in R11 blocks the plate current of the second tube, silencing the loud speaker, but when the signal reaches a certain strength this voltage drop is eliminated, thus causing the circuit to function normally.



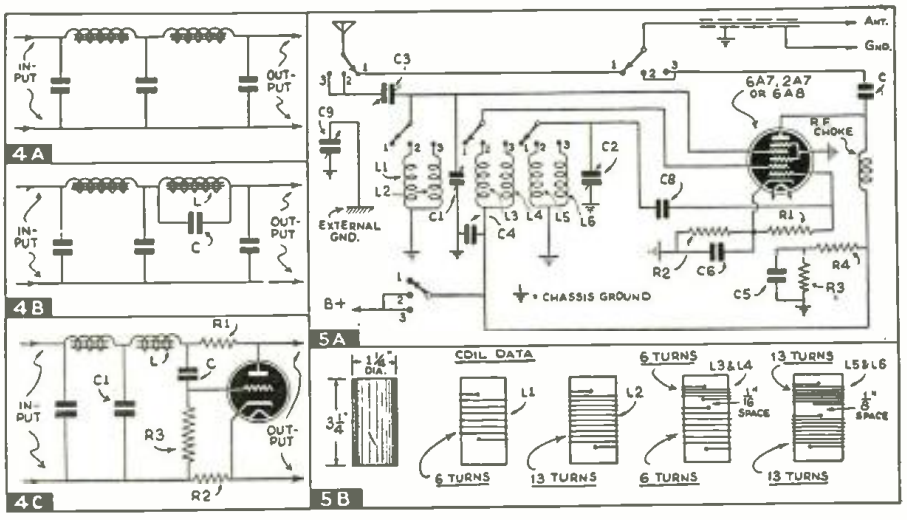
Filter Circuits

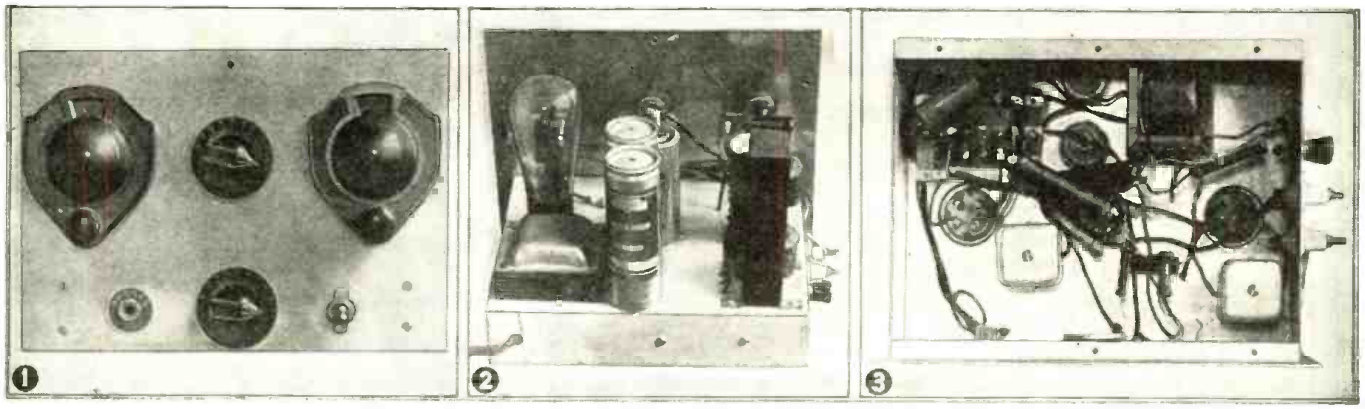
4 SOME interesting power-supply filter circuits are explained in a recent issue of *Wireless World* of Britain. Fig. 4A shows the conventional two-stage power-supply filter using condensers and chokes as employed in high quality amplifiers of moderate gain. Fig. 4B illustrates a method of tuning one of the chokes to resonate at the dominant frequency (usually 60 or 120 cycles in America). Unfortunately, however, this tuning may cause an increase of hum at other frequencies. Where a special high gain and fine filtering must be used, a circuit like that shown in Fig. 4C may be employed. In this, the ripple causes a voltage change on the plate and grid of the triode, increasing plate current and causing the plate voltage to fall, due to the increase of current through R3. This change of voltage is precisely equal to the ripple or hum voltage, effecting complete filtering. The sum of R1 plus R2 (in ohms) should equal the reciprocal of the mutual conductance of the tube or the ratio of the current (in microamperes) to the voltage. R1 is usually made variable with 600 ohms max., R3 may be .5 meg., and C is usually about 1 mf. The tube should be a high mutual conductance tube using low plate current.

Short Wave Adapter

5 AN ingenious circuit for a short wave adapter is published in *Radio Technica* of Buenos Aires. This circuit is reproduced at Fig. 5A. It is a 2-band adapter, and the coils specified cover the 13 to 30 meter and 30 to 60 meter bands.

(Continued on page 673)





Photos show front, rear and bottom views of the 2-tube receiver.

S. W. and B. C. 2-Tube Beginner's Receiver

Frederic Urlau Dillion

A 2-tube regenerative receiver, suitable for short wave or broadcast reception, is here described. Bandspread is provided; the set operates on 110 volts 60 cycle A.C. Headphones give "personal" reception.

● IN designing a receiver for the beginner there are a few things to be considered, simplicity in circuit design and the cost to operate the outfit. With these features in mind, this 2-tube A.C. operated set was designed. A *band-spread* system, which will increase the range of this set, is also included as one of its many features.

As far as circuit diagrams are concerned, 2-tube receivers might be said to all look alike, but experience shows that some work and others don't.

The explanation of this is that, in designing a radio receiver for *short-wave* reception, a circuit diagram tells very little toward its being a success or a failure. The thing that does determine whether it will work properly or not is paying attention to such things as smooth control of regeneration, noiseless tuning, and getting the most out of your antenna. These and many other features are presented in this article.

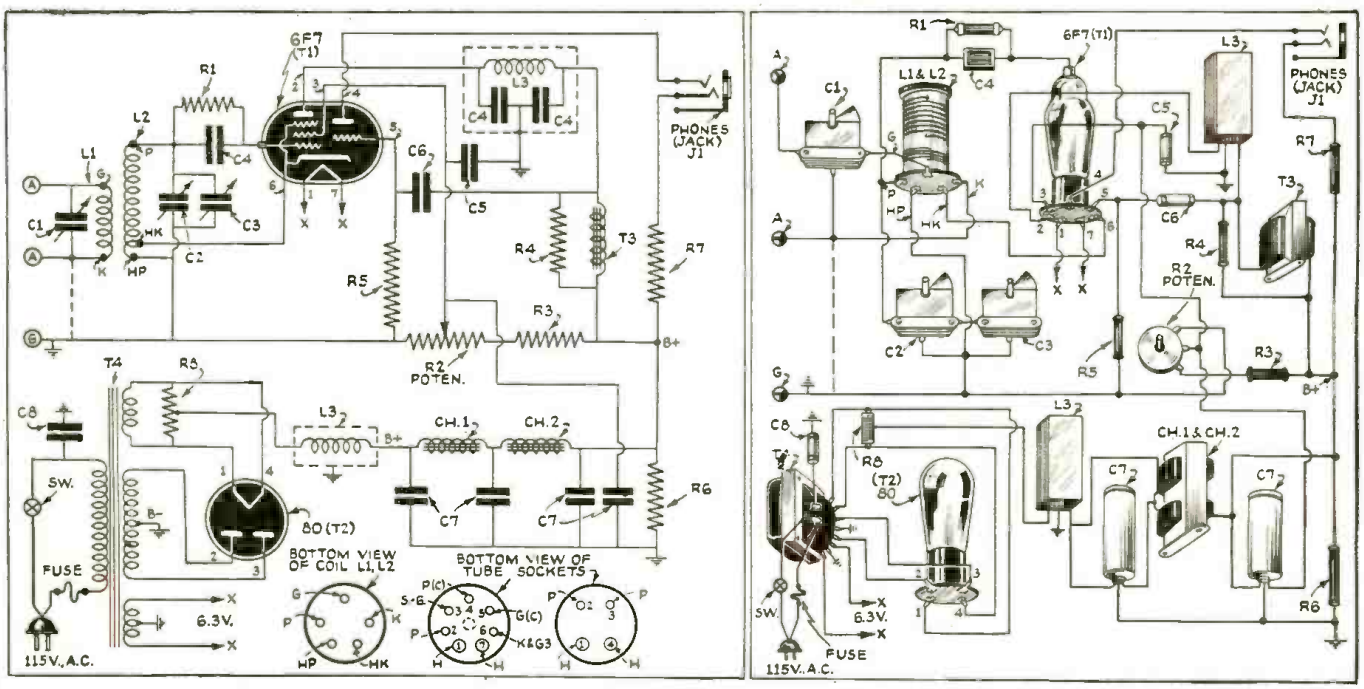
Use of "Doublet" Aerial

Discussing the above mentioned points, the advantage of a *doublet* antenna is a gain in signal strength to noise, as compared with the usual flat-top and similar aerials. The *doublet* used with this receiver was 38 feet long with insulators at each end and one in the center, to which the transposed noise-reducing Philco lead-in is connected. By twisting these two wires, any noise picked up on the lead-in is eliminated. A point to remember in erecting any antenna system is to get it as high as possible, and at right-angles to any high-tension or telephone wires. The ideal aerial should be at least fifteen feet above all surrounding objects.

After getting a form of input to the set that will give you the most signal strength, a means of controlling this signal to the best advantage must be developed. This is accomplished by having a low resistance and noiseless tuning circuit with a good grade of tuning condenser, one mounted on isolantite or insulex which are theoretically the best type of insulating material for short wave work. Therefore isolantite

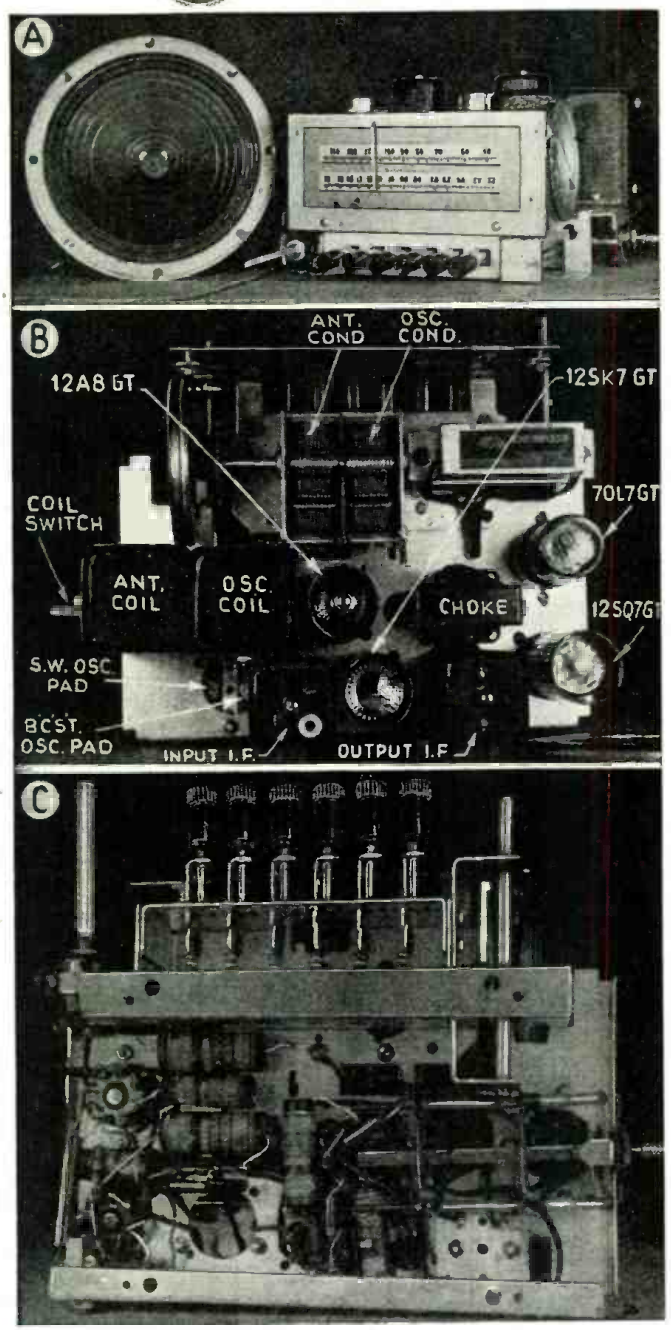
(Continued on page 671)

Circuit diagram of 2-tube set for the beginner.



A COMPACT 2-BAND RECEIVER

Herman Yellin, W2AJL



Photos above show front, top and bottom views of the 2-band receiver. This set has superior sensitivity and selectivity and covers the B.C. and short-wave bands, with pushbutton selection of the more popular local stations.

● THE recent introduction of the 70L7GT tube, which is a combination beam power output and rectifier tube enables the set constructor to build an efficient super-het using only four tubes. This results not only in a compact receiver but in a slight saving.

With this new tube as a *raison d'etre*, the writer built a small two-band receiver for use as a second receiver in his home. However, the outfit turned out so well, that it bids fair to reign supreme as the major source of radio entertainment. We were really surprised at the tone quality from so modest a set but this was due in no small measure to the use of a good speaker placed in an adequate cabinet. Unfortunately, the cabinet was acquired too late to be photographed.

Use of the 70L7GT enables us to dispense with any series filament resistor or ballast tube, since the sum of all filament voltages adds up to 120 volts (using two pilot lights). Using a 12A8GT as a combined first detector-oscillator, a 12SK7GT I.F. tube and a 12SQ7GT as a second detector, AVC and first audio besides the 70L7GT, the receiver is remarkably simple to wire.

Band Reception Covered

Since it is a two-band affair, there are naturally two sets of coils—one for the *broadcast* band and one for the *short-wave* band from 5.8 to 19 megacycles. These coils can be procured already assembled in metal cans with individual trimmers mounted inside the cans. Mounted in one can are the broadcast and short-wave *antenna* coils, while the other can contains the two *oscillator* coils. Incidentally, the coil shield cans are not absolutely essential from an electrical viewpoint but do help to keep the coils free from dust. These coils can be had unmounted, in which form they will take up a little less room. They are also available in a combination of broadcast band and police band frequencies for those so desiring.

The Chassis

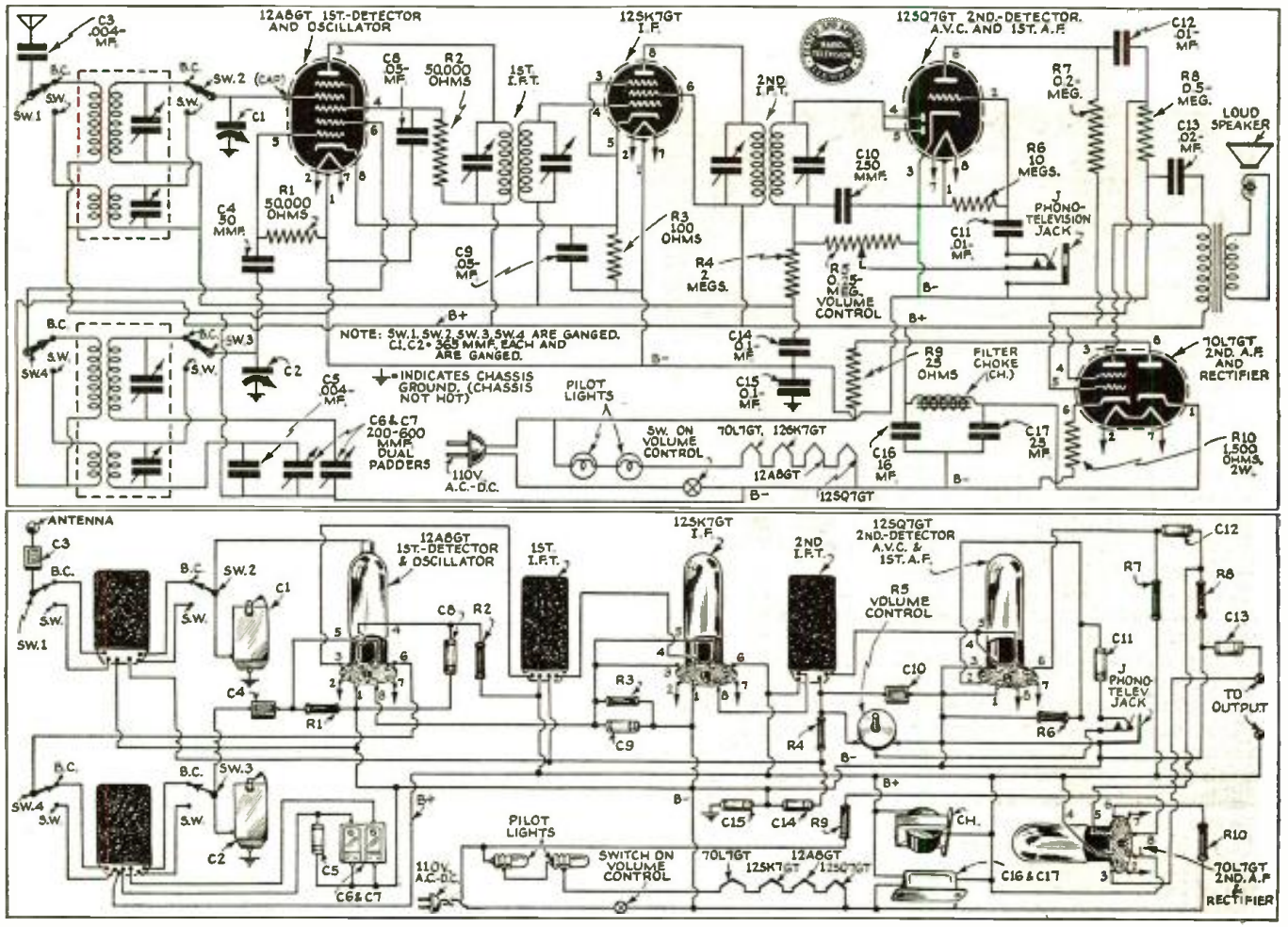
For a chassis, the writer used an old one he had kicking around which was already punched out for most of the necessary holes. About 9" x 5" x 1½", its size is not important nor the layout of the parts particularly critical. The photographs show where the parts were mounted. This layout need not be strictly adhered to since some deviation is allowable. The main point is to keep the R.F. leads as short as possible. Note that the coil-changing switch is mounted so that its two decks are just above the coils, thereby keeping the R.F. leads quite short. A two-gang, four-pole, two-position switch is needed for this set but the recommended unit is a 3-gang, six-pole switch, so it will be necessary to remove one deck of the switch and cut down the center guide rod and the two tie-rods. It is advisable to do this rather than purchase a standard 2-gang switch because of the lower cost of the former. The dual oscillator padder condenser is mounted so that it can be adjusted from the top of the chassis. Note that the *short-wave* padder has an additional .004 mf. fixed condenser paralleling it.

Unlike most A.C.-D.C. receivers, no matter which way the line plug is inserted in the receptacle, the chassis is not "hot," this should be a welcome relief to those of us who have accidentally grounded the chassis and then connected the set to the line in such a manner that the ungrounded side of the line was connected to the chassis. All leads which would ordinarily be connected to the chassis are tied to a common bus, which is kept insulated from the chassis but is connected by a .1 mf. condenser to the chassis, thereby retaining the shielding capabilities of the chassis. The two-gang tuning condenser, however, has its rotor connected to ground (chassis) because of mechanical difficulties encountered in attempting to insulate it.

I.F. Stage Details

The I.F. tube, a 12SK7, is of the single-ended type—that is, it has no grid cap, all its terminals being brought out at the base. The control grid and plate terminals are at opposite ends of the base and separated by terminals which are at ground potentials (so as to minimize inter-coupling with its resultant oscillation difficulties). Be careful to keep the I.F. transformer leads to the grid and plate of this tube as short as possible. It is also a good idea to keep these leads dressed close to the chassis so that they receive a slight amount of shielding. Incidentally, the first I.F. transformer has its grid lead coming out at the top of the can, necessitating a slight change. Merely rethread this lead out through the bottom of the I.F. can. When handling the I.F. transformers, be careful not to disturb the positions of the trimmer condensers. Note that the first three tubes have form-fitting shields. These are sometimes furnished with the tubes, so get the tubes first and if they are not in the carton, get a set of them.

Set has 1st detector-oscillator, an I.F. stage, a second detector, A.V.C. and first audio stage, and a 70L7GT as a beam power output and rectifier tube. It tunes over the broadcast range and the short-wave band from 5.8 to 19 mc. and has push-buttons for local stations.



Wiring diagram of the 2-band receiver.

"Television" and "Phono" Jacks

A phono jack was incorporated just ahead of the A.F. section of the 12SQ7GT, thereby allowing us to connect a phonograph to the audio section of the receiver. This is also a so-called "television" receptacle which all the latest receivers have. A very few of the cheaper television receivers have the sound portion built up only as far as the second detector, necessitating the use of an external audio amplifier.

This led to the inclusion of so-called "television" receptacles on all ordinary broadcast receivers. Actually they are nothing more than the old phono input receptacles we've had all these years. Don't forget to keep the jack frame insulated from the chassis.

Reference to the diagram will show that a small A.C.-D.C. choke is used in the power supply. This was used because we had a P.M. (permanent magnet) speaker. If an ordinary dynamic speaker is desired, procure one with a 500 or 600 ohm field and substitute this for the filter choke. Place a 25 ohm, ½ watt resistor in series with the rectifier plate to minimize the effects of the comparatively high charging current through the electrolytics when turning the set on and off. This will protect the rectifier section.

Parts List

MEISSNER MFG. CO.
1—2-gang tuning condenser (365 mmf.), No. 21-5214
1—2-band antenna coil, No. 14-7476
1—2-band oscillator coil, No. 14-7480
1—padding condenser kit for above, No. 22-5203
1—3-gang 2 position rotary switch, No. 24-8265
1—input I.F. transformer (Ferrocart), No. 16-5740
1—output I.F. transformer (Ferrocart), No. 16-5742
5—octal sockets, No. 25-8209

SPRAGUE CONDENSERS
1—50 mmf. mica, No. 2FM145
2—250 mmf. mica, No. 2FM-325
2—.01 mf. paper, No. TC-11
2—.1 mf. paper, No. TC-1
3—.05 mf. paper, No. TC-15
1—.02 mf. paper, No. TC-12
1—25 mf. condenser electrolytic, No. BT-252
1—16 mf. electrolytic, No. BT-162

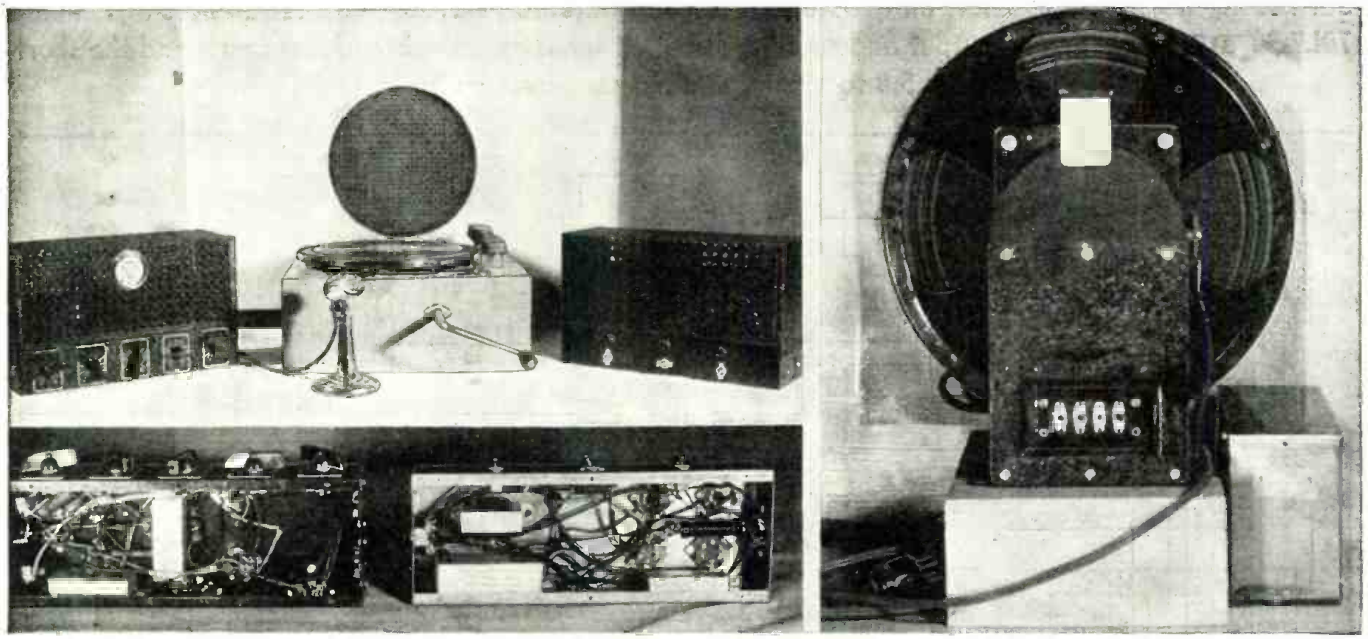
I.R.C.
1—100 ohm ½ watt, No. BT½
2—50,000 ohm ½ watt, No. BT½
1—200,000 ohm ½ watt, No. BT½
1—500,000 ohm ½ watt, No. BT½
1—2 megohms ½ watt, No. BT½
1—10 megohms ½ watt, No. BT½
1—120 ohms 2 watt wire-wound type BW2
1—25 ohms wire-wound, ½ watt, type BW½
1—250,000 ohm potentiometer, No. 13-130
1—SPST switch for potentiometer

STANDARD TRANSFORMER
1—15 henry, 50 ma. filter choke, No. 1277

CROWE NAME PLATE
1—Ravenswood "Actuator" Tuning Unit

NATIONAL UNION TUBE
1—12A8GT 1—12SQ7GT
1—12SK7GT 1—70L7GT
2—6.3 volt, 150 ma. pilot lights.

Aligning the receiver can be performed easily and without a test oscillator if none is available. The I.F. transformers are peaked at the factory to 456 kc.; while wiring them into the receiver *be careful not to disturb their trimmers*, so that you will not have to align the I.F. stage. Now, with the filaments warmed up, the coil switch selecting the broadcast band and the volume control full on, tune a station at the high frequency end of the dial. Now adjust the trimmer condenser across the broadcast oscillator coil until this station is heard at the proper position of the tuning dial (slight rotation of tuning condenser if necessary). Now adjust the trimmer condenser across the antenna coil for loudest signal. Now turn the tuning condenser so that the plates are almost all meshed and adjust the broadcast oscillator padder until a station at the low frequency end of the band is heard. This should be done while slightly rocking the tuning condenser back and forth. In making these adjustments, bear in mind that the coils cover a range of 530-1660 kc. and the frequencies of the stations used for alignment should be known so that trimmers and padders can be adjusted for the stations to appear at their proper positions on the dial. The above procedure should be repeated for the short-wave band.



Photos above show front and bottom views of the A.F. amplifier and its power-supply unit. Right-hand photo shows loud-speaker.

A 25-Watt A.C.-D.C. Audio Amplifier

Francis J. Bauer, Jr., W6FPO

● SOME time ago the writer was called upon to design and build a portable public address system that would operate either on 6 volts D.C. or 110 volts A.C. The complete outfit had to be simple to set up and use so that non-technical people could operate the equipment without the danger of wrong connections. The one designed is also suitable for use as an A.F. amplifier with a radio tuner.

In addition, this amplifier had to be as compact as possible and yet have sufficient reserve power for good coverage outdoors. Three mixed inputs were also required; two fairly high-gain channels suitable for the usual variety of crystal and dynamic microphones, and one low-gain channel for the phono pickup. All three inputs had to have individual gain control in addition to the master gain and tone controls—quite a large order for a 25 watt amplifier built on a chassis measuring only 13½ by 5 inches.

In the design of any portable amplifier the power supply should be given first consideration, because it is in this unit that the greatest weight is concentrated. As a rule, power packs of poorer regulation are more economical from the standpoint of weight and space requirements than those of good regulation (i.e., choke input) delivering the same voltage and current. For this reason class AB 6L6's were chosen for the *output* tubes in this amplifier, since they present a constant load to the power supply and permit the use of condenser input to the filter. In addition, class AB 6L6's require negligible driving power, thereby affecting further savings in current by using a 6C5 as the driver. This saving in current, of course, is most important on D.C.

Speech Amplifier

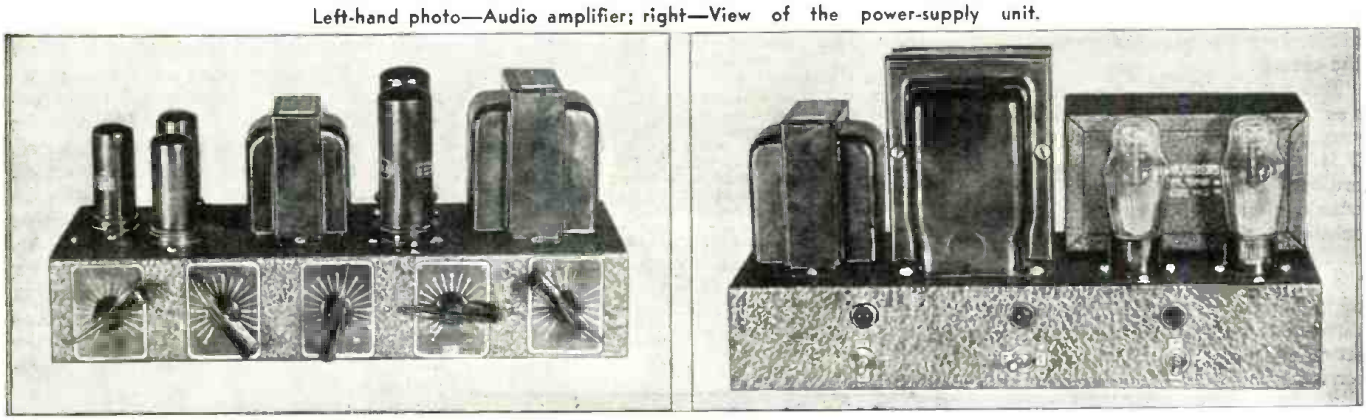
Turning our attention now to the speech amplifier, we find the mixing circuit presenting the next problem. Here the difficulty is chiefly space limitation rather than circuit design. This problem was solved by means of two 6N7's as shown in Fig. 1.

It will be noticed that the first 6N7 is used as a mixer for the two microphone circuits, each grid serving as the input for one microphone. The two plates of the first 6N7 are tied together in the conventional manner and serve to drive one of the grids of the second 6N7. The remaining free grid of the second 6N7 is used for phono input, as shown.

The net result of this particular circuit arrangement is the equivalent of a cascaded 6N7 speech amplifier for each microphone, together with independent mixing facilities for three channels. All this is accomplished by means of a very simple circuit employing only two tubes, yet having adequate gain for most dynamic or crystal microphones.

The only difficulty encountered with this particular circuit arrangement was a tendency toward motor-boating. This could

Left-hand photo—Audio amplifier; right—View of the power-supply unit.



This useful high fidelity amplifier will work equally well on 6 volts D.C. or 115 volts A.C. It may also be used as a modulator for a Ham phone transmitter. The amplifier may be connected to any B.C. or S.W. tuner; a microphone or phonograph pick-up are optional attachments.

readily be overcome by means of a decoupling network but since this necessarily meant a reduction in gain, another method was used instead. It was found that increasing the capacity of the final filter condenser (C) from 8 mf. to 24 mf. completely eliminated all speech amplifier oscillation without the necessity of adding decoupling networks to the circuit.

Incidentally, while on the subject of filters, look at CH2 in Fig. 1. It will be observed that a tapped filter choke is used in a hum-bucking circuit. If the choke indicated is used, together with the recommended condenser capacity, it will be found that the gain controls on the amplifier can be turned all the way on and A.C. hum will be barely audible in the speaker. This feature is invaluable in a portable amplifier that must be occasionally run indoors at fairly low levels.

Two Chassis Used

It was originally planned to build the amplifier and power supply on one chassis, but careful consideration resulted in the abandonment of this idea. In the first place, the writer recalled having had very unpleasant experiences with circulating ground currents caused by vibrator circuits. These vagrant currents can cause hum to appear in the output of an amplifier in the most unaccountable manner. By building the amplifier and power supply on separate chassis there can be only one common ground point between the two units, so every possibility of annoyance from circulating ground currents is at once eliminated.

In addition, the physical aspect should be considered. It has also been found by experience that it is far easier to carry two properly balanced and dimensioned units than one large, unwieldy chunk of iron and copper.

Both the amplifier and power supply units are built on the same size chassis, measuring 5" x 13½" x 2". These chassis can be obtained with covers as shown in the photographs and are just the right size to accommodate all the necessary parts without wasting space. The proper parts layout may be gleaned from the photographs and the chassis schematics. These should be generally adhered to for best results and to avoid unexpected hum troubles.

In the photograph of the amplifier chassis may be seen, from left to right, the two 6N7's and 6C5 grouped in a triangle, then the driver transformer followed by the 6L6's and the output transformer. The controls (from left to right) are microphone control, microphone control, master gain and tone controls, respectively. This arrangement results in good appearance and operating convenience, but it will be noticed that some of the speech amplifier leads may be "dangerously" long from the standpoint of hum pickup. However, if the wires are shielded and grounded at both ends as indicated in Fig. 1, no trouble should be experienced from hum pickup either on A.C. or D.C.

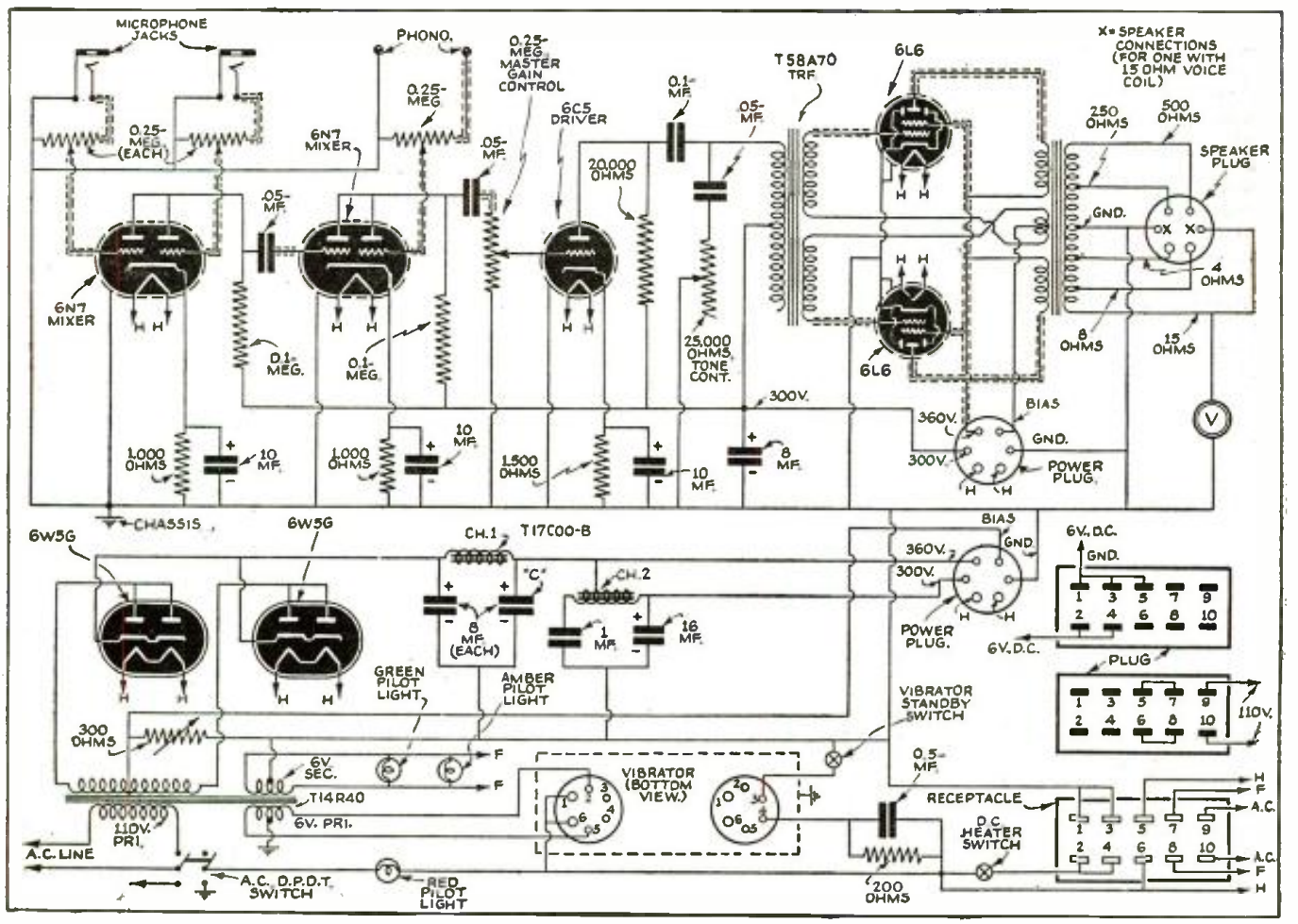
While on the subject of shielding it may be well to add that the wiring of the output stage must also be shielded, as shown on the diagram, in order to be certain that the 6L6's will not oscillate.

Oscillation, although inaudible, can cause plenty of trouble in the form of distortion, apparently low power output, or burned out voice coils. Unless the facilities of an oscilloscope are available, it is far better to be on the safe side and employ the shielding indicated. It will be found that the time and effort expended on careful shielding is time well spent because it will save many a headache when the amplifier is first put into operation.

The only other source of oscillation could be the *inverse feedback* winding, if it is improperly connected. The best safeguard

(Continued on page 673)

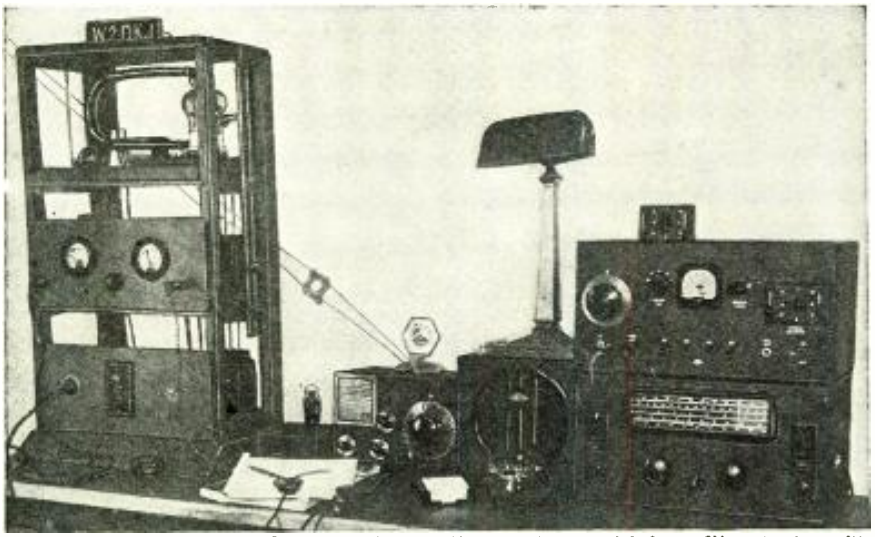
Wiring diagram of the 25-watt audio amplifier, suitable for operation on A.C. or D.C. Fig. 1.



Simple

A transmitter, which has given an excellent account of itself on 5 meters, is now giving the same service on the higher frequency. It incorporates some excellent design features, which may well be applied to other ultra-high frequency set-ups.

Certified Seal Article



The layout at W2DKJ, Garden City, Long Island, N. Y. The rack to the left is the 2½ meter transmitter. Immediately to the right is the National code practice oscillator used for ICW operation. Next to the right is the same company's 1-10 receiver with its accompanying loudspeaker. The receiver at the extreme right is their NC-44A, which is used with their NTX-30 transmitter immediately above it for CW operation on 10, 20, 40 and 80 meters. In the foreground may be seen the microphone for the 5 meter transmitter, the Trimm headphones and a Mac-key.

● MANY years ago Stanley P. McMinn, W2WD, designed and built a 5 meter transmitter for me, which he said would be inexpensive and from which I would derive great pleasure. It was a very simple form of modulated oscillator, wherein a pair of 210 tubes were set up in a tuned plate-tuned grid circuit and were modulated by a pair of 250 tubes in multiple, in a class A audio arrangement, which was used with a single 27 tube and a single-button, carbon microphone. Little did he imagine that the rig would one day become one of the best known ultra-high frequency transmitters in the world.

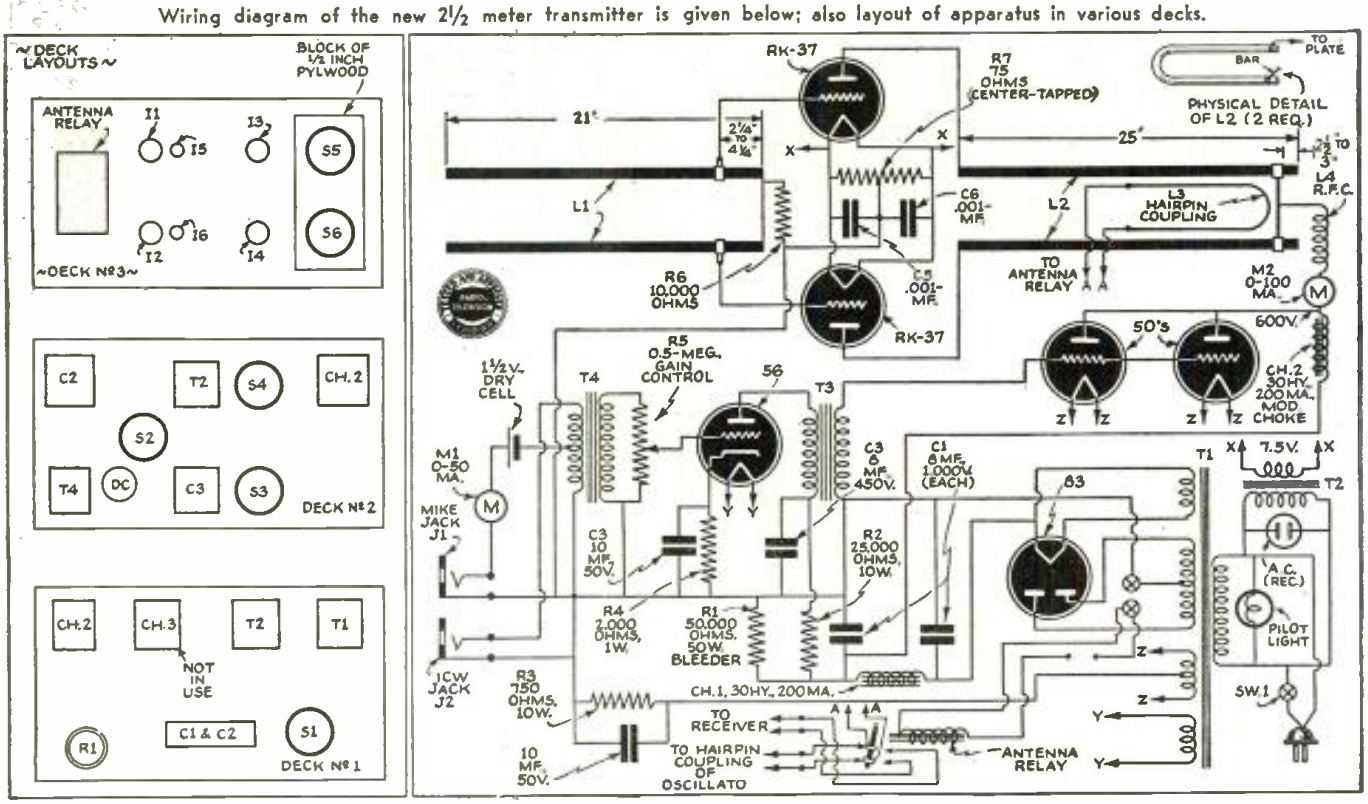
McMinn, who is the secretary of the Garden City Radio Club, got the ball rolling with some of the other members, who happen to be airplane pilots, as well as radio amateurs, with the result that some of the initial experimental work done in that field was done with that little transmitter for the ground station and a couple of transceivers were lugged into the air by Dr. L. J. Dunn, W2CLA, former Director of the Hudson Division of the A.R.R.L., and Richard Depew, W2SB. The results of those tests were published in many of the technical periodicals.

Original Assembly in a Book Rack

In the interest of economy, as well as to permit future changes in an assembly, which was designed to be experimental, one of those inexpensive, unpainted, three-shelf, wooden book racks was chosen for the job. The main power supply went on the bottom shelf; the audio channel on the second, and the oscillator was set up on the top shelf, using the shelves themselves for mounting the components.

A year or two later, the Technical Committee of the Garden City Radio Club decided that the transmitter was receiving so much publicity as a result of its use in connection with experiments involving multi-element beam arrays, that they wanted to make it over, so that it would look a bit more presentable. Separate decks, made of ply-wood, with hollow bottoms, were made to fit the various shelves, and the entire wooden portion was given a couple of coats of good clear varnish. A couple of wooden front panels were treated in a similar manner and then the equipment was put back, in separate units, which could

Wiring diagram of the new 2½ meter transmitter is given below; also layout of apparatus in various decks.



2½ Meter Transmitter

Arthur H. Lynch, W2DKJ
Managing Director, W2USA Radio Club

be removed with little trouble. That revision was made by Ed Ruth, W2GYL, and Harry Lawson, W2IER.

At about that time, George Shuart, W2AMN, who was then the Technical Editor of *Short Wave Craft* magazine, announced his work in connection with "Long-Line" oscillators and it was decided to take advantage of the stability which they made possible. Many interesting tests were then run between his station at Ramsey, N. J., and our own at Garden City, L. I., a distance of about forty miles.

Then the little rig was set up at the Hotel Pennsylvania during one of the conventions of the Hudson Division of the A.R.R.L., where it was used to convince some of the more hard-boiled hams that there really was something to the ultra-high frequency spectrum.

W2DLG, Hotel New Yorker

Then, through the cooperation of Eli M. Lurie, W2DLG, and Mr. Ralph Hitz, manager of the chain of hotels which controls the Hotel New Yorker, it was set up on the top (43rd) floor of that hotel and operated as W2DLG, Portable. From that point, five meter contacts were made with more than four hundred five meter stations and practically regular contacts were made with Tony Repicci, W3FGN, who had set up a similar station at the City Hall in Philadelphia, where he poked his antenna up through the hat of the famous statue of William Penn, some five hundred feet above the street.

Some of the work done in connection with the study of various types of beam aerials at that location was described by Mr. Lurie in an article which appeared in *Short Wave Craft* for February, 1935. The circuit diagram of the transmitter used at that time is interesting for comparative purposes. As that old article indicates, it was realized that more power could be had by the simple expedient of using a separate modulator, equipped with its own power supply and using all the power from the original set-up for the oscillator tubes, exclusively.

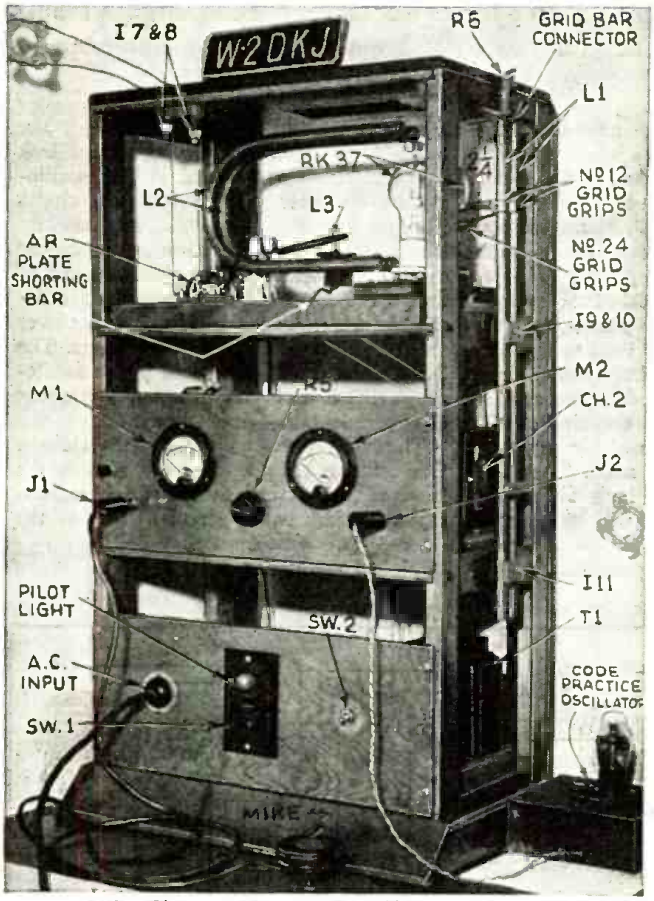
After about a year and a half as W2DLG, Portable, we were able to secure the cooperation of the builder and the manager of the Bank of the Manhattan Company Building at 40 Wall Street, to which the station was moved. At this location, we had a lovely room on the 71st floor—over 960 feet above the street.

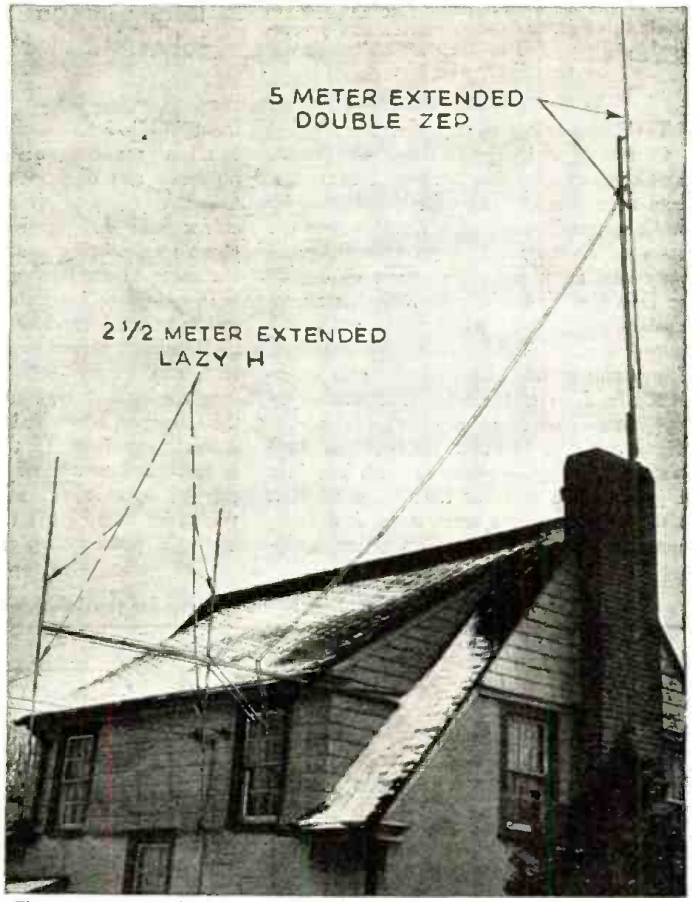
W2DKJ, Portable, 40 Wall Street, N. Y. City

Here, with a very simple antenna comprising two half waves, in phase, with a quarter wave matching stub, fed by a twisted pair, our range was extended to include New Haven to the north and Wilmington to the south as a regular thing, and Washington and Boston reported us more or less regularly.

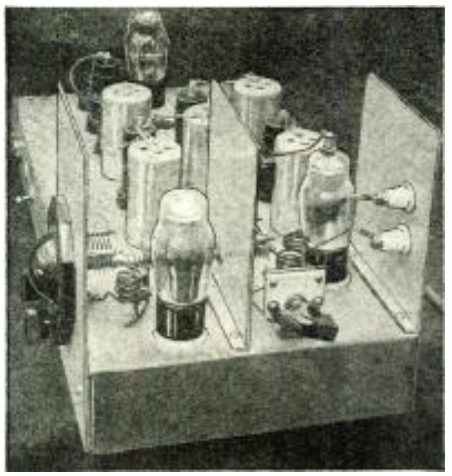
It was at 40 Wall Street that a weekly QST, containing information of interest to all amateurs, was begun. Similar transmissions now go out, on all bands, at 9:45 p.m., New York time, every Friday night, from W2USA, located in the Hall of Communications at the New York World's Fair. It is not unlikely that the revised transmitter we are about to describe will find itself in operation on 2½ meters at the Fair when it opens next May. *(The weekly QST by Mr. Lynch from W2USA goes out every Friday night, even during the period the*

(Continued on page 674)





Left—Close-up view of the 2½ meter transmitter. Right—The antennas used at Station W2DKJ for 2½ meter operation.



View of the 8-tube television receiver chassis, showing shields. The sweep circuits and power-supply are mounted on separate units and will be described next month.

A Low-Cost Experimental *Television Receiver*

Howard C. Lawrence, Jr., W2IUP/3 *Part I—The Receiver*

This 2" Tube Television Receiver has been tested in actual reception of images from stations in Boston, New York and Philadelphia. This article will appeal to every student, as the action in the various stages is explained. Also, with a change in the power supply and the substitution of a 3-inch C-R tube, larger images may be enjoyed. Receiver proper employs 8 tubes. Just the set for the experimenter and the beginner.

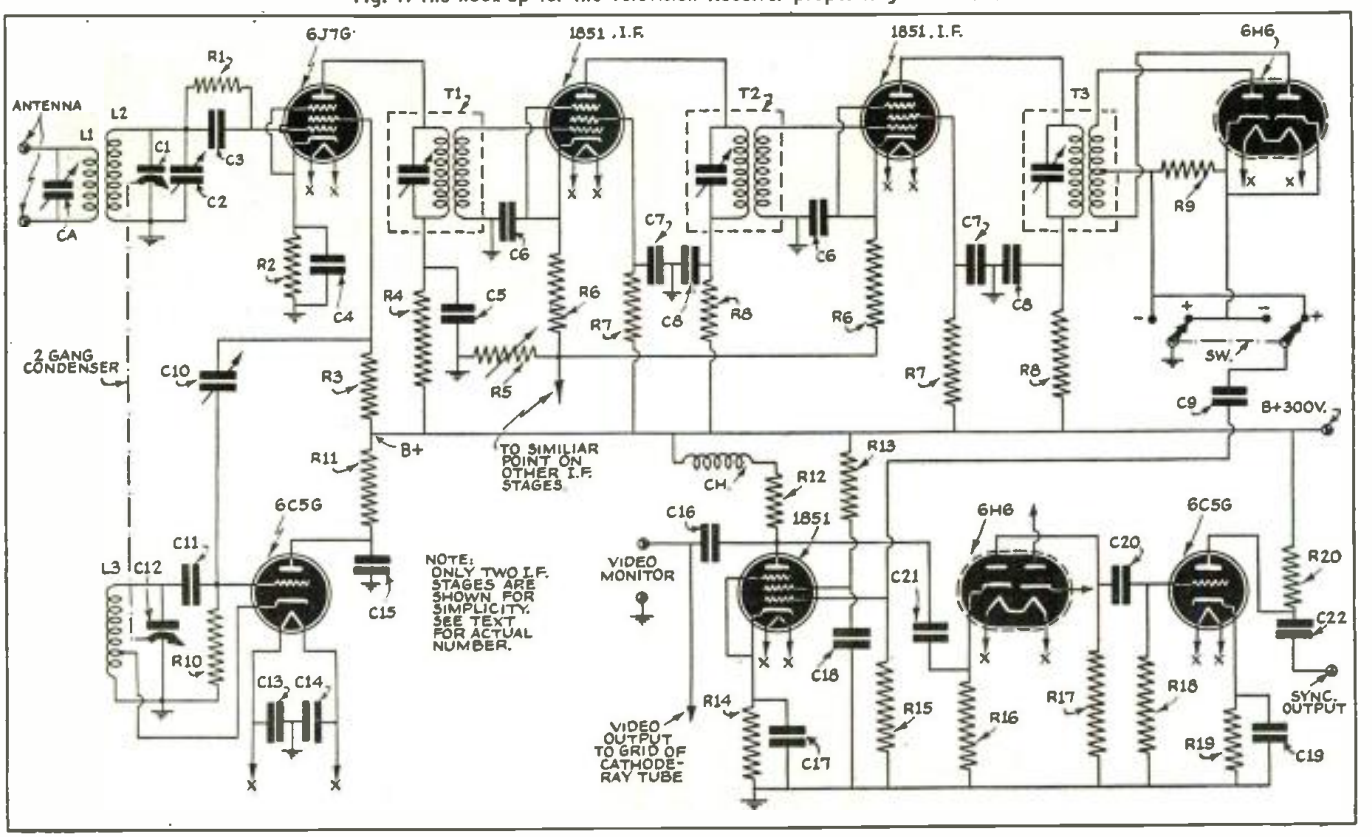
● THE beginning of scheduled television transmissions by the National Broadcasting Company in New York and the prospects of a second transmitter operated by the Columbia Broadcasting System gave the ranks of amateur television experimenters many new members. The recent change in the Don Lee transmitter to make its transmissions conform to RMA standards is encouraging many West Coast experimenters. Many who would like to enter this interesting field of experimentation are being kept from doing so by the high cost of the necessary parts. The receiver described here was designed and developed with the idea of providing a receiver that could be built in the average home work-shop at a minimum cost and with almost no test equipment. While a test oscillator such as is used to align broadcast receivers is a great help, no other test equipment than a five-meter transmitter and receiver (a borrowed transceiver will do) is needed, the television picture tube being used as an oscillograph for some of the testing.

In many receivers the cost of the cathode ray tube used to view the picture, and the high voltage power supply used to run this tube, account for over half the cost. Therefore the easiest way to reduce the cost of the receiver is to reduce the size of the cathode ray tube. If the cathode ray tube is restricted to one of the small tubes that can be operated at something under 500 volts, the cost of the tube will be low and a single power supply, built of low cost receiver parts, can be used to supply the complete receiver. The popular 2-inch ray tube, such as is used in test oscillographs, fits these requirements very nicely. The picture received, while only slightly larger than pictures taken with candid cameras, possesses a surprising amount of detail. Later on, if larger pictures are desired, a larger tube and the necessary power supply can be used with this receiver. The 2-inch tube can then be used in the oscillograph that is necessary if any great amount of experimental work is to be done.

The receiver was built up on three chassis. One contains the power supply, another the receiver proper, and the other the cathode ray tube and sweep circuits. This is the

(Continued on page 668)

Fig. 1. The hook-up for the Television Receiver proper is given below.



THE NEW 1130-S
SIGNAL GENERATOR
WITH AUDIO FREQUENCIES

SPECIFICATIONS

Combination R.F. and Audio Signal Generator, R.F.—100 Kc. to 100 Mc., A.F.—100-7,500 cycles. All direct reading, all by front panel switching.
R.F. and A.F. output independently obtainable alone or with A.F. (any frequency) modulating R.F.
Accuracy is within 1% on I.F. and Broadcast bands; 2% on higher frequencies.
Audio frequencies in 5 bands: 100, 400, 1000, 5000, and 7500 cycles.
Giant airplane full vision, direct-reading dial.
Condenser and other leakages tested to 100 megohms.
All services on 90-130 volts A.C. or D.C. (any frequency).
Model 1130-S comes complete with tubes, test leads, carrying handle, instructions. Size 12"x9" x6½". Shipping weight 15 pounds. Our net price **$11.85**

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 4½ 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 4½" 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 6½". Our net price .. **$19.95**

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
D.C. Voltage:—0-15, 0-150, 0-750 volts
A.C. Voltage:—0-15, 0-150, 0-750 volts
D.C. Current:—0-1, 0-15, 0-150, 0-750 ma.
A.C. Current:—0-15, 0-150, 0-750 ma.
2 Resistance Ranges 0-500 ohms, 500-5 megohms
High and Low Capacity Scales .0005 to 1 mfd. and .05 to 50 mfd.
3 Decibel Ranges -10 to +19, -10 to +38, -10 to +53
Inductance: 1 to 700 Henries
Watts: Based on 6 mw. at 0 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 9½" x 11" x 6½". Our net price **$11.85**

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, loctals, Bantam 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 7½" x 10¾". Our Net Price..... **$11.85**

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SUPERIOR INSTRUMENTS CO.
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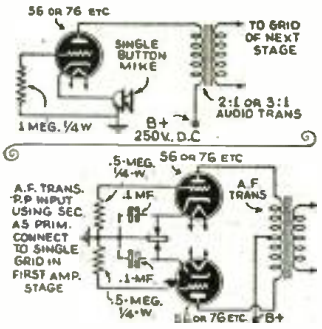
Radio Kinks

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

First Prize Winner

Useful Mike Circuit

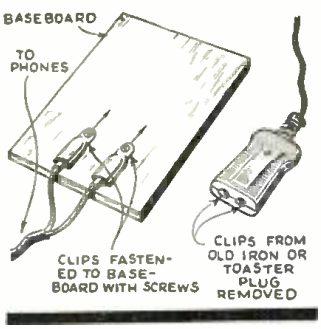
It is not necessary to have a microphone transformer in order to use a carbon microphone, if the mike resistance will furnish cathode bias to the tube or tubes to which it is connected and, at the same time, the current passing through is proper for microphone operation. Remember, however, that the gain in this circuit is small and it should not be considered as an amplifier, but as a method of coupling.



The bass response may be increased by shunting the mike with a .1 mf. condenser or larger, depending upon the amount of bass needed. In the case of the double-button mike, condensers of the same capacity are advisable across *each* button of the mike. However, if some degree of fidelity is wanted, a single condenser across one section of the mike is all that will be necessary. One button then reproduces high frequencies and the other reproduces low frequencies.—*Raymond T. Stephens.*

Emergency Phone Jacks

When doing experimental work using bread-board type mountings I ran short of phone



posts. However, I had some old plugs of the type used for electric irons and toasters. I removed the clips from these plugs and screwed them to the board, where they worked fine as phone jacks.—*Dayton Baldwin, Jr.*

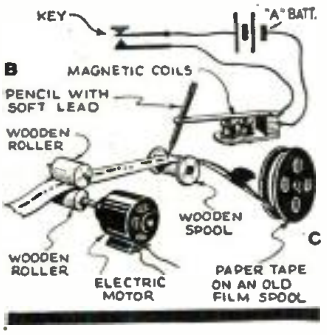
Code Recorder Easily Made from "Junk"

If you have a small electric motor, the speed of which may be regulated, you can make a code recorder very easily.

In the accompanying diagram "A" is an old spool of the type on which thread comes. "B" is either a fountain pen or a pencil with very soft lead, while "C" is a reel from a small home movie camera. The pen is attached to the end of the bar on a telegraph sounder and in the practice hook-up shown the key is a standard telegraph key.

The rollers "D" are about ¼" diameter wooden dowel and the lower one is attached directly to the motor shaft.

The tape may be of the type which comes with ribbon, or may be cut strips of paper glued together at the ends. Instead of the practice hook-up shown, by using the proper matching transformer the sounder may be connected to the output of a radio receiver.—*Alex Ciciora.*



Cabinet Shielding

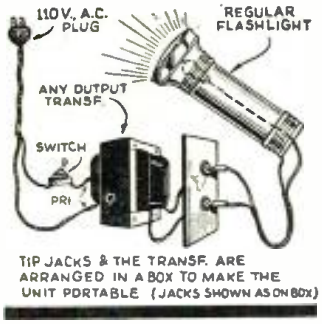
Since I have become interested in building portable radios, I have devised a method to reduce hand capacity without going into any additional expenditure for metal cabinets or shielding. My

system entirely eliminates the hand capacity which is so bothersome on short wave apparatus.

Instead of a metal cabinet I used a wooden one made of 3-ply veneer. The inner side of this cabinet is covered with strips of foil taken from old electrolytic or tubular condensers. When the set is installed in the completed cabinet the foil is grounded by soldering a wire from it to the ground of the set.—*Wm. Whitehead.*

Batteryless Flashlight

Flashlights are often used around the shack or work bench, and while it does not keep one broke to buy batteries for them, such expenditures are not needed. I hooked up an old output trans-



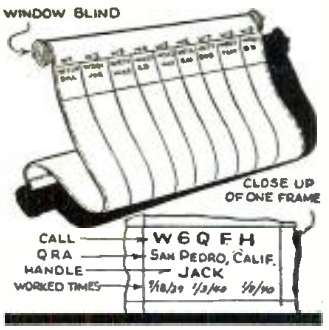
former, as shown in the accompanying sketch, as power for the flashlight used to inspect receivers in my service shop. Any output transformer will provide the low voltage high current necessary for flashlight bulb operation or, if one prefers, a filament transformer can be used, in which event standard pilot light bulbs can be operated in the flashlight at their normal brilliancy. And it's always ready when needed.—*A. Morino.*

Watch for R. & T. Radio Kinks by facsimile on WOR & WZXUP, Newark, N. J.; WOKO, Albany, N. Y.; and WHK-WCLE, Cleveland, O.

File for Contacts

When I answer a CQ in my shack, I can tell at a glance whether or not I have worked the station before and can locate the operator's handle (name) in a jiffy. This saves a long description of the rig, etc., if the station has been worked before.

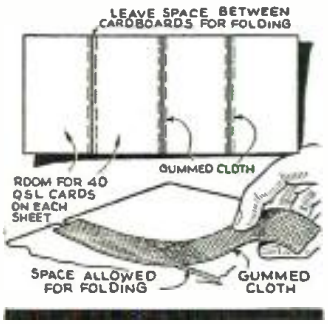
I merely take an old white window shade and divide it into nine columns—one for each district in the U. S.—as shown. These columns are subdivided so that I can list the station



called, address, operator's air name, and dates worked, in each frame. Let me emphasize, however, that this is *not* a log and is not intended as such.—*J. T. Kelly (W6QFH).*

QSL Card Rack

For the SWL who would like to plaster his walls with QSL cards and still carry them around on his person to show his friends in distant parts, mounting is indeed a problem. Here is a solution: Cut two 28 by 22½ inch cardboard sections in half, lay the four halves on a table or flat surface, paste the halves together with gummed cloth 1¼ inches wide. This will make four parts which can be folded one over the other and carried around as a scrap book or



spread out to hang on the wall of your radio den. In fact, a combination scrap book and wall mounting can thus be obtained. Use mounting corners to mount the cards. All items needed may be purchased at any stationery store.—*Clarence Sargent.*

I Cover the Pacific Coast!

(All times are P.S.T.)

Lyle M. Nelson

• EVENING reception from South and Central America has continued to improve here on the Pacific Coast with most stations on the 25 and 31 meter bands coming in well as early as 3:30 p.m.

A great many Cuban stations on 31 and 49 meters continue to furnish excellent entertainment during the evening. COCM on 9.82, COCH on 9.43, COBC on 9.36, COBX on 9.21, COCA on 9.10, COBZ on 9.02, COCQ on 8.85, COHI on 6.46, COCQ on 6.40, and COCD on 6.13 mc. are heard here with good volume.

Received here on the Coast is the "Aussie," VLQ on 9.61 mc., although VLQ2 on 11.87 mc. has been reported with good volume. Both stations are on the air irregularly during the early morning hours, but can usually be tuned near 6 a.m. In addition, Mr. Kendall Walker of Yamhill, Oregon, reports VLQ at 11 p.m.

Mr. Walker also reports a station announcing as VLW2 on 9.56 mc. This station, he says, is located in Perth and can be heard Monday and Wednesday mornings near 4 a.m.

Meanwhile Melbourne's popular broadcaster, VLR on 9.58 mc., continues to reach here during the early mornings daily except Sunday.

Marked improvement in reception from the Vatican has been noted here. HVJ on 15.12 mc. is well received on Tuesdays from 7 to 7:30 a.m. and on Sundays from 10 to 10:30 a.m. The Sunday broadcast is directed to North America.

Mr. T. S. Hite of Los Angeles reports a rare catch for Pacific Coast listeners—"Radio Tananarive." This station can be tuned under favorable conditions near 7 a.m. daily except Sunday on 9.85 mc., he says.

Several listeners have written that the Overseas Program for the Pacific Coast from Japan has been changed from JZJ to JVW3 on 11.73 mc. This is incorrect. Both JZJ on 11.80 and JVW3 are carrying the program with best reception usually from JZJ.

SHORT WAVE LEAGUE

DX on the HAM Bands

Edited by Elmer R. Fuller

Ten Best DX Catches

No.	Observer	Call	Freq.	Miles
1.	Worrell	PK1MX	14.33	12,400
2.	Worrell	PK3WI	14.05	12,100
3.	Fleming	PK1OG	14.18	11,700
4.	Worrell	VS6AG	13.683	11,500
5.	Worrell	KA1BB	14.265	11,200
6.	Lendzioszek	VS7RG	14.01	10,900
7.	Gabriel	KA1LZ	14.17	10,900
8.	Mannheimer	KA1CS	14.13	10,400
9.	Fleming	KA1GC	14.18	10,300
10.	Lendzioszek	J7CC	13.995	10,100

• THE second great European war still seems to be a deciding factor in the world of DX, if you can call it such. Since September, the DX has fallen down to almost none at all. But those who are still plying the amateur bands are finding some very fb DX. It is not as consistent as it used to be, but it does come in now and then.

Most predominant, it is still the South Americans who are putting their signals through our ether. The Spanish hams were not reported at all last month, although it is thought they are still on. It is not believed the war will affect them, as it has the other Europeans.

At the present writing we have a report from Charles Le Rasle, our observer for France, stating that the following countries have again allowed their amateurs to use the ether: Estonia, Hungary, Roumania, Greece and Italy. Spain, likewise is still being heard, but the Portuguese amateurs have been suspended for the time being. It is thought that the Portuguese will soon be back, however.

Thanks to Roger Legge of Binghamton, New York, and to "Ama-Touring," we learn the calls which have been assigned to the Byrd Antarctic Expedition. The amateur calls to be used are KC4USA (west base), KC4USB (east base), and KC4USC (the Snow Cruiser).

Also from Ama-Touring, "On December 14th, Byrd's flagship *North Star* stopped at Pitcairn Island, while en route from Panama to New Zealand. Rear Admiral Byrd reported that supplies of food, clothing and medicine were very low there. Nearly a quarter of the island's population were treated for varied ailments by the Expedition's doctors. Radio operators repaired the island's radio receiver. The transmitter (VR6AY) is still at Panama, awaiting some means of transporting it to Pitcairn."

Once more may we ask our observers to send in their reports *every month*, even if they are not up to par. Yours is not the only one that isn't as good as it used to be. Everyone is getting the same results, no DX and lots of QRM and American hams. For December we received reports

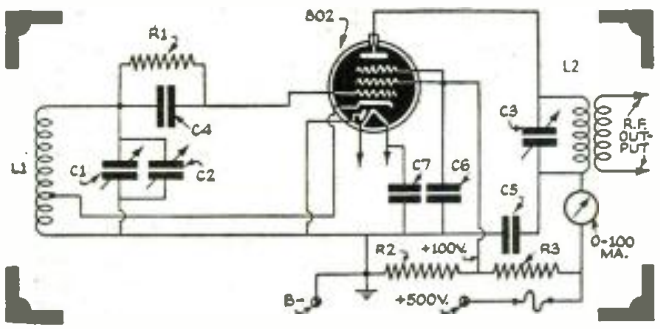
(Continued on page 661)

Question Box

Electron-Coupled Oscillator

I intend building a transmitter and plan to make use of an 802 in an electron coupled oscillator stage. Could a circuit be published showing the value of parts needed? —K. Coleman, Newark, N. J.

A. Here is a diagram of such an oscillator. The parts shown and numbered are as follows. C1—4 mmf./meter; C2—Trimmer condenser; C3—2 mmf./meter; C4—0.00025 mfd. mica; C5, C7—0.005 mfd., mica; C6—0.01 mfd.; R1—25,000 ohms, 1 watt; R2—20,000 ohms, 5 watts; R3—20.000 ohms, 10 watts; L1 tunes to frequency "f"; L2—tunes to frequency "2F". The capacitance values given for the various tuned circuits are in terms of mmf. per meter of wave length. (L2 is coil across C3.)



Electron-coupled oscillator for transmitter. No. 1210.

Parlor Transmitter

Several questions regarding the "parlor" transmitter described in the September issue were asked by G. B. English, 6526 Perry Avenue, Chicago, Ill.

A. The 30 tube requires 2 volts for the filament so that you must use two 1½ volt cells in series to supply 3 volts. A small wire-wound resistor of from 14 to 16 ohms in series with the tube filament and the two cells will then provide proper filament power for the 30. The Hytron tube used in the original had a 1.5 volt filament. You may use a type 1G4G which is similar in size and characteristics to a type 30, but has a 1.5 volt filament.

Facsimile Kit Construction

I have seen the Crosley facsimile kit advertised in your magazine and am thinking of building one. Can you give me an idea how long it will take to put this kit together for operation? —Herbert Massy, Clifton, N. J.

A. The putting together of this kit will all depend upon your skill at following diagrams and constructing radio apparatus. One of our technical men here put one together in four hours and was copying programs from WOR that same evening. You can figure that it will take you a good evening. See Mr. Eichberg's story on assembling this kit in the October issue. Write our circulation department for a copy of this issue.

I.F. Needs Adjustment

A peculiar type of code interference on the broadcast band is being experienced with my radio receiver. The signals which have been identified as those of high frequency transoceanic transmitters are heard with medium strength on certain critical settings of the tuning dial, usually between 1500 and about 1300 kc. In some instances they break through the programs of small local stations; in others they are audible only between carrier waves. Can this sort of interference be eliminated?—Chester Moran, White Plains, N. Y.

A. The trouble is evidently due to "beating" or heterodyning between the actual radio signals from the transmitting stations and spurious harmonics of the local oscillator circuit of the superheterodyne receiver which you are using. The resulting "beat note" happens accidentally to match the setting of the intermediate-frequency amplifier section of the receiver and therefore a detectable signal rides through to the loud speaker. If the signals tend to break up a favorite station, they can be eliminated by slight readjustment of the I.F. amplifier.

Three-Tube Diagram

I am constructing a set consisting of a 6K7, and a 6F6, with an 80 as rectifier. I desire to use this receiver for use on the short waves but have no diagram to work from. Please publish such a diagram, with complete particulars as to parts needed?—H. W. Warnecke, Tarrytown, N. Y.

A. A circuit such as you request appeared in the September, 1939, issue of Radio and Television. Write our circulation department for a copy of this issue.

Improving Aerial Response

Recently I installed one of these new all-wave antennas but did not use any coupling coil between antenna and receiver. I was informed that if a coupling coil were used, more signal with less noise could be had from the antenna. If this is so, can you inform me how such a coil can be made?—Felix Johnson, Madison, Wis.

A. Many antenna systems do not supply coupling arrangements for connecting a transmission line leading to the receiver proper, with the result that the full advantage of the noise-reduction antenna system is often lost. A simple coupler can be experimented with. Any insulated wire of reasonable size can be used to make the coupler. Ordinary bell wire is cheap and readily available at any radio or hardware store. Obtain a 2-inch winding form—even a bottle, pepper can, or round box. Wind on 5 turns of wire, slip off the coil and bind into a tight coil with a few pieces of thread or tape. This coil connects to the transmission line at the set end. Wind 20 more turns in the same way, bind, and in turn bind the second coil to the first coil. The second coil connects to the doublet posts of the receiver. Turns should be removed, one at a time, from the larger coil until best results are obtained.

Distance-Finding Chart

On the television and facsimile bands, I understand that transmissions and their reception are limited to the horizon. Is there any chart available that can be used to calculate the distance in miles if the height of the transmitting and height of the receiving antenna are known? I have seen such a chart but now I can't find it.—S. Sylvetre, White Plains, N. Y.

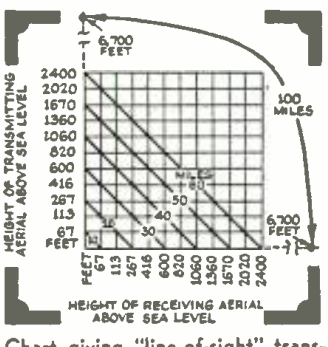


Chart giving "line-of-sight" transmission distances. No. 1211.

A. Here is a chart that can be used in calculating distances in miles when the height of both the transmitting and receiving antennas are known. As an example: find the height of the transmitting antenna and your receiving antenna. Follow over from the left margin (transmitter height) to the vertical line corresponding to the height of the receiving aerial. The nearest diagonal line is the normal limiting distance for that particular station.

A fee of 25c (stamps, coin or money order) is charged for letters that are answered by mail. This fee includes only hand-drawn schematics. We cannot furnish full-size working drawings or picture layouts. Letters not accompanied by 25c will be answered on this page. Questions involving considerable research will be quoted upon request. Names and addresses should be clearly printed on each letter.

Short Wave League

(Continued from page 659)

from only fourteen states and West Australia. This is only about one-third of our American observers.

Reports were received from the following observers:—

Arizona	Lester Fuller
Colorado	Dan T. Hallen
Florida	Major Lester
Iowa	Dick Mannheimer
Kansas	Burns E. Hegler
Maine	Frank L. Bernard
Massachusetts	Edward Lendzioszek
Michigan	Vernon Gabriel
Missouri	R. B. Fleming
North Carolina	Roger Poole
Texas	Edward C. Slaughter
Virginia	Everett Worrell
Wisconsin	Jesse Dana Wheaton
West Virginia	W. O. Deem
West Australia	Roy W. Matthews

Again last month, for the second time, one of our observers has pulled in the best DX possible. Everett Worrell, Observer for Virginia, reports hearing PK1MX on 14.33 mc. This ham is 12,400 miles from this listening post, which is just about half way around the world, or as far as one can possibly get.

Only seven Asiatics were heard during the past month.

Call	*Freq.*	*R*	*S*	*Where Heard*
J7CC	13.995	4	6-7	Mass.
VS6AG	13.683	4	5-6	Va.
VS7RG	14.01	3	5	Mass.
XU7HY	14.	5	7-8	West Australia
XU8MY	14.	5	6	West Australia
XU8ZA	14.	5	8	West Australia
XU8RB	14.08	4	6	Mo.

Three Africans were all that were reported:—

CN8DU	14.35	2	6	Mass.
EK1AF	14.12	5	9	Mich., N. C.
OQ5AB	14.39	5	6-7	Mich., Ariz.

NORTH AMERICA—

HI7G	14.08	5	9	Kans., N. C.
K4FKC	14.17	5	8-9	Mich., Colo.
K4DDH	14.275	5	9	Mass.
K4FBC	28.2	4	5	N. C.
K5AM	14.27	5	7-8	Mich.
K7GTP	14.31	5	6-7	Mich.
K7HCX	14.24	5	9	Mich.
K7FQY	14.31	2	3-4	Mass.
TI2RC	14.08	5	7	N. C.

SOUTH AMERICA

CE3BK	14.12	5	9	Mich.
CE3AG	14.06	5	6	Ia.
HC1CM	14.02	5	7	Colo.
HK3CC	14.08	5	6	N. C.
LU1QA	13.89	5	8	Va.
LU4CZ	14.035	4	7	Ariz.
LU4AD	14.03	5	7-8	Va.
LU7BK	14.06	4	5	Colo.
OA4N	14.27	4	5	Colo.
PY2AC	14.085	3	4	Ia.
PY5AK	14.16	5	8	Mich.
PY7AL	14.075	5	7-8	Mass.
YV1AQ	13.995	5	5	Ia.
YV4AE	14.1	5	7	Ia.
YV4AB	14.12	4	5	N. C.
YV5ABF	14.06	5	9	Kans., Ia.
YV5AG	14.08	5	8	Kans.
YV5AK	13.975	4	7	Mass.
YV5AKA	14.06	4	5	N. C.

EUROPE—

LK1UU	28.35	5	5-6	Va.

OCEANIA—

PK1OG	14.18	4	6	Mo.
PK1MX	14.33	4	4-5	Va.
PK3WI	14.05	5	7-8	Va.
K6BNR	14.25	5	9	Mich., Colo., Ia.
K6NYD	14.2	5	8	Kans., Colo., Ia., Ariz.
K6LCV	14.225	5	6	Colo.
K6MVA	14.165	5	8	Colo.
K6OFW	14.23	5	6	Colo.
K6OJI	14.155	5	6-8	Mass.
K6PAD	14.255	5	8	Mass.
K6OXJ	14.305	5	7-8	Mass.
K6LKN	14.2	5	9	Ariz.
K6PTW	14.195	5	8	Ariz.
KA1BB	14.265	5	6	Va., Kans.
KA1LZ	14.17	5	8-9	Mich.
KA1AF	14.13	5	9	West Australia, Kans.
KA1HS	14.	5	9	West Australia
KA1JP	14.	5	9	West Australia
KA1LB	14.	5	9	West Australia
KA1AG	14.1	5	7	Kans.
KA1CW	14.07	5	9	Kans., Ia., Mo.
KA1CS	14.13	5	5	Ia., Mo.
KA1AP	14.14	4	7	Mo.
KA1GC	14.18	5	9	Mo.
KA1ME	14.18	5	7	Mo.
KB6OCL	14.	5	6	West Australia

United States—Forty stations were heard in West Australia by Observer Matthews and on the 14 megacycle band. These included 6—W1's, 4—W2's; 7—W4's; 6—W6's; 4—W8's; and 9—W9's.

Be Sure to See Page 644 for Important New Subscription Offer!

World Short Wave Stations

Revised Monthly

Complete List of SW Broadcast Stations

Reports on station changes are appreciated.

Mc.	Call	
42.020	VK2MA	SYDNEY, AUSTRALIA., 7.14 m. Addr. Amal. Wireless Ltd., 47 York St. Daily 1-7 am.
31.600	W1XKA	BOSTON, MASS., 9.494 m., Addr. Westinghouse Co. Daily 6 am.-1 am., Sun. 8 am.-1 am. Relays WBZ.
31.600	W1XKB	SPRINGFIELD, MASS., 9.494 m., Addr. Westinghouse Co. Daily 6 am.-1 am., Sun. 8 am.-1 am. Relays WBZ.
31.600	W3XEY	BALTIMORE, MD., 9.494 m., Relays WFBR 4 pm-12 m.
31.600	W2XDV	NEW YORK CITY, 9.494 m., Addr. Col. Broad. System, 485 Madison Ave. Daily 6-11 pm.; Sat. and Sun. 1.30-6, 7-10 pm.
31.600	W9XHW	MINNEAPOLIS, MINN., 9.494 m. Relays WCCO 9 am.-12:30 am.
31.600	W3XKA	PHILADELPHIA, PA., 9.494 m., Addr. NBC. Relays KYW 9 am.-10 pm.
31.600	W5XAU	OKLAHOMA CITY, 9.494 m., Sun. 12 n-1 pm., 6-7 pm. Irregular other times.
31.600	W9XUY	OMAHA, NEBR., 9.494 m. No sked. known.
31.600	W4XCA	MEMPHIS, TENN., 9.494 m. Addr. Memphis Commercial Appeal. Relays WMC. 10 am.-6 pm.
31.600	W8XAI	ROCHESTER, N. Y., 9.494 m., Addr. Stromberg Carlson Co. Relays WHAM 7.30-12.05 am.
31.600	W8XWJ	DETROIT, MICH., 9.494 m., Addr Evening News Ass'n. Relays WWJ 5 am.-11.30 pm. Sun. 7 am.-11 pm.
26.550	W2XQO	NEW YORK CITY, N. Y. 11.30 m. Noon-9 pm.
26.500	W9XTA	HARRISBURG, ILL., 11.32 m. 1-4 pm.
26.400	W9XAZ	MILWAUKEE, WIS., 11.36 m., Addr. The Journal Co. Relays WTMJ from 1 pm. to midnite.
26.150	W4XA	NASHVILLE, TENN., 11.47 m., noon-1, 6.30-10 pm.
26.150	W9XUP	ST. PAUL, MINN. 11.47 m. Rel. KSTP 8 am.-1 am.
26.100	W9XJL	SUPERIOR, WIS., 11.49 m. Relays WEBC daily. 11 am.-3 pm.
26.050	W9XTC	MINNEAPOLIS, MINN., 11.51 m. Relays WCTN 10 am.-8 pm.
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.
26.000	W8XUJ	CINCINNATI, OHIO. 11.54 m. 2-4 pm.
26.000	W9XA	KANSAS CITY, MO., 11.54 m., Addr. Commercial Radio Eqpt. Co. 12 noon-3 pm.
25.950	W6XKG	LOS ANGELES, CAL., 11.56 m., Addr. B. S. McGlashan, Wash. Blvd. at Oak St. Relays KGFJ 24 hours daily. DX tips Mon., Wed. and Fri. 2.15 pm. Temp. off air.
25.950	W8XNU	CINCINNATI, OHIO, 11.56 m., 7 am.-2, 4 pm.-1 am.
25.900	W9XPD	ST. LOUIS, MO., 11.6 m. Addr. Pulitzer Pub. Co. Relays KSD. 10 am.-1, 4-8 pm.
25.300	W5XD	DALLAS, TEXAS, 11.86 m., 12.30-2.30 pm.
25.300	W9XOK	ST. LOUIS, MO., 11.86 m. Addr. St. Louis Times-Star, Relays KXOK.
25.300	W2XJI	NEW YORK, N. Y. 11.86 m., Addr. Bamberger Broad. Service, 1440 Broadway. Relays WOR 11.30 am.-3.45, 5-6 pm.
25.250	W2XUP	NEW YORK CITY. 11.88 m. 4-6 pm.
21.640	GRZ	DAVENTRY, ENG., 13.86 m. Addr. B.B.C., London. Unused at present.
21.630	WRCA	BOUND BROOK, N. J. 13.87 m. Addr. N.B.C., N. Y. C. Noon-3.30 pm. to Latin America.
21.570	WCBX	NEW YORK CITY, 13.91 m. Addr. CBS, 485 Madison Ave. 8 am.-12.30 pm. to Europe.
21.565	DJJ	BERLIN, GERMANY, 13.92 m., Addr. Broadcasting House. Irreg.
21.550	GST	DAVENTRY, ENG., 13.92 m., Addr. (B.B.C., London) 5.42-10.15 am.
21.540	WPIT	PITTSBURGH, PA., 13.93 m., Addr. Grant Bldg. Relays KDKA 6.30-8 am.
21.530	GSJ	DAVENTRY, ENG., 13.93 m., Addr (See 21.550 mc.) 5.40-8.45, 9.30-11.45 am.
21.520	WCAB	PHILA., PA., 13.94 m., Addr. Col. Broad. Syst., 485 Madison Ave., N. Y. C. 12 n. to 3.45 pm. Sat. 12 n.-6 pm. Sun. 12 n.-2.30 pm. to So. Am.
21.510	2RO16	ROME, ITALY. 13.94 m. 9-9.55 am., irregularly.
21.500	WGEA	SCHENECTADY, N. Y., 13.95 m., General Electric Co., 8-11 am.
21.480	PHI3	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.
21.450	DJS	BERLIN, GERMANY, 13.99 m., Addr., Broadcasting House. 12.05-7.55 am. To Asia.
19.020	HS6PJ	BANGKOK, THAI, 15.77 m. Mondays 8-10 am. See 15.23 mc.
18.450	HBF	GENEVA, SWITZERLAND, 16.26 m., Addr. Radio Nations. Fri. 8.45-10.45 am.
18.040	KHE	KAHUKU, HAWAII. 16.63 m. Sats. and Suns. 8.30-9 pm.

16 Met. Broadcast Band

17.850	TPB3	PARIS, FRANCE, 16.8 m. Addr. (See 15.245 mc.) 5-10 am.
17.845	DJH	BERLIN, GERMANY, 16.81 m., 12.05-7.50, 8-11 am.
17.840	HVJ	VATICAN CITY, 16.82 m. Heard 12 n. on Wednesday.
17.840	EIRE	MOYDRUM, ATHLONE, EIRE, 16.82 m. Addr. Radio Eireann. 8.30-10 am.; Even dates 12.30-2.30 pm., 5.30-6 pm.; Odd dates 12.30-2.30 pm.
17.830	LRA5	BUENOS AIRES, ARG. Fri., 4-4.30 pm.
17.830	WCBX	NEW YORK CITY, 16.81 m. Addr. CBS, 485 Madison Ave., N. Y. C. 8 am.-6 pm. Irregular.
17.820	2RO8	ROME, ITALY. 16.84 m., Addr. (See 2RO, 11.81 mc.) 5-7.25, 7.30-9 am., 6-7.25 pm. to So. Am.
17.810	GSV	DAVENTRY, ENGLAND, 16.84 m., 7-11.45 am. to N.A, 11.52 am.-3.30 pm. to Africa. News, 8.15, 11 am. to Far East.
17.800	OIH	LAHTI, FINLAND, 16.85 meters, 4-9 am.
17.790	GSG	DAVENTRY, ENG., 16.86 m., Addr. B.B.C., London. 5.40-10.15 am. to Australia and W. I.
17.785	JZL	TOKYO, JAPAN, 16.86 m. Irregular.
17.780	WNBI	BOUND BROOK, N. J., 16.87 m., Addr. Natl. Broad. Co., 9 am.-4 pm. to Europe, 4-11 pm. to So. Amer.
17.770	PHI2	HUIZEN, HOLLAND, 16.88 m., Addr. (See PHI, 11.730 mc.) Sun. 6.40-7.40 am. to Far East.
17.760	DJE	BERLIN, GERMANY, 16.89 m., Addr. Broadcasting House. 12.05-11 am.
17.755	ZBW5	HONGKONG, CHINA, 16.9 m., Addr. P.O. Box 200. Dly. 11.30 pm.-1.15 am., 5-10 am., Sat. 9 pm.-1.30 am., Sun. 5-9.30 am. Operates irreg.

End of Broadcast Band

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.
17.280	FZE8	DJIBOUTI, FRENCH SOMALILAND, 17.36 m. Test XMSN 1st Thurs. each month 8-8.30 am.
15.550	CO9XX	TUINICU, ORIENTE, CUBA, 19.29 m., Addr. Frank Jones, Central Tuinicu, Tuinicu, Santa Clara. Broadcasts irregularly evenings.
15.410	RV96	MOSCOW, U.S.S.R. 19.47 m., 5-7.30 am., 8.55-10.30 pm.
15.370	HAS3	BUDAPEST, HUNGARY, 19.52 m., Addr. Radiolabor, Gyali Ut 22. Sun. 9-10.30 am.
15.360	—	BERNE, SWITZERLAND, 19.53 m. Irreg. 6.45-7.45 pm.
15.360	DZG	ZEESEN, GERMANY, 19.53 m., Addr. Reichspostzenstralamt. Tests irregularly. Ams.
15.350	—	LUXEMBURG, (no call). 19.54 m., 7 pm.-3 am. approx.

19 Met. Broadcast Band

15.340	DJR	BERLIN, GERMANY, 19.56 m., Addr. Br'dcast'g House, 4.55-10.50 pm. to C.A.
15.330	KGEI	SAN FRANCISCO, CALIF., 19.56 m. Addr. General Electric Co., 6.30-11.15 pm. to So. America.
15.330	WGEA	SCHENECTADY, N. Y., 19.56 m., Addr. General Electric Co. Relays WGY, 8 am.-6 pm. to Europe.
15.325	JLT3	TOKYO, JAPAN, 19.58 m. 9-10.30 pm.
15.320	OZH	SKAMLEBAK, DENMARK, 19.58 m., Sun. 8 am.-1.30 pm. Dly. 1-1.30 pm.
15.310	GSP	DAVENTRY, ENG., 19.6 m., Addr. (See 17.79 mc.) 2-5 am. to Near East, 1.35-3.30 pm. News 2 pm. to No. Am.
15.310	YDB	SOERABAJA, JAVA, N. E. I. 19.60 m. Addr. NIROM. 10.30 pm.-2 am., Sat. 7.30 pm.-2 am.
15.300	2RO6	ROME, ITALY. 19.61 m., Addr. (See 2RO. 11.81 mc.) 4.10-4.55 am.; 10 am.-12.06 pm.; 12.20-12.40; 1.40-2.30; 3-5.30 pm., 7.30-9 pm. to N.A.
15.300	XEBM	MAZATLAN, SIN., MEX., 19.61 m., Addr. Box 78, "El Pregonero del Pacifico." Irregularly 9-10 am., 1-2, 8-10 pm.
15.290	VUD2	DELHI, INDIA, 19.62 m. Addr. All India Radio. 9.30-11.30 pm., 1.30-3.30 am., 7.30 am.-12.30 pm.
15.290	LRU	BUENOS AIRES, ARG., 19.62 m., Addr. El Mundo. Relays LRI, 7-9 am.
15.280	DJQ	BERLIN, GERMANY, 19.63 m., Addr. Broadcasting House. 12.05-11 am., 4.50-10.50 pm.
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.

(Continued on page 677)

All Schedules Eastern Standard Time

This month's Plaque Winner, H. E. Saltmarsh of Dayton, Ohio.

"Award of Honor" Plaque

For Best HAM STATION PHOTO

This Month Goes to

Harley E. Saltmarsh, W8CIB

Editor,

The following is a description of my Ham station.

The three photos cover all the equipment used here at amateur radio station W8CIB and were home constructed except for the receiver, an NC-100AA. The small cabinet at the far end on top of the speaker cabinet is the frequency meter-monitor which is used continuously for Bug keying.

The transmitter lineup is as follows: a 59 keyed Xtal oscillator coupled to an RK-20-A in the final amplifier, running with 2000 volts on the plate at 90 ma. current. This allows over 100 watts to be put into the antenna with the RK-20 running cool, and with normal keying.

Seven Weston meters check every circuit in the rig including the antenna current. The separate photos show the transmitter and the master control box in more detail, the latter being hidden entirely from view by the operator in the main station photo. Every operation is automatic, being taken care of by relays.

W8CIB is a one hundred per cent CW station and was designed and built up to commercial standards.

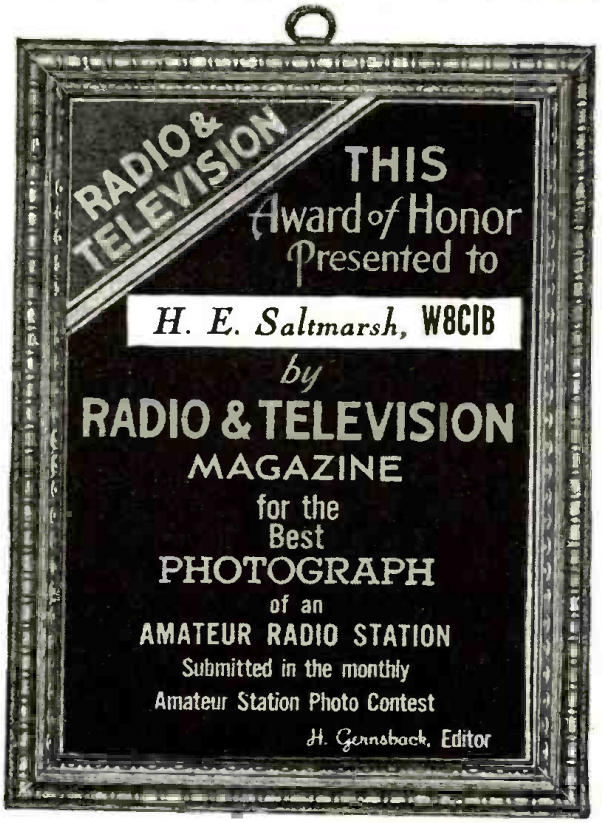
DX here is all districts, along with many foreign contacts, such as England, Hawaiian Islands, Australia, etc., by way of example. The antennas are end-fed half-wave Zepp.

HARLEY E. SALTMARSH, W8CIB,
21 Brandt St., Dayton, Ohio.

●

Can you win an Award of Honor? Full rules appeared in December Radio & Television.

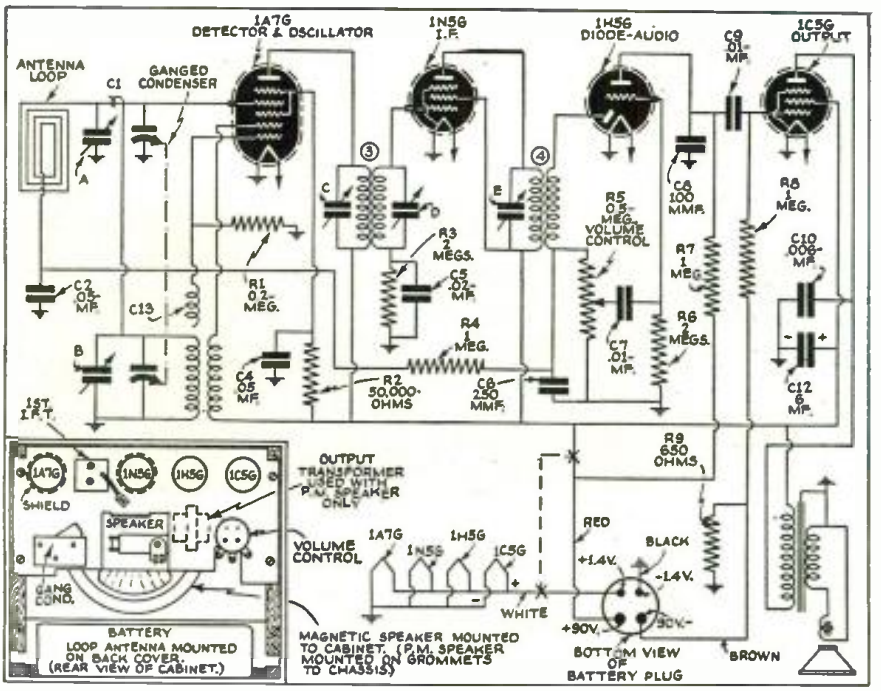
Here is the new "Award of Honor" Plaque which measures 5" x 7" in size. It is handsomely executed in colors on metal, and is framed, ready to hang on the wall. The letters appear in gray against a beautiful black background, and we are sure that our amateur friends who are awarded one of these new "badges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



4-Tube Portable Tunes B.C. and Police Bands

By G. C. Crose

Neat 4-Tube Portable—its hook-up is shown at right.



● THIS new Knight 1.4 volt compact portable is inexpensive, easy to build, has excellent sensitivity, and excellent tone. It is very economical to operate, uses an "AB" power pack, and features the new built-in "Air-Magnet" antenna. The portable cabinet is sturdy and attractive.

All parts have been carefully selected, and the chassis is supplied drilled and punched for ease of assembly. The picture diagram supplied with the kit will help one mount the parts correctly. The actual wiring should be carried out by following the schematic diagram.

At all times try to keep your leads as short as possible by wiring directly from point to point. The wires which connect the grid and plate terminals of the tubes should be especially short for most efficient performance. Remember that you need not use the entire length of the leads which are attached to condensers and resistors; if the leads are longer than needed for the connection to be made, cut the leads off at the desired length.

This receiver has an "Air-Magnet" built-in loop antenna, so requires no external antenna. It is somewhat directional, so reception from weak stations can be improved by turning the set in the proper direction. The loop consists of 33 turns of No. 20 d.c.c. wire, wound in "pancake" form, the inside diameter being 2 in. and the outside diameter 3¼ ins.

The battery used on this receiver is a 1½ volt and 90 volt "AB" dry pack 6⅞" x 5 7/16" x 2¾" in size. Knight battery No. A10049 is recommended for this receiver. This battery pack has a minimum life of about 150 continuous hours. The life may be appreciably extended to above 200 hours under intermittent use.

The left-hand knob is manual volume control and "On-Off" switch. Turn the left-hand knob to the extreme right, the switch will click, turning on the set with volume wide open.

The right-hand knob is the station selector.

This Knight portable covers the broadcast band between 535 and 1612 kc. and tunes police calls up to 1712 kc. (175 meters.)

For best results this four-tube superhet should be aligned with a signal generator. However, a fair alignment job can be made without any service equipment. If you do not have a signal generator, proceed as follows: Tune in a local station around 1400 kc., then reduce the volume until you can scarcely hear the station. Now turn the trimmers of the second I.F. transformer until maximum volume is obtained. Next, turn the trimmers of the first I.F. transformer, repeating the resetting of the volume control.

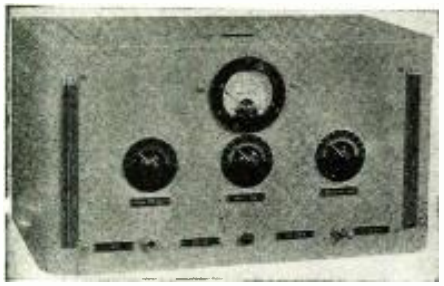
The next step is to adjust the small trimmers which appear on the sides of each gang of the tuning condenser. These should be adjusted until maximum volume is obtained. Finally, tune in a station at about 600 kc. Rocking the tuning condenser up and back a little past the setting for this station, turn the padder (25 mmfd.) condenser until maximum volume is obtained.

For most efficient alignment a signal generator covering the frequencies of 456, 600, 1400 and 1720 kc. should be used together with an output meter which should be connected across the primary or secondary of the output transformer. Full instructions come with the kit.

Since the complete kit is available at a price below the cost of similar ready built sets, you can economize by building this portable for your own use or resell custom-built sets at a profit.

This article prepared from data supplied by courtesy of Allied Radio Corp.

Transmitter Kit



● THE Bud XT-25 or XT-25C kits make up a radio-frequency unit intended to be used either as a driver for a higher power R.F. amplifier such as the BP-A-500 amplifier, or as a transmitter complete in itself and delivering 25 watts of R.F. output (from 10 to 160 meters). The difference in the two kits lies in the fact that the XT-25 kit is mounted on a standard 10½" x 19" Masonite rack panel, while the XT-25C kit mounts in a streamline metal cabinet suiting it for use directly on the operating table in a fixed station, as a portable transmitter, or in similar applications.

The tube lineup consists of an RK-25 (or 802) Tritet crystal oscillator and a pair of ceramic base 6L6G tubes in the output stage. By using the 6L6G tubes in parallel for straight-through amplification and in push-pull for doubling, practically the same output may be obtained on all bands with good efficiency. Great care has been taken in the design of this unit to assure the shortest possible R.F. leads, and adequate shielding is incorporated to assure complete freedom from any sort of parasitics or self-oscillation once the output stage has been neutralized. If reasonable care is taken to make an accurate and neat wiring job, fine performance can be expected from this unit working as an exciter, C.W. transmitter, or plate-modulated transmitter on all bands.

High Capacity in Compact Form

● THERE are numerous low-voltage radio and electric applications, including "A" eliminators, rectifiers, and dynamic speaker installations, which require extremely high capacity for maximum operating effectiveness. For such services Cornell-Dubilier has produced the Type FA capacitor in a variety of capacity values up to 2,000 mfd. The units are extremely compact; the FA-1220 unit, for instance, which provides 2000 mf. at 12 volts,

is only 1⅜" in diameter by 4⅛" in length. Other units vary in size from 1⅜" x 2½" to 2½" x 4⅛". These units are made up in cylindrical aluminum cans with bakelite terminals caps into which screw terminals are molded. Over this assembly is a cardboard insulating sleeve.

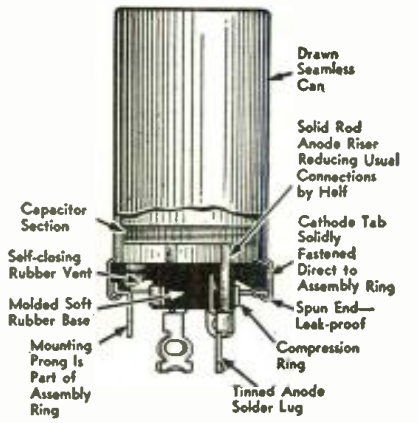
Standard FA units are made for working voltages of 12, 15, 18, 25 and 35 volts, and in capacities of 500, 1,000 and 2,000 mf. Other FA capacitors of higher voltage ratings are also available on special order. The type FA capacitors are described in detail in Catalog No. 175A.

Sockets for Midget Tubes

● AMERICAN PHENOLIC CORPORATION is producing sockets of molded high-dielectric black bakelite, with seven contacts arranged in a ⅛" diameter circle to fit the new all-glass midget RCA tubes. These sockets mount in plain ⅝" holes which afford adequate clearance, and are held in place with spring steel retainer rings. Floating contacts are provided to avoid breaking the seal between the glass and the .040" tube prongs. Arranged at the center of the underside of the socket is a sleeve which may be grounded to shield the prongs from cross-coupling. The company is also providing adapters for these tubes, to be used with tube testers and analyzers.

New Dry Electrolytic

● SOLAR MANUFACTURING CORP. has just announced a dry electrolytic capacitor, type DY. The special base is a novel soft rubber molding through which all terminals are brought and sealed under compression in a manner similar to that successfully used for years in wet electrolytic practice. Low contact resistance, improved R.F. characteristics, thorough sealing, freedom from the cause of intermittents, and the advantages of the wet electrolytic type of vent are claimed. A special engineering data sheet is available.



New RCA Signal Generator

● THE RCA "Signalyst," a low-priced signal generator designed for increased efficiency in radio and television receiver alignment work, has been announced by RCA Mfg. Co. The new service instrument is a companion to the Rider Chanalyst and the Rider VoltOhmyst recently acquired by RCA.

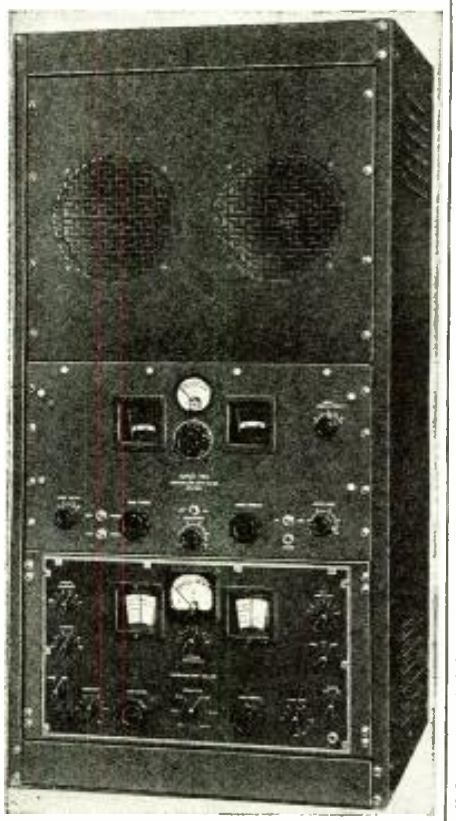
The new Signalyst (Stock No. 161) has a fundamental frequency range of 100 kilocycles to 120 megacycles on 10 bands, and is accurate and stable to within plus or minus 1% scale calibration. Heterodyne detection is provided for calibration purposes.

It is useful for R-F and I-F alignment of radio broadcast receivers and special receivers operating in the ultra-high frequency bands, for *television* overall tests when modulated by square waves or composite picture signals, and for direct calibration of *television* receiver local oscillator when used in conjunction with the Piezo Electric Calibrator.

Its maximum output voltage is .05 volt at low range and 1.3 volts at high range. Its features include iron core air trimmer capacitors and adjusted coils wound on special low-loss coil forms; die-cast shielded attenuator providing direct reading of output voltage by means of a meter; large three-color dial (90 inches scale length); output available at end of a coaxial cable; and regulated plate and screen voltage supply.

Byrd Takes 15 Receivers

● THE Byrd Expedition to the Antarctic is equipped with 15 Hammarlund receivers, nine of which are Super-Pros, the remaining six being HQ-120-Xs. Large double unit, as illustrated below, will be



used in base stations and on ships, while individual sets will serve in output stations and mobile units. The planes and snow cruiser will carry the HQ-120-Xs.

New RCA "Ham" Tube

812 Transmitting Triode, because of its high perveance, can be operated at high plate efficiency and low driving power. For example, two tubes in Class C telegraph service (ICAS) may be operated at a plate input of 450 watts with only 13 watts driving power. The tube may be operated at maximum ratings in R.F. service at frequencies as high as 60 mc. and at reduced ratings as high as 100 mc. Some of its characteristics are: Filament voltage, A.C. or D.C., 6.3; filament current, 4 amps. As A.F. power amplifier and modulator, Class B, maximum plate voltage, 1,500; maximum signal power output, 225 watts. As R.F. power amplifier, Class B telephony, maximum plate voltage, same; power output, 25 watts. As plate-modulated R.F. power amplifier, Class C telephony, plate voltage, 1,250 maximum; power output, 120 watts. As R.F. power amplifier and oscillator, Class C telegraphy, D.C. plate voltage maximum, 1,500; power output, 170 watts.

Like other RCA tubes, this one is described in detail in an 8-page booklet published by the manufacturer.

CORRECTION

In the diagram for the "War News" receiver on page 584 of the last issue, the line marked with an X should be left out of the circuit.

Frequency Modulation Stations Multiply

(Continued from page 645)

to drill through 575 feet of solid rock to secure sufficient water for the plant.

In ten months the first unit of the transmitter was on the air with 2,000 watts and it is expected by early spring that the new wing to the transmitter building will be completed and the full 50,000 watts be used, affording excellent entertainment to all within a 100-mile radius, including the metropolitan areas of Boston, Springfield, Providence, Hartford, Worcester, Fall River and New Bedford, which together with other smaller cities and towns have a population of almost 6,000,000 people.

In order to assure this wide-spread coverage, the radiating antenna system used consists of a four-bay (16 elements) turnstile array, located at the top of a 400-foot guyed mast, 1,800 feet above sea-level. This system is fed by concentric lines in preference to open-wire feeds, thus minimizing the effects of ice and sleet. Shunt exciting each individual element in the array through capacitors reduces standing waves to a very few per cent.

The problem of getting the Yankee Network programs to W1XOJ, which is 42 miles from Boston, was solved by another pioneering project, designed by Major Armstrong.

In Boston and atop the Studio Building was installed WEOD, a 250 watt F-M transmitter operating on 133,030 kc., similar to W1XOJ except for size. Programs were taken from the Yankee Network studios and fed to this transmitter, which is using a directive antenna array in a south-west-south direction, or toward Paxton. On the summit of Asnebumskit Hill a "V" beam was set up, which easily picked up the WEOD signal and in turn fed it to the W1XOJ transmitter. A simple and foolproof solution to a difficult problem, for the usual leased telephone wire hookup would not have been able to carry the high fidelity over this distance. Also, if that is not reason enough, the calculated cost of this relay is approximately *one-quarter* of that of the leased wire system!

As a whole, the Yankee Network feels well satisfied with their new F-M project. Mr. Shepard and his technical staff may be remembered for their other pioneering adventures in the broadcasting industry, such as directional antennas, half-wave antennas, live-end, dead-end studios, etc., and they feel that the inauguration of the type of broadcasting service given by the F-M of W1XOJ will demonstrate such a superiority over present methods that the results will be revolutionary.

W1XPW

Meanwhile, down in Hartford, Conn., the owners of independent WDRC, Inc., were the next to be impressed by F-M, and they have set up a 1,000 watt station atop West Peak, near Meriden, Conn. Here at W1XPW, the antenna in use is also a turnstile, but of six sections (24 elements), each of which are a little less than ½ wave apart. The array is resonated by means of two short-circuited matching stubs. From each stub a 280 ohm open line goes down the side of the steel pole, supporting the array, to a pair of concentric lines of 140 ohm surge impedance, which are in turn joined and fed to another 140 ohm concentric line coming from the transmitter.

W1XPW operates on 43,400 kc., or 400 kilocycles higher than W1XOJ. Present operating schedule is 2:00 p.m. to 10:00 p.m. daily. W2XQR: The F-M station of WQXR, well-known for their programs using the highest fidelity possible on the regular broadcast band, is now in daily operation after coming on the air last November 6th. W2XQR operates on 43,200 kc., with a new REL 1,000 watt transmitter from a site on the North Boulevard in Long Island City, N. Y.

Recently on W2XQR, F-M was put to another test, that of *broadcasting facsimile*. While the results have not been made public, we believe it needs no over-exercise of the imagination to see that use of F-M for facsimile transmission would provide unmarred type and pictures over considerably greater distances.

W2XMN: Major Armstrong's Own F-M Station

No description of the F-M stations would be complete without some mention of Major Armstrong's own station, W2XMN.

In the Major's own words, "W2XMN is located at Alpine, N. J. (about 15 miles north of New York City on the west bank of the Hudson River) and transmission is accomplished by modulation of the frequency of the radiated wave. The mid-frequency is 42.80 mc., the deviation is from 42.7 to 42.9 mc., and the transmission is horizontally polarized. One may find wide variations in signal strength, as we frequently change the power and type of antenna."

W2XMN operates mostly 4:00 to 11:00 p.m. week days and uses a power of approximately 40,000 watts.

How Far?

Those closely associated with UHF often find themselves discussing: What will the DX limit of an F-M transmitter be?

While it would be sheer folly to attempt to answer that question at this time, certain obvious facts should be brought to attention.

First, the DX limit of an F-M transmitter (this is provided one uses an F-M receiver, of course) will be considerably greater than heretofore possible with amplitude broadcasting. Why? Since there will be no outside interference, such as QRN, heterodynes and cross-talk, etc., a very few microvolts of signal will be needed to actuate the distant receiver. Also, the stations themselves, for the most part, shall be located in very favorable positions that will afford programs of entertainment value *far beyond the horizon.*

At the writer's location (Pleasantville, N. J.), we have been able to make a study of receiving F-M stations. W2XMN, which is 114 miles from us, is received with no difficulty whatsoever, any time of the day or night. W1XPW, which was first heard on a super-regenerator (amplitude modulated type of receiver) at a distance of 178 miles, has since been picked up when there was the slightest tendency toward bending of the UHF waves in the lower atmosphere and when this lower atmosphere bending was prevalent it has been possible to log W1XOJ (near Boston) 251 miles away—this when the power was but 2,000 watts!

CBS Discloses Television Plans

(Continued from page 646)

been testing—sending out the standard pattern developed by technicians. In that time, study of the patterns has resulted in constant adjustments, which have produced a marked improvement in the quality of transmission.

For future telecasting, four of the new cameras to be installed will use a new kind of electronic tube which is expected to require only a fraction of the light needed for the present cameras and which will have a more uniform response to the various shades of light and dark. Further experimentation, of course, will still be carried on by the CBS technical staff. For this purpose, a fifth camera, developed in the Columbia laboratories, is serving as a test unit for new optical and mechanical controls later to be incorporated in the other four.

These improvements are necessary not only for the technical quality of transmission. According to Gilbert Seldes, CBS director of television programs, the special controls have proved desirable for the optical and physical flexibility required by Columbia's approach to the program problem. When used for multiple pickups, the five additional cameras will allow the development of highly complex programs.

Working closely with the technical staff, Seldes and his assistants have been delving into the vast field of television programming. To provide facilities for most effective covering of outside events, work is now under way at CBS on a new-type mobile unit which, when completed in 1940, will be used for this purpose. Application has been made to the Federal Communications Commission for a construction permit for this mobile unit, which will operate between 336,000–348,000 kilocycles. The unit will be completely independent of outside power sources, and will carry three new-type cameras of its own, thus enabling it, while in motion, to pick up and transmit both pictures and sound. This will give a tremendous increase to the mobility necessary for covering news as it occurs.

NBC Television Activities

(Continued from page 646)

Broadcasting Company is now undergoing severe tests to determine its capabilities. We expect to use it in reaching into new and hitherto unattainable sources of program material. With this apparatus, far lighter and more flexible than the units in use at present, although somewhat more limited as to range of relay transmission, we expect to go more extensively into the telecasting of news events. At the present time these, I believe, offer the viewer more of the unique qualities of television than any other type of program material.

Those who own television receivers will probably receive an additional service shortly in the transmission of regular NBC network sound programs over the transmitter of Station W2XBS. The high fidelity of programs over the ultra-high frequencies should be of particular appeal to discriminating lovers of music.

The year just past has given us an insight into the character and magnitude of the problems facing American television.

This, however, is another year. Highlighted by the beginning of network television, the linking of NBC's station with that of the General Electric Company near Schenectady, 1940 should provide several "landmarks" in the spread of television over the United States.

Low-Cost Experimental Television Receiver

(Continued from page 656)

logical way of building the receiver since it makes for a minimum of interconnections between the chassis and gives a set of units that can be used independently with other equipment.

The Receiver

The diagram of the image receiver and video amplifier is shown in Fig. 1. The first detector and oscillator are very much like those used in ultra high frequency converters for audio receivers. The tuning condensers, C1 and C12, are ganged together and, with careful adjustment of the coils, will track over the entire tuning range from about 40 to 65 megacycles. Since there is no R.F. stage to isolate the first detector from the antenna, the antenna used will affect the tuning of this stage. It was to correct for this and to reduce the necessity of perfect coil adjustment that the trimming condenser C2 was included. For simplicity in drawing, only two I.F. stages are shown in the circuit diagram. The actual number used will be determined by the band width desired in the I.F. amplifier and the location of the receiver with respect to the transmitter.

With 1851 tubes, a gain of about 15 per stage can be expected. Within a distance of 20 miles from a powerful station, two stages are sufficient. The best way to determine the number needed in the particular locality is to build up about two stages in such a manner that additional stages may be added. With the chassis layout shown in Fig. 2 additional stages may be added by changing only one connection in the set.

A 6H6, connected as a full wave rectifier, is used as the second detector. The use of a full wave rectifier in this position eliminates the fundamental of the I.F. frequency from the video amplifier, without the necessity of adding a bypass condenser that will also limit the high frequency response of the video amplifier. The size of the load resistor, R9, will depend on the high frequency limit of the video frequencies that it is desired to retain. More will be said about this later. In the original receiver, a switch, SW, was used to reverse the polarity of the output of the receiver for experimental purposes. It would be well to make the connections marked "–" and omit the switch. If it is desired to add another video amplifier stage to increase the sensitivity of the receiver, the stage should be added between the first detector and the video stage shown and the diode load connections marked "+" should be made.

The output of the second detector feeds into the video amplifier which in turn feeds the grid of the picture tube and the 6H6 diode sync. separator. This sync. separator is of the self-bias type and automatically adjusts itself to the picture received. The 6C5G triode amplifier tube inverts the sync. pulses to give them the proper polarity to synchronize the sweep oscillators.

The band width in the video amplifier will depend on the gain needed. If the receiver is to be operated in a location where there is a strong signal, the band width can be greater than if maximum gain must be obtained. Values of diode load resistor R12 and video choke CH are given for conditions of high fidelity and maximum gain. The values of CH will vary with the particular receiver, and if possible a response curve should be run on the video amplifier to determine the exact value.

It has been found that the most satisfactory method of obtaining a wide I.F. amplifier band width is to stagger the tuning of the stages. This results in greater gain than can be obtained by loading the transformers with resistors and also gives a sharper cut off at the ends of the pass band.

Pin jacks were provided to monitor the output of the video and synchronizing amplifiers for tuning and testing purposes. Three binding posts (video, sync. and ground) are provided for connecting the output of the receiver to the cathode-ray tube unit.

The receiver unit was built upon an 8 x 17 x 2 inch steel chassis. It could have been crowded onto a smaller chassis, but for experimental work it is well to have plenty of room. Care should be taken to keep the capacity to ground in the video amplifier as low as possible. The use of metal tubes in the I.F. stages makes it unnecessary to do any shielding other than that provided by the sheet aluminum baffles between the oscillator and first detector.

When the receiver construction work is finished, it may be lined up in the usual way if a test oscillator is available, using earphones or some sort of output meter connected to the output of the video amplifier as an indicator. If no such test equipment is on hand, a five meter transmitter and superregenerative receiver can be used. First it is well to listen for the oscillator with the five meter receiver to make sure it is oscillating. Then, with C1 and C12 not yet coupled together, turn on the transmitter. With some sort of tone modulation on the carrier (someone whistling in the mike will do in a pinch), tune the receiver oscillator until there is a sudden increase in the signal heard in the earphones connected

to the output of the receiver. Next rotate the first detector tuning condenser C1 to get the greatest output. Because of the broad I.F. amplifier used, this can be done before the I.F. amplifier is lined up. The next step is to line up the I.F. amplifier by adjusting the trimmer condensers on the I.F. transformers until the receiver output is at its peak. This is made easy by the use of only one trimmer on these transformers.

If the receiver is to be tuned for *high fidelity* reception, the first I.F. transformer should be tuned about ½ mc. lower than the I.F. frequency and the last stage transformer to a frequency ½ mc. higher. The other transformers should be spaced between these limits to give a uniform pass band, easily obtained by sweeping a modulated test oscillator over the desired band and tuning the transformers until the output of the receiver is about the same at all frequencies. Those not having a test oscillator will find it helpful to know that in the vicinity of 13 mc. a 30° turn of the tuning screw changes the tuning about 1 mc.

Now with the transmitter set to some frequency in the five meter band, adjust the receiver oscillator coil until the transmitter is tuned-in with the tuning condenser nearly all the way open. The coupling condenser, C10, should be adjusted to give the maximum coupling allowable, without pulling the oscillator out of oscillation. A little experimentation with the position of the tap on coil L3 may allow greater coupling. The first detector trimmer, C2, is then set half closed and tuning condenser C1 tuned to the transmitter, after which it is coupled to the common tuning shaft. The transmitter, or test oscillator, is now tuned to a lower frequency and the main tuning shaft rotated until the transmitter is again in tune. Trimmer C2 is then adjusted to bring the signal more nearly in tune. If it is necessary to increase the capacity of the trimmer, coil L2 should be squeezed together a little and the process repeated. If it had been necessary to decrease the capacity of the trimmer, L2 would have had to be stretched out a little. It is best to use two frequencies that lie near the ends of the tuning range to make these adjustments. If no other suitable signal source is available, an automobile ignition coil and spark plug (which radiates at all frequencies at once) will make a satisfactory source.

Part 2—Sweep Circuits and Power Supply—next month.

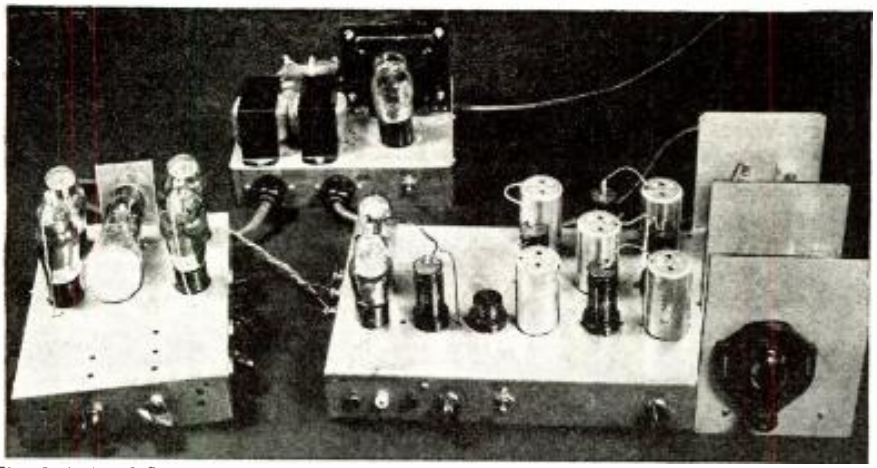


Fig. 2. Left—C-R tube and sweep oscillators; rear—power-supply; right—television receiver.

Parts List for Television Receiver

I.R.C. (Resistors)

R1—100,000 ohm, ½ watt
R2—5000 ohm, ½ watt
R3—100,000 ohm, ½ watt
R4—2000 ohm, ½ watt
R5—10,000 ohm pot. (CLAROSTAT)
R6—150 ohm, ½ watt
R7—60,000 ohm, ½ watt
R8—2000 ohm, ½ watt
R9—5000 ohm, ½ watt for max. gain, 2500 ohm for high fidelity (see text)
R10—50,000 ohm, ½ watt
R11—25,000 ohm, ½ watt
R12—5000 ohm, ½ watt for max. gain, 2000 ohm for high fidelity (see text)
R13—60,000 ohm, ½ w. R17—7000 ohm, ½ w.
R14—150 ohm, ½ w. R18—1 megohm, ½ w.
R15—250,000 ohm, ½ w. R19—1500 ohm, ½ w.
R16—100,000 ohm, ½ w. R20—5000 ohm, ½ w.

CARDWELL

Ca—35 mmf. variable (midget) (type ZR35AS) mounted on antenna post on back of receiver
C1—35 mmf. midget variable (type ZR35AS)
C2—5 mmf. midget variable (type ZV5TS)

AEROVOX

C3—100 mmf. mica condenser
C4 to C8 inclusive—.01 mf. 400 volt paper
C9—.05 mf. 400 volt paper
C10—35 mmf. trimmer (Hammarlund EC35)
C11—100 mmf. mica
C12—35 mmf. midget variable (Cardwell ZR35AS)
C13, C14—.01 mf. 200 volt paper
C15—.002 mf. mica
C16—.1 mf. 400 volt paper
C17—25 mf. 25 volt electrolytic
C18—.1 mf. 200 volt paper
C19—10 mf. 25 volt electrolytic
C20—.1 mf. 400 volt paper
C21—.1 mf. 400 volt paper
C22—.1 mf. 400 volt. paper

ALADDIN

T1, T2—U100 television I.F. transformers
T3—U200 television I.F. transformers

MISCELLANEOUS

CH—Max. gain, 0.5 mh. (approx.). high fidelity, 0.1 mh. (see text) (one section of a National type R-100 R.F. choke is about 0.5 mh.)
L1—4 turns No. 14 wire, ½-inch inside dia. spaced diameter of wire
L2—6 turns No. 14 wire, ½-inch inside dia., spaced to be 1 inch long
L3—3½ turns No. 14 wire, ½-inch inside dia., spaced to be ⅝ inch long. Tap 1¼ turn up

RCA (Tubes)

1—6J7G 2—6H6
3—1851 2—6C5G

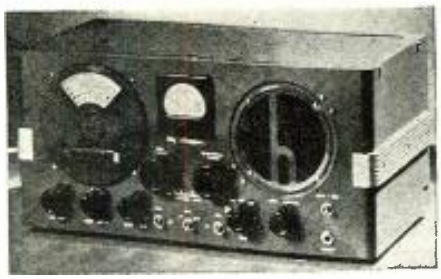
MUNIZ TELEVISION SET

Corrections

The correct values for several of the condensers in the R. & T. 10-tube Television Receiver described in the December, January and February issues are given below.

C-16—.5 mf. 400 V. paper.
C-31—.002 mf. 400 V. paper.
C-32—.001 mf. mica.
C-36—.1 mf. 400 V. paper.

In *10-Tube Television with 5" Picture Tube* in last issue, credit should have been given to the Alden Products Co. for the 11-contact specially designed Cathode-Ray Socket which was used in constructing this receiver.



New Communications Receiver

● THE Hallicrafters announce the improved "Sky Champion" communications receiver, Model S20-R, features of which appeal not only to the "Ham" but to short wave listeners, DX'ers, and for various commercial applications as well.

The tuning range is from 540 kc. to 44 megacycles in four bands of 540–1770 kc., 1.72–5.4 mc., 5.3–15.7 mc., and 15.2–44.0 mc. The tube line-up includes: 6SK7 tuned R.F. stage, 6KS oscillator-mixer (with special input tuned circuit which provides approximately twice normal conversion gain at frequencies above 14 mc.), two 6SK7 I.F. stages, 6SQ7 detector-a.v.c.-first audio, 6F6G audio power stage, 6H6 automatic noise limiter, 6J5GT beat-frequency oscillator, and 80 rectifier.

Special features include unusually high R.F. gain and consequent high signal-to-noise ratio, provision for either line or battery operation (for emergency, mobile or marine applications) with instant changeover from one to the other, electrical bandspreading in all ranges, rubber-cushioned built-in loudspeaker, A.V.C. applied to all R.F. and I.F. amplifiers, special frequency-stabilized oscillator to minimize effect of line-voltage variations, provision for remote stand-by control, connection socket for connecting external "S" meter, and fully automatic noise limiter circuit to trap out ignition and similar interfering noise.

New Wire-Wound Resistors

● NOW available generally for the first time through leading distributors are Sprague Koolohm resistors, made by the makers of the well-known Sprague condensers. Every fractional inch of wire used in their windings is uniformly insulated with a hard, moisture-proof insulation developed especially for this purpose. It conducts heat away from the wire with great rapidity and is not damaged even by bright red heat. They can be mounted in direct contact with chassis or other grounded parts.

This insulation makes possible interleaved windings wherein wires touch but do not short. This feature permits the use of larger, stronger wire to give higher resistances in smaller size.

Interleaved windings also permit a guaranteed accuracy of 5% or better and pave the way for non-inductive Koolohms with 0 inductance at 50 mc. and distributed capacity of only 2 mf.

Another outstanding feature is the fact that each resistor has an automatic red Teledot wattage indicator, which automatically changes color and warns when a 25% overload occurs. When the overload is removed, the Teledot returns to its original color.

These resistors are available in 5-watt fixed types; 10-watt fixed; 10-watt adjustable and 10-watt non-inductive. Complete descriptive catalog will gladly be sent upon request.

Hi-Cap., Hi-Volt Condensers

● NEW high capacity, high voltage condensers in working voltages of 600 volts and 800 volts and in both round and square can and square cardboard types have been introduced by the Sprague Products Company. They are specifically designed for public address and theatre applications where working voltages are high and where surges run over 600 volts. The high capacities and high voltages are obtained by the use of dry electrolytics connected in series and designed for long, trouble-free service. These new units are known as Sprague types AP, AD and RC.

New Safety Device

● IN apparatus developing high voltage, such as television receivers, some form of interlock, to break the primary source of power to the instrument when the back panel is removed, is essential. Alden Products Company has developed such a connector.

New Crystal Mike

● THE Turner Co. is offering a new crystal microphone, 33X, which has a 25-foot removable cable set, and 90° tilting head—for semi- or non-directional operation. It has a response of 30–10,000 cycles, free from peaks, and remarkably low feedback. The crystal is impregnated against moisture, and is blast proof. This mike is particularly well adapted to P.A. and recorder work, and for the Ham. It has a high output of –52 db. on a wide range of frequencies. The complete catalog of Turner Microphones may be had on request.

NEW CATALOGS

C-D Replacement Unit Cat.

● A 240-PAGE ready reference guide for the selection of standard Cornell-Dubilier capacitors for use as replacements in all different types of receivers. Set manufacturers' names are listed alphabetically, and under each is listed various models. For each model the data includes capacitor values in each circuit, working voltages, Cornell-Dubilier standard types recommended for various replacements, references to basic filter and by-pass circuits (over 165 of which are given in a separate section), manufacturers' original parts numbers, and the volume and page No. of the Rider Manuals in which the complete circuits are shown.

Turner Mikes

● THE new eight-page Turner Microphone catalog No. 60 shows and explains all the microphones and equipment in the complete Turner line. Included are microphones for every amateur, commercial broadcast, recording and public address purpose. The new crystal and dynamic microphones are shown on the opening pages, while the back page of the catalog is devoted to the new U-9 Multi-Flex microphone, which microphone works at 50 ohms on long lines, 200 or 500 ohms for the particular job; with balance line connections, or on high impedance on regular shorter lines.

This catalog also depicts hand, desk and lapel microphones, as well as microphone equipment such as floor and desk stands, cable, cable guides and racks, positive contact connections and transformers. The new 44X crystal selective directional microphone has 13-15 db. differential between front and rear pick-up.

Super-Pro Booklet

● THE Hammarlund Series 200 Super-Pro is fully described in a little booklet just issued by this old reliable company. The booklet not only gives specifications and mechanical details on this desirable receiver but also has many photographic and schematic illustrations and graphs, which explain precisely what goes on in the circuits; for example, details are shown of the first T.R.F. stage to illustrate how the electro-static shield is used to reduce noise pick-up. A complete diagram is also given so that anyone who is interested in the receiver may trace through all the circuits. A separate diagram is given for the power pack used to supply the set from A.C. lines. Other "Super-Pro" models and prices are given at the back of the book.

This book may be requested through RADIO & TELEVISION by mentioning No. 114A.

Bliley Folder

● BLILEY ELECTRIC CO. has just published a new folder, A-7, which replaces A-6. This sheet gives prices and specifications on various Bliley crystals and variable frequency crystal units, and also has a highly interesting chart giving the amateur frequencies on the various wave bands. Also shown is a circuit diagram of a crystal application.

Bud Radio Catalog

● THE new Bud Radio 40-page general catalog No. 240 lists the company's entire line, together with various tables which are of use in radio experimentation or construction.

Some of the items featured in the line are 500 watt R.F. amplifier kits, 25 watt transmitter kits, code practice oscillators and keying monitors, variable condensers for all purposes, a wide range of coils, coil forms, chokes, cabinets, panel racks, etc.

Among the tables which the catalog includes is a capacity-air-gap curve for all disc type neutralizing condensers, number of feet per ½ lb. spool of various types of wire, air-gap-voltage relation table for condensers, drill chart, code chart, etc.

S.W. 2-Tube Beginner's Receiver

(Continued from page 649)

sockets are used. For best results manufactured coils were employed. The beginner has quite a number to choose from.

Electron Coupling Used

If the grid-leak and condenser (C4-R1) are mounted on top of the grid cap of the detector tube (see photo) it will be found that, when the tube shield is in place, these parts are completely shielded, eliminating a great source of noise.

The detector tube employed in this receiver is known as a *duplex* tube, because its elements make up two tubes. It is composed of a pentode section similar to a 6C6 and a triode section similar to a 76, with the exception that they have a common cathode and heater. The tube is known as 6F7 (or the metal equivalent 6P7) which of course takes an octal type socket if it is used. Thus we have a super-sensitive screen-grid pentode as a detector and a high-gain triode as a first audio amplifier, all in one tube.

The shielded filter, shown in dotted lines in Fig. 1, connecting the plate of the detector tube to the audio frequency coupling impedance, keeps any stray radio frequency currents from getting into the audio amplifier and causing uncontrollable oscillation.

The impedance unit (T3) is used between the detector and the audio amplifier instead of the usual resistance. This type of coupling gives high gain and also helps to smooth the regeneration control by putting the proper voltage on the plate of the detector, thus allowing it to operate more efficiently. Resistor (R4) is used to subdue any audio oscillation that might occur from a high gain set-up of this type.

Resistors (R3 and R7) limit the voltage in their respective circuits. The headphones are plugged into the jack (J-1) which is connected to the output of the triode section of the 6F7.

Power Supply

The second section of the set is the power pack or power supply, and is designed for use in *short-wave* receivers. The usual run of old style "B" eliminators hum. This spoils the possibility of good reception. The cause is usually a lack of sufficient filtering. The filter in this power pack is choke input. It was chosen because of its ability to give a smooth regulation of D.C. voltage.

The power transformer in this pack has an electro-static shield and puts out 700 volts A.C. center-tapped which, after it is filtered, runs about 300 volts D.C. The majority of sets, including this one, use only 250 volts D.C.

The pack is divided into three main parts. First, the transformer: its duty is to step up the 110 volt line voltage for the plates on the high voltage secondary winding. The other two secondaries are the filament windings. The heart of the unit is the rectifier tube which rectifies the high voltage A.C. to pulsating D.C.

This rectified current then flows through the filter, which is the third part of the power system. It is composed of one or more sections of chokes in series with the rectifier's output. Condensers are connected on either side of the chokes across the system to the ground. The first condenser (C7) acts as a reservoir and stores up the voltage until it reaches its peak, discharging through the filter system. The choke's duty is to smooth out any pulsations in the voltage. The resistor (R6) is known as a bleeder

(Continued on following page)

(Continued from preceding page)

and helps to stabilize the output voltage of the power pack.

The resistor (R8) tends to equalize the flow of current and minimize the hum level, as these windings are raw A.C. There is a fuse connected in the primary winding to act as a safety against short-circuits.

Construction Hints

Place a washer on each side of the panel, holding the antenna condenser in the center of the hole, so that the shaft does not touch the panel. Then tighten the mounting nut. Do the same with the phone jack. To check these two parts for complete insulation: Take a 4½ volt battery or an ordinary flashlight battery and connect one phone tip to one side of the battery, and from the other side run a convenient length of wire to the panel. The other phone tip goes to the mounting nut on the part to be tested. Put the phones on, place the wire against the panel and the tip of the phones to the part. If a click is heard, then it means that the part is not properly insulated.

After the set is all wired and ready to operate, if you haven't bought ready-wound coils, and intend to wind your own, now is the time to do it, and here is the dope. Follow Fig. 2. First, obtain five Bud Sr. Low Loss coil forms, or others having five prongs each, and one-eighth pound each of Numbers 24 and 30 d.c.c. wire, B&S gauge. Some coil dope can be made by dissolving celluloid in acetone. This is applied to the finished coil to keep the wire in place. If you wind them good and tight it's not necessary, but frequent handling may loosen them. Loose windings will keep the set from operating at its best.

Looking at the coil form, Fig. 2, drill a hole ½" from the top in line with prong "P". Use a 1/16" drill. Another hole is drilled ⅛" from "P", but in line with prong "HK". A third hole is drilled 1/16" from "HK", but in line with prong "HP".

Scrape the wire clean and put it through the first hole and down into prong "P" and solder. A bit of solder pushed into the prong first will insure a well soldered joint.

Now wind three turns left to right; holding the wire alongside of the second hole, measure the length of wire to go down to the second prong "HK" and cut it off. Clean the wire a little over the length of the prong, putting it through the hole and down into prong "HK". Do not solder it just yet. Now take your wire again and thread it through the second hole and down into the same prong "HK", then solder the two wires in that prong. Continue the winding with one third of a turn, then run it through the third hole and down into prong "HP" and solder. That completes the secondary or grid coil for the 17-32 meter band. The two largest coils will start an eighth of an inch from the top. The largest coil is wound in two layers of fifty turns each. Wind fifty, then start right at the top again and wind fifty more. (See Fig. 2. The dotted lines represent the second layer.)

Wind the required number of turns on the form and measure the space they cover, then drill the two holes at the beginning and end of the coil. Be sure the windings are tight. Leave enough wire at the ends to make the connections in the prongs.

With the coils finished, the set completely wired and checked, all accessories bought, such as headphones, tubes, and aerial kit, the reader is now ready to sit down and indulge in a little "DXing."

To operate this set, a few minor adjustments are made. After the switch is turned on, advance the regeneration control until a rushing sound is heard. The set is now oscillating, and is in its most sensitive condition. Adjust the antenna condenser for maximum noise level. This is done for each band before tuning for any stations. To tune the set, use the left-hand dial, which varies (C2). The other dial (C3) is set at zero.

The best method of tuning is "zero beat" tuning. It is performed in the following manner. Start at 100 mark on the dial of C2, be sure the set is oscillating, tune slowly until a long squeal is heard. It will rise to a peak and drop. Right there is the station. Retard the regeneration control until the squealing stops, then advance it slowly until the station is heard. If it should squeal again, repeat the above action. It will take the novice a little time to acquire the knack of tuning a short wave receiver, but learning will be an enjoyable experience. As you become more adept, the "foreigners" will roll in with as much ease as the locals.

When a station is heard and identified, if one operating on a nearby frequency is desired, the band-spreading condenser (C3) is tuned slowly until another signal is received.

If a large section of the dial is covered without hearing any station, this condition is known as a dead spot. Of course, the set must be oscillating when tuning. To avoid dead spots, readjust the capacity of the antenna condenser (C1) for the loudest back-ground noise level.

Don't expect to tune in the world in one night. It takes time for the beginner to acquire the knack of tuning a short wave set.

And, by all means, remember that patience in analyzing your directions will in the end bring better success than rushing the job through.

List of Parts

BUD

1—Panel, 7 x 10 inches
1—Chassis, 7 x 9 x 2 inches
1—Metal cabinet, 6 x 10 x 7 inches—No. 933
3—Midget var. cond., 2—140 mf., 1—35 mf. (C1, C2, C3)
2—Shield R.F. chokes, No. 1278 2.5 mh. (L3)
1—Tube shield can
7—Sr. low loss 5-prong No. 917 E.C. plug-in coils, 7-565 meters
1—Midget jack "232" (J-1)
3—Name plates 0-100 180 deg. 1-jack plate "Phones"
2—Vernier dials, 3" black
2—Bar knobs, 1¼"
2—Feed-through insulators for the doublet input terminals
1—Toggle switch, S.P.S.T. (SW-1)
2—Wire-wound resistors, 60 ohms (R8)

SPRAGUE

3—Cardboard electrolytic condensers, 4 mf., 450 w.v.
3—Tub. .02 mf., 600 w.v. (C5)
1—Tub. .01 mf., 600 w.v. (C6)
2—Can sc-8-8. mf., 600 w.v. (C7)
1—Tub. .1 mf., 450 w.v. (C8)

CORNELL-DUBILIER

3—"Tiny-mites" .0001 mf. (C4)

RCA

2—Tubes, 280 and 6F7 (T1, T2)
1—Fuse, 2A-250v. (F)

THORDARSON

1—A.F. coupling impedance, T-2927 (T3)
1—Power transformer for 4 tubes, 6.3 fil. (T4)
1—Double (or equivalent) choke 30H, (CH1, CH2)

C. F. CANNON CO.

1—Pr. Cannonball headphones

CENTRALAB

1—Potentiometer, 50 ohms (R2)
1—Carbon ½ watt resistor, 2 megohms (R1)
1—Carbon ½ watt resistor, .25 megohm (R4)
1—Carbon ½ watt resistor, 1. megohm (R5)
1—Carbon 1 watt resistor, 50,000 ohms (R3)
1—Carbon 3 watt resistor, 10,000 ohms (R6)
1—Carbon 1 watt resistor, 50,000 ohms (R7)

AMPHENOL

3—Steatite isolantite sockets: 1—4-, 5-, 7-prong

A 25-Watt A.C.-D.C. Audio Amplifier

(Continued from page 653)

here is to check the tertiary winding connections and be sure that they are correct. An alternative feedback circuit for those wishing to use transformers without tertiary windings is shown in Fig. 2, Part 2.

Turning now to the photograph of the power supply we find, from left to right, filter choke CH1, the power transformer, and the two 6W5G rectifier tubes. Directly behind the rectifier tubes is the Electronics No. 490 heavy duty vibrator which comes mounted in its own case and has two sets of 6-prong plugs protruding from the bottom.

Power Supply Controls

The controls on the power supply are—again from left to right—A.C. ON-OFF switch, D.C. *heater* switch, and *vibrator* ON-OFF switch respectively. As can be seen, each switch has a pilot light above it, the two outer lights lighting simultaneously either on A.C. or when the vibrator is turned on. This is because both lights are permanently wired to the 6-volt heater winding on the power transformer. The center light (red) is so connected that it lights only when the center (heater) switch is turned on and the amplifier operates on D.C.

This amplifier should present no exceptional construction difficulties. The usual practices of good construction apply here as they do to any other equipment of this nature. Mount all small parts, such as resistors and condensers, as close as possible to their actual positions in the circuit, keeping all leads short, and of course observing the shielding precautions referred to previously.

One precaution, however, to be observed in the wiring of the power supply is to insure adequately heavy leads for the 6-volt primary circuit. Remember the current in this circuit is in the neighborhood of 20 amperes, so use heavy wire as indicated in Fig. 1. If this is not done, the voltage drop due to the heavy current in the leads will be so great that it will be impossible to realize full output from the amplifier on D.C. For the same reason it is necessary to use heavy leads on the D.C. plug. Use No. 10 rubber-covered stranded wire and keep the leads as short as possible. About six feet will be found long enough for most purposes.

Referring back once more to constructional details, it will be noticed that no filter condensers are visible on the top of the power supply chassis as in most amplifiers. Paper filter condensers were used because they could be conveniently mounted underneath the chassis. If can type electrolytics had been used, it would have been necessary to use a larger power supply chassis which would have spoiled the balanced appearance of the amplifier. *Good* cardboard electrolytics are every bit as satisfactory as metal can electrolytics in the writer's opinion.

Output Meter

Getting back to the amplifier proper, it can be seen from the photographs that the *output meter* is mounted in the amplifier cover. One side of the meter is grounded directly to the amplifier cover, whereas the other terminal is connected to a short, flexible lead with a phone tip soldered to the end. The phone tip plugs into a tip jack mounted near the front edge of the chassis between the input transformer and the 6L6's. This feature greatly facilitates removal of the cover when making tube replacements since it is only necessary to lift the cover in order to disconnect the meter.

The meter is left permanently connected to the 15 ohm tap on the output transformer, although in this particular amplifier the 15 ohm tap is not used for the speaker. It was found more desirable to employ a line-to-voice coil transformer in order to eliminate once and for all any troubles connected with long voice coil lines. An amplifier designed for portable use must be able to operate under a great variety of conditions and certainly should not be handicapped by a short voice coil line. A 250-foot line was decided upon and, with the transformers shown, gave excellent results with no noticeable attenuation of the "highs." Results were in fact so good that it was decided to leave the 500 ohm line permanently connected.

Loud-Speaker

The final problem to be solved involved the *loud-speaker*. Several p.m. (permanent magnet) speakers were tried on the amplifier with very unsatisfactory results. The difficulty was not primarily power handling ability but rather a problem in efficiency. Comparative tests between p.m. and electro dynamic speakers were decidedly in favor of the dynamic type. For a given volume control setting, the dynamic speaker produced not only noticeably greater volume output but had better quality than the p.m. In other words, for a given input the dynamic speaker produced more *useful* audio than the p.m.—a very important consideration on an A.C.-D.C. amplifier of limited output.

Consequently one large dynamic speaker with separate A.C.-D.C. field supply was finally decided upon.*

The circuit for the A.C.-D.C. field supply shown in Fig. 3, Part 2, should be self-explanatory. A small auto radio vibrator type of "B" supply is used in conjunction with a 25Z5 connected as a half wave rectifier for A.C. operation, since only 10 watts of field excitation are required on a 1000 ohm field.

The cathodes of both rectifier tubes (the 84 and the 25Z5—see Part 2) are tied together. This makes it possible to go from A.C. to D.C. operation without the necessity of switching connections; it is merely necessary to turn on the proper switch in order to get field excitation—and there is no possibility of causing damage because of wrong operation.

The line-to-voice coil transformer is inside the speaker and can't be seen in the photo. The speaker, by the way, is a large old Peerless—the one with the single turn voice coil—that had a new cone and 15 ohm voice coil installed. This particular speaker was entirely adequate for handling the full output of the amplifier with good fidelity.

(To be concluded next month)

*Several smaller speakers could have been used instead, but the bass response would not have been as good as with one large speaker and there would have also been the possibility of trouble from improper load distribution between speakers.

International Radio Review

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The circuit has various desirable features among which is that it may be left connected to the broadcast receiver with which it is used. In this little adapter, the antenna condenser has a capacity of 50 mmf. and is operated by a single knob. The tuning condensers are of the conventional 140 mmf. capacity and are ganged. The coils are wound on 1¼" forms fastened to tube bases. Specifications are given in Fig. 5B.

Simple 2½ Meter Transmitter

(Continued from page 655)

Fair is closed, on 5, 10, 20, 75 and 160 meters, with power ranging from 300 to 600 watts. It is also picked up and relayed by a number of amateur stations, on all bands, with power up to a kilowatt. It is heard quite regularly in nearly all parts of the world.—Editor)

After closing down the station at 40 Wall Street, this little rig was out of commission for a long time. At our home station it was replaced by our much more powerful crystal-controlled assembly, described as the "5-40-400 Transmitter" in *Short Wave and Television* for August to October, 1937. The 5-40-400, by the way, has been in continual operation at the New York World's Fair since the latter part of December, 1938.

Just before the new regulations for 5 meter operation went into effect, this same little five meter rig was used to lure another old-timer back to the air. John Di Blasi, W2LKC, who was 2FD, set it up at his home station at Little Neck, L. I. where it gave the same kind of service for which it has become famous.

And Now to 2½ Meters

Such excellent results had always been obtained from the use of George Shuart's oscillator arrangement that it was decided to try a somewhat similar arrangement on the higher frequency. Then, too, the use of Raytheon RK-38s, with hair-pin rods, in the plate circuit, excited by a single RK-37, in our big rig, had been so satisfactory that a pair of RK-37s was chosen for the new oscillator, although we realized that it would be impossible to run them to anything like their full power capability. Before going through with the revision, we discussed the matter with the Technical Committee of the Garden City Radio Club and the completed job is the consolidation of a great many suggestions. The actual work of revising was turned over to "Doc" Byron Kretzman, W2JTP, and we believe you will agree that it has been well carried out.

The combination switch and pilot light, shown in the center of the lower panel, is a regular 110 volt, two circuit unit. Originally, the lower switch was used to turn the filament current on and the upper switch was used to put the plate voltage on. It would not do so without arcing over, so it was replaced by a high-voltage toggle, set to the right. That has now been replaced by a single throw, double pole, high voltage toggle. One section of this double pole switch throws the plate voltage on and the other cuts in the 110 volt antenna relay for the transmitting position.

A female, 110 volt receptacle has been wired in shunt with the primary of the power transformer so as to permit the male plug on the receiver cord to be plugged into it. This prevents the possibility of forgetting to turn the receiver power supply off. In the present set-up, the B-Switch on the receiver is thrown off, and the transmitter switch is then thrown and vice versa. It would simplify matters to use an antenna relay provided with an extra set of contacts which would cut the receiver plate voltage off when the transmitter was thrown on. Such relays are common.

The 7.5 volt filament on the power transformer will not supply enough current for the two 250s in the modulator, as well as for the RK-37s in the oscillator, so the Kenyon filament transformer, type T-353, has been included for that purpose.

Building the 2½ Meter Oscillator

Most of the construction of the oscillator which has been giving us such satisfaction

See Page 688 for list of our dealers.

is straight-forward and there is no doubt about duplicating the performance if the simple details given here are duplicated. However, it may be that the following tips will be of some real time-saving value to those who are not acquainted with this sort of work.

Bending the copper tubes into the *hair-pins* for use as the plate rods is likely to cause trouble if certain precautions are not taken. The simplest procedure is to fill the tubes with damp beach sand, being sure that both ends are well corked. Then the tubing may be bent, SLOWLY, over some solid material which has an outside diameter of 5 inches. The corks are then removed and the sand removed by running water through the tubing.

Placing the *hair-pin* plate rods on their respective mounting insulators should be obvious from the illustrations. There are, however, a couple of tips in connection with the grid rods which may prove valuable. Firstly, they are connected at the top, just below the point for connecting the grid bias resistor, by a strip of solid copper. Before trying to solder the copper strip to the tops of the tubes, the latter should be squared off and cleaned so as to make the soldering as easy as possible. They should then be held in place, spaced in the same manner in which they are to be spaced when they are in use—separated by a distance equal to their own diameter—and then both the tubes and the copper strip which is to be attached to them should be thoroughly treated for the soldering process. If a soldering iron is to be used for that operation, it will have to be a very large one, because the tubes will dissipate the heat from a small iron before they can be heated well enough to take the solder. It is simpler to do the job with an alcohol blow-torch, if one is handy.

Poor insulation anywhere along these rods will result in a great loss of efficiency in the overall performance of the oscillator as a whole, so the second consideration is the method of mounting them. It will be seen that they have been placed in a very convenient location, where they do not increase the overall dimensions of the rig, as was the case with the rods used in the 5 meter oscillator. Small pieces of National Victron of the ¼ inch thick variety are used to keep the rods off the wooden framework and similar pieces are used to lock the rods in place.

The connections to the grids of the RK-37s are made by a pair of National type 24 Grid Grips, joined by a pair of short, flexible leads to a pair of type 12 Grid Grips, which fit snugly over the rods themselves.

It will be observed that the plate *shorting bar* is a bit out of the ordinary. Instead of using some broad surface for this connection, as has been general in the past, we have gone to a knife-edge bar. This is simple to construct. An 8/32 machine screw, two inches long, is soldered to the ½ inch by 3 inch by 1/32 inch copper strip, which forms the knife-edge. A strip of ¼ inch bakelite (do not use Victron or polystyrene here) ¾ inch by 3 inches, with a hole through its center completes the rig.

Adjusting the 2½ Meter Lines Oscillator

While most of the information necessary for the building of the oscillator may be had from the drawings and the pictures, it may be well to consider one or two of the more important points in connection with the construction and adjustment. The length of the copper tubes indicated is ample for any portion of the 112-116 megacycle band, with the present tubes, and it is doubtful that any tubes will be chosen which will have any lower internal capacity, so the matter of length may be forgotten.

It should be remembered that almost any change in any one portion of the circuit will have an effect on the radiated wave, even though everything else remains fixed. For instance, the frequency of the entire oscillator is likely to vary somewhat as the coupling to the antenna is changed. A similar effect is to be noted for any change in the position of the shorting bar in the plate circuit or the relocation of the slide connectors on the grid rods. It is essential that a good balance between the adjustment of the shorting bar on the plate rods and the position of the sliders on the grid rods be had for the particular load involved. The figures which have been given here are for just about the center of the band (114 mc.).

Leaving the plate shorting bar in the position indicated, it has been noted that moving the grid connectors toward the top of the grid rods has the double effect of increasing the frequency and decreasing the load. Moving them in the opposite direction brings about greater loading and a lowering of the frequency. It will be found, from contacting other stations, that there is a point where there is a balance between frequency and load, which will best match the output impedance of the particular modulator unit which may be used, as indicated at the receiving location by the best overall signal, both as to intensity and quality. With no change in the location of the plate shorting bar, and by the simple adjustment of the grid connections to the grid rods, it was found that three-quarters of an inch above the recommended place for 114 mc. would run the emitted wave out of the band on the high frequency end and decrease the plate loading to 50 milliamperes. Three-quarters of an inch in the other direction would raise the load to 70 milliamperes and put the emitted wave outside the band, on the low frequency end. Both these extreme effects are accompanied by distortion of the audio quality as a result of the impedance mismatch between the modulator and the oscillator.

By leaving the grid connectors in the point indicated and making all frequency adjustments by means of varying the position of the plate shorting bar and a slight adjustment of the hairpin antenna coupling, it is possible to secure any desired frequency and any desired load without the undesirable mismatch and accompanying distortion

While it is true that much of the ultimate performance of the system will depend upon the efficiency of the antenna with which it is used, the performance of the oscillator itself will depend on those factors just discussed. And, while the results with a poor antenna will not be compared to those which may be expected from a good one, a good balance between antenna loading, frequency and audio input will produce the most satisfactory results for a given set of conditions.

Regardless of all other considerations, it will be found that best overall performance will be obtained when the resonant frequency of the oscillator, operating with normal load for the amount of power available, is in resonance with the antenna's fundamental frequency.

The simplest way to bring this condition about is to design the antenna for the desired frequency and then make the adjustments of the oscillator until optimum results are obtained. In our own case, this condition existed when we operated the oscillator at normal load, at the frequency for which the antenna was designed. It is safe to say that such a condition does not often occur, though it is always well to try to procure it.

As a definite indication of the importance of the foregoing we cite our own experience.

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When first tried out, our oscillator was on a high frequency. The results were somewhat disappointing when we used a four element 2½ meter antenna, in comparison with a two element 5 meter antenna, which happened to be just about twice as high above ground. Retuning the oscillator to the fundamental of the four element antenna, brought about just the reverse condition, which was to be expected.

The two antennas used in making the comparisons are shown in one of the accompanying pictures. The upper one is the so-called "extended Double-Zep," which has been perfected for the 5 meter band by Frank Lester, W2AMJ, and the lower one is a vertical, extended Lazy H, which we believe has had its initial use on 2½ meters here at W2DKJ. It does seem to have a reasonably good *beam action* and would be best if it were made rotatable, where communication is to be carried on in all directions. However, the subject of suitable antennas for the ultra-highs is another matter and we hope to have more to report on that at a later date. Before leaving the case of the aerial, however, it may be well to report that most of the present occupants of the 2½ meter band are using vertical arrays of one form or another, due, no doubt, to the drop to that band when the restrictions were put on the 5 meter band. Some of the best-informed amateurs of our acquaintance, who have been doing serious work on the 2½ meter band for many years, are convinced that the best results will be obtained from the use of *horizontal* antennas. But more about that later. There is enough here to give us the basic facts for getting under way in a suitable manner.

A Few Suggestions

The results we have been able to secure from our 2½ meter oscillator have been most gratifying. It would seem that much better results are to be expected than those we used to get on the 5 meter band. To a large degree, we believe the difference may be traced to the fact that most of the amateurs who are on 2½ meters are using multi-element beam antennas.

The dual winding on the microphone transformer makes it possible, by the incorporation of two jacks and a pair of binding posts, to use a microphone; the National Code Practice Oscillator (which is self-contained, along with the batteries which operate it, and any desired note may be obtained from it) and a phonograph, which we find very handy for making tests, by using some of the frequency standard records or the code practice records. Music, of course, is not permitted. In running the open wire line from the antenna terminals at the window to the transmitter and from the relay to the receiver, we found it handy to use No. 16 enamelled wire which we ran through Victron transposition blocks *without transposing the wires.*

More Power

With the present arrangement, the load which seems to give the best results is 55 mils (ma.) to the plates of the oscillator tubes. Cutting out the audio system enables us to load the oscillator to 95 mils, which means that we can nearly double our present power by going to an external modulator, and we believe the National Modulator, type NSM, which we are about to install, will do the trick very nicely for us. At present, we are running just under 600 volts to the oscillator plates, so the input is about 35 watts. The other arrangement will give us a little better than 50 watts, which seems to be worth while.

(Continued on page 687)

World S-W Stations

(Continued from page 662)

Mc.	Call	
15.270	HI3X	CIUDAD TRUJILLO, D. R., 19.65 m. Relays HIX Sun. 7.40-9.40 am. Tues. and Fri. 8.10-10.10 pm.
15.270	WCAB	PHILA., PA., 19.65 m. (Addr. See 21.52 mc.) 4-6 pm. exc. Sat. and Sun. Sat. 12 n.-6 pm., Sun. 3-6 pm.
15.260	GSI	DAVENTRY, ENG., 19.66 m., Addr. (See 17.79 mc.) 12.57-5 am., 11.52 am.-1.30 pm.
15.250	WRUL	BOSTON, MASS., 19.67 m., Addr. University Club. Daily exc. Sat. and Sun. 10 am.-11 am. to Europe.
15.245	TPA2	PARIS, FRANCE, 19.68 m., Addr. 98 Bis. Blvd. Haussmann. "Paris Mondial" 5-10 am. only.
15.240	2RO14	ROME, ITALY, 19.68 m. Irregular.
15.240	YUF	BELGRADE, YUGOSLAVIA. 19.68 m., 7-8 pm. to S.A.
15.240	YUG	BELGRADE, YUGOSLAVIA. 19.68 m., 8-9 pm. to N.A.
15.240	CR7BD	LOURENCO MARQUES, MOZAMBIQUE. 19.68 m. 4.30-6.30, 9.30-11 am., noon-4 pm.
15.230	HS6PJ	BANGKOK, SIAM, 19.7 m. Irregularly Mon. 8-10 am.
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.
15.210	WPIT	PITTSBURGH, PA., 19.72 m., Addr. (See 21.540 mc.) 8 am.-3 pm.
15.200	DJB	BERLIN, GERMANY, 19.74 m., Addr. (See 15.280 mc.) 12.05-6; 6.30-9; 9.15-9.30 am. to N.A. News 6.45-8.30 and 9.15 am.
15.200	XGOX	SZECHWAN, CHINA. 19.74 m. 8.30-10.45 pm.; News 9.50 pm.
15.190	OIE	LAHTI, FINLAND. 19.75 m. Addr. (See OFD, 9.5 mc). 1.05-4 am, 9 am.-5 pm.
15.190	ZBW4	HONGKONG, CHINA, 19.75 m., Addr. P. O. Box 200. Irregular. 11.30 pm. to 1.15 am., 3-10 am.
15.180	GSO	DAVENTRY, ENG., 19.76 m., Addr. (See 17.79 mc.) 5.42-11.30 am. to Europe.
15.180	RV96	MOSCOW, U.S.S.R., 19.76 m., 3-3.45 am. (Eng.) to No. Am.
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.) 3.30-5, 9-11.45 am., 3.50-6 pm.
15.135	JLU3	TOKYO, JAPAN, 19.82 m., 8-9.30 am. to China. Irregular.
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. 5.30-9 pm., Sat. 10 am.-noon.
15.130	TPB6	PARIS, FRANCE. 19.83 m., Addr. "Paris Mondial," 98 Bis Blvd. Haussmann. 1-4 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. 4.30-5 pm.
15.120	CSW4	LISBON, PORTUGAL, 19.84 m., 7-9 am.
15.120	SPI9 *	WARSAW, POLAND, 19.84 m.
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	CB1510	VALPARAISO, CHILE. 19.87 m. Testing near 7.30 am.
15.100	2RO12	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 pm. to N.A. 8.30-9 pm. in French.

End of Broadcast Band

* Operation uncertain.

Mc.	Call	
14.960	RZZ	MOSCOW, U.S.S.R., 20.05 m. Irregular.
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	HCIJB	QUITO, ECUADOR, 20.80 m. 7-8.15, 11.30 am.-2.30, 4.45 pm.-10.15 pm. Exc. Mon.
13.997	EA9AH	TETUAN, SPANISH MOROCCO, 21.43 m. Apartado 124. 5.15-6.15 pm., 6.30-7.30 pm., 9-10 pm. Relays Salamanca from 5.40 pm.
13.900	YNDG	LEON, NICARAGUA, 21.58 m. Sun. 12.30-1, or 1.30 am.
13.635	SPW *	WARSAW, POLAND, 22 m.
12.862	W9XDH	ELGIN, ILL., 23.32 m. Press Wireless, 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	VOF8	ST. JOHNS, NEWFOUNDLAND. 24.37 m. 5.30-7.30 pm.
12.235	TFJ	REYKJAVIK, ICELAND, 24.52 m. Sun. 1.30-2.30 pm.
12.230	COCE	HAVANA, CUBA, 24.53 m.-8 am.-11.30 pm. Sun. noon-11.30 pm.
12.200	——	TRUJILLO, PERU, 24.59 m., "Rancho Grande." Address Hacienda Chiclin. Irregular.
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	CB1180	SANTIAGO, CHILE, 25.06 m. 4.50-11 pm.
11.970	HI2X	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.

25 Met. Broadcast Band

11.940	TI2XD	SAN JOSE, COSTA RICA, 25.13 m. La Voz del Pilot. Apartado 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.
11.910	—	HANOI, FRENCH INDO-CHINA. 25.19 m. "Radio Hanoi", Addr. Radio Club de l'Indochine. 3.45-4.15 am., 7-9.30 am., 150 watts.
11.900	XGOY	SZECHWAN, CHINA. 25.21 m. 5.30-7.35, 7.40-11, 11.10-11.50 am., 2-4.20, 4.30-6.20 pm. News 6.15, 9 am. and 5 pm.
11.900	XEWI	MEXICO CITY, MEXICO, 25.21 m., Addr. P. O. Box 2874. Mon., Wed., Fri. 3-4 pm., 9 pm.-12 m. Tues. and Thur. 7.30 pm.-12 m., Sat. 9 pm.-12 m., Sun. 12.30-2 pm.
11.900	—	MOSCOW, U.S.S.R., 25.21 m. 4-5.30 pm. Sun. 4-6 pm.
11.895	2RO13	ROME, ITALY. 25.23 m. Irregular 6-9 pm.
11.890	VLR3	MELBOURNE, AUSTRALIA. 25.23 m. 3.30 pm.-3 am.
11.885	TPB	PARIS, FRANCE, 25.24 m. (See 15.245 mc.) 1-4, 10.15 am.-5.10, 6-7.45, 8 pm.-12.30 am. to N. A. News, 8.03, 11.30 pm., 12.15 am.
11.870	WPIT	PITTSBURGH, PA., 25.26 m., Addr. (See 21.540 mc.) 3-9, 10-11 pm. later.
11.870	VUM2	MADRAS, INDIA, 25.26 m. M.W.F. 3.30-4 am.
11.865	——	BERNE, SWITZERLAND. 25.28 m. Irreg. 8-9 pm. to No. Amer.

(Continued on following page)

(Continued from preceding page)

Mc.	Call	
11.860	GSE	DAVENTRY, ENG., 25.30 m., Addr. (See 11.75 mc.) 3.30-5, 1.45-3.30, 6.22-9.15 pm.
11.855	XMHA	SHANGHAI, CHINA. 25.31 m. Wkdys 11 pm.-1 am., 5-11 am. Sat. 10 pm.-Sun. 11 am.
11.855	DJP	BERLIN, GERMANY, 25.31 m., Addr. (See 15.200 mc.) 12.05-2 am., 4.50-10.50 pm. and irreg.
11.850	HAD	BUDAPEST, HUNGARY, 25.32 m. 3-6 pm. to S. A.
11.850	CB1185	SANTIAGO, CHILE, 25.32 m. Sat. 6-11 pm. and irreg.
11.850	OAX2A	TRUJILLO, PERU, 25.32 m. Testing on this freq. (See 12.200).
11.845	TPB	PARIS, FRANCE. 25.33 m. 12.30-1.30 pm. to N.A. 1.40-5.10 pm. News at 1.20 pm.
11.840	OLR4A	PRAGUE, BOHEMIA, 25.35 m., Addr. Czech Shortwave Sta., Praha XII, Fochova 16. Daily 6.55-10.15 pm. to No. Am.
11.840	KZRM	MANILA, P. I., 25.35 m. Addr. Erlanger & Gallinger, Box 283. 9 pm.-10 am. Irregular.
11.840	CSW	LISBON, PORT., 25.35 m. Nat'l Broad. Station. 11.30 am.-1.30 pm. Irregular.
11.830	WCBI	CHICAGO, ILL., 25.36 m., Addr. Chicago Federation of Labor. Irregular 7 am.-6 pm.
11.830	VLW3	PERTH, W. AUSTRALIA. 25.36 m. 3-10.30 am. Irreg.
11.830	WCBX	NEW YORK CITY, 25.34 m., Addr. Col. Broad. System, 485 Madison Av., N.Y.C. Daily exc. Sat. and Sun. 4-6 pm.; Sun. 3-6 pm. to Europe; Sat. 1-6 pm. Daily 6.30-10 pm. to S. A.
11.826	XE8R	HERMOSILLA, SON., MEX., 25.37 m., Addr. Box 68. Relays XEBH. 9-11 am., 8-10.30 pm.
11.825	CXA14	COLONIA, URUGUAY. 25.37 m. Rel. LR6 5-9.20 pm.
11.810	2RO4	ROME, ITALY, 25.4 m., Addr. E.I.A.R., Via Montello 5. Daily 4.10 am.-3 pm., 6-7.25, 7.30-9 pm. to N.A. News, 7.30 pm.
11.805	OZG	SKAMLEBAK, DENMARK, 25.41 m. Addr. Statsradiofonien. Irreg.
11.801	DJZ	BERLIN, GERMANY, 25.42 m. Addr. See 15.280 mc. 4.50-10.50 pm. To No. America. Irregular.
11.800	JZJ	TOKYO, JAPAN, 25.42 m., Addr. Broadcasting Co. of Japan, Overseas Division 12-1.30 am. to N.A. News 12.03 am., 7-9.30 am., 4.30-5.30 pm.
11.800	COGF	MATANZAS, CUBA, 25.42 m., Addr. Gen. Betancourt 51. Relays CMGF. 9 am.-11.30 pm.
11.800	XGOK	CANTON, CHINA. 25.42 m. 6-8.35 am.
11.795	DJO	BERLIN, GERMANY, 25.42 m. Addr. (See 15.280 mc.) Irreg.
11.790	WRUL	BOSTON, MASS., 25.45 m., Addr. (See 15.130 mc.) 3-5 pm.
11.780	OFE	LAHTI, FINLAND. 25.47 m. Addr. (See OFD, 9.5 mc.) 1.15 am-12.05 pm.
11.780	—	SAIGON, INDO-CHINA. 25.47 m. 6-10.15, 10.30-11.30 am. 6.30-7.25, 11.45 pm.-12.45 am. News 6 and 11 am.
11.780	——	LUXEMBURG, LUXEMBURG, 25.47 m. Radio Luxemburg. Heard 8.30-10 pm.
11.780	HP5G	PANAMA CITY, PAN., 25.47 m., Addr. Box 1121. Noon-1 pm., 6-10 pm.
11.775	MTCY	HSINGKING, MANCHUKUO, 25.48 m. Addr. Central Broadcasting Station. 1.30-2.30 to No. Am. 9.50-10.50 am., 4-4.50 pm.
11.770	DJD	BERLIN, GERMANY, 25.49 m., Addr. (See 15.280 mc.) 10.45 am.-4.25 pm., 4.50-10.50 pm. to N.A. News 6, 8.15, 10.30 pm.
11.760	2RO15	ROME, ITALY, 25.51 m. 4.30 am.-12.10 pm.
11.760	TGWA	GUATEMALA CITY, GUAT., 25.51 m. (See 17.8 mc.) Irregular 10-11.30 pm. Sun. 6-11.30 pm., irregular.
11.760	XETA	MONTEREY, MEX. 25.51 m., Addr. Box 203. Relays XET, n.-3.30 pm. and evenings.
11.760	OLR4B	PRAGUE, BOHEMIA, 25.51 m. Addr. (See 11.840 mc.) Daily exc. Sun. 8.25-10.05 am.
11.750	GSD	DAVENTRY, ENG., 25.53 m., Addr. B.B.C., London, 12.57-5, 10.30-11.45, 11.52 am-3.30, 3.50-6 pm. to N.A. News 3.50 and 4.45 pm.

Mc.	Call	
11.740	CB1174	SANTIAGO, CHILE. 25.55 m. 6-11 pm. Sun 6-10.30 pm.
11.740	SP25 *	WARSAW, POLAND, 25.55 m.
11.740	HVJ	VATICAN CITY, 25.55 m. Tues. 10.30-10.45 am.
11.740	CR6RC	LOANDA, ANGOLA, 25.55 m., 6.30-7.45 am. Tues., Wed., Sat., 3.30-5 pm., Sun. 9.30 am.-1 pm.
11.735	COCX	HAVANA, CUBA. 25.57 m. P. O. Box 32. Daily 8 am.-12 m. Sun. 8 am.-1 am. Relays CMX.
11.735	LKQ	OSLO, NORWAY, 25.57 m. 4.30-8.50 am., Sun. 2.30-8.50 am.
11.735	YUE	BELGRADE, YUGOSLAVIA, 25.57 m. 7-9.05 pm. to N. A. irreg.
11.730	PHI	HUIZEN, HOLLAND, 25.57 m., Addr. N. V. Philips' Radio.
11.730	WRUW-WRUL	BOSTON, MASS., 25.58 m., Addr. World-Wide B'cast'g Foundation, University Club. Sun. 2-8 pm.; 5.30-8.30, 8.45-10.30 pm.
11.725	JVW3	TOKYO, JAPAN, 25.57 m. 1.15-2.20 am.
11.720	CJRX	WINNIPEG, CANADA, 25.6 m., Addr. James Richardson & Sons, Ltd. Daily 4 pm. Irreg. to 1.30 am.
11.720	ZP14	VILLARICA, PARAGUAY, 25.60 m. Mon. to Fri. 4-8 pm., Sat.-Sun. 11 am.-6 pm.
11.718	CR7BH	LAURENCO MARQUES, PORTUGUESE E. AFRICA, 25.6 m. Daily 12.05-1, 4.30-6.30, 9.30-11 am., 12.05-4 pm., Sun. 4-7 am., 10 am.-2 pm.
11.718	TPA4	PARIS, FRANCE, 25.60 m. (See 15.245 mc.) 6-7.45, 8 pm.-12.30 am. to No. America.
11.710	YSM	SAN SALVADOR, EL SALVADOR, 25.62 m., Addr. (See 7.894 mc.) 1-2.30 pm. and 6.30-9.30 pm.
11.710	—	SAIGON, FRENCH INDO-CHINA. 25.62 m., Addr. Boy-Landry, 17 Place A Foray. 7.30-9.45 am.
11.705	SBP	MOTALA, SWEDEN, 25.63 m., 1-4.30 pm. Sun. 3 am.-4.30 pm. Daily 8-9 pm. to N.A. News 8 pm.
11.700	HP5A	PANAMA CITY, PAN., 25.64 m. Addr. Radio Teatro. Apartado 954. 7-10.40 am. 5-11 pm. Sun 6-11 pm.
11.700	CB1170	SANTIAGO, CHILE, 25.64 m. Addr. P.O. Box 706. Relays CB89 10 am.-2 pm., 3.30-Mid.
		End of Broadcast Band
11.700	IQY	ROME, ITALY. 25.64 m. 5.20-5.40 am. 1.50-2.30 pm in Russian. ex. Sun., Daily 12.07-12.56 in Arabic. 7.30-9 pm. to N.A. News 7.15 pm.
11.650	XGOK	CANTON, CHINA. 25.75 m. 7-8.30 am.
11.640	—	MOSCOW, U.S.S.R., 25.77 m. 6-7 am. (Eng.) 1-2 pm. (French).
11.535	SPD *	WARSAW, POLAND, 26.01 m., Addr. 5 Mazowiecka St. 6-9 pm.
11.480	CXA7	MONTEVIDEO, URUGUAY. 26.13 m. Heard evens.
11.402	HBO	GENEVA, SWITZERLAND, 26.31 m., Addr. Radio Nations. 1st Sun of mo. 12.45-2.30 am., 1.45-2.30 pm. Tues. 12.45-2.45 pm., Fri. 8.45-10.45 pm.
11.040	CSW5	LISBON, PORTUGAL, 27.17 m., Addr. Nat. Broad. Sta. 12-3.30 pm. Sun. 10 am.-3.30 pm.
11.000	PLP	BANDOENG, JAVA, 27.27 m. Relays YDB. 6-9 pm., 10.30 pm.-2 am., 4.30-10.30 or 11 am. Sat. until 11.30 am.
10,950	FIQA	TANANARIVE, MADAGASCAR, 27.40 m., Addr. (See 9.38 mc.) 12.30-45, 10-11 am., 2.30-4 am.,
10.670	CEC	SANTIAGO, CHILE, 28.12 m. Irregular.
10.660	JVN	NAZAKI, JAPAN, 28.14 m. Broadcasts daily 1.50-7.40 am. Works Europe irregularly at other times.
10.600	ZIK2	BELIZE, BR. HONDURAS, 28.30 m Tues., Thurs., Sat. 1.30-2, 8.30-9 pm.
10.535	JIB	TAIHOKU, TAIWAN, 28.48 m. Works Japan around 6.25 am. Broadcasts, relaying JFAK 9-9.55 am., 4-5 am. irreg.
10.400	YSP	SAN SALVADOR, EL SALVADOR, 28.85 m., 1-3, 6.30-11 pm.
10.360	EAJ43	TENERIFE, CANARY ISL., 28.96 m., 3-4.30, 5-7, 7.45-8.45, 9-10 pm.
10.350	LSX	BUENOS AIRES, ARG., 28.98 m., Addr. Transradio International. Tests irregularly.
10.330	ORK	RUYSSELEDE, BELGIUM, 29.04 m. Broadcasts 1.30-3 pm. to Belgian Congo. Works OPM 1-3 am., 3-5 pm.
10.290	DZC	BERLIN, GERMANY. 29.15 m. 3-3.10 pm., 6.30-9 to Brazil.
10.260	PMN	BANDOENG, JAVA, 29.24 m. Relays YDB 6-9 pm., 10.30 pm.- 2 am., 4.30-10.30 or 11 am., Sat. to 11.30 am.
10.220	PSH	RIO DE JANEIRO, BRAZIL, 29.35 m., Addr. Box 709. Broadcasts 6-7 pm., Mon. 8-8.30 pm. to N. A. Fri. 7-7.30 pm.
10.070	—	DEUTSCHE FREIHEITS SENDER, 29.82 m., loc. in Germany, undercover. 4-5 pm.
10.065	TIEM	SAN JOSE, COSTA RICA. 29.81 m., 4.30-8 pm.
9.985	COBC	HAVANA, CUBA, 30.05 m. Addr. P. O. Box 132. Relays CMBC 6 am.-12 mid.
9.925	JDY	DAIREN, MANCHUKUO, 30.23 m. Relays JOAK daily 7-8 am. Works Tokyo occasionally in early am.
9.892	CPI	SUCRE, BOLIVIA, 30.33 m., 11 am.-n., 7-9 pm.
9.870	FIQA	TANANARIVE, MADAGASCAR. 30.40 m. (See 10.950 mc.)
9.855	EAQ	MADRID, SPAIN, 30.45 m., Addr. P. O. Box 951. 6-7.30, 7.45-8.50 pm. to N.A. News 8.40 pm.
9.830	IRF	ROME, ITALY, 30.52 m. Works Egypt afternoons. Relays 2RO, 5.20-5.40 am., 12-12.25 pm. Daily 1.50-2.30, 6-9 pm. to N. A.
9.825	COCM	HAVANA, CUBA. 30.54 m. Addr. Transradio Columbia, P. O. Box 33. 8 am.-12.30 am. Relays CMCM.
9.78	HH3W	PORT-AU-PRINCE, HAITI, 30.67 m. Addr. P. O. Box A117. 1-2, 7-9 pm. Sun 1-2, 5-8 pm.
9.755	ZRO	DURBAN, SOUTH AFRICA, 30.75 m. Addr. S. A. Broadcasting Corp., P. O. Box 4559, Johannesburg. Daily exc. Sat. 11.45 pm.-12.50 am. Daily exc. Sun. 3.30-7.30 am., 9-11.15 am. Sun. 5.30-7, 7-11.15 am.
9.750	HJ6FAH	ARMENIA, COLOMBIA, 30.77 m. 8-10.30 am., 5-10.30 pm.
9.740	CSW7	LISBON, PORTUGAL. 30.80 m. Addr. Nat. Broad. Sta. 4-5.30-5.45-9 pm. for N.A.
9.730	CB970	VALPARAISO, CHILE, 30.83 m., 7 am.-11.30 pm. irreg.
9.730	HJFK	PEREIRA, COLOMBIA. 30.83 m. 7-9 am.-eves. to 10.30 pm.
9.708	COCQ	HAVANA, CUBA, 30.90 m. Addr. 25 No. 445, Vedado, Havana, 7-1 am. Sun. 6.55 am.-1 am.

31 Met. Broadcast Band

9.705	HJCF	BOGOTA, COLOMBIA, 30.92 m. Eves. to 9, irreg. to 11 pm.
9.703	——	FORT DE FRANCE, MARTINIQUE, 30.92 m. Addr. P. O. Box 136. 6-8.10 pm. Irr. to 9.30 pm.
9.695	JIE3	TYUREKI, TAIWAN, 30.95 m. 9.05-10.20 am.
9.690	—	TANANARIVE, MADAGASCAR, 30.96 m., 12.30-12.45, 3.30-4.30, 10-11 am., Sun 2.30-4 am.
9.690	ZHP	SINGAPORE, MALAYA, 30.96 m. Sun. 5.40-9.40 am., Wed. 12.40-1.40 am., Mon.-Fri. 4.40-9.40 am., Sat. 12.25-1.40 am., 4.40-9.40 am., 10.40 pm.-1.10 am. (Sun.)
9.690	GRX	DAVENTRY, ENGLAND, 30.96 m., Addr. See GSC, 9.58 mc. 12.25-5.15 am., 11.52 am.-8 pm. to Europe.
9.690	TI4NRH	HEREDIA, COSTA RICA, 30.96 m., Addr. Amando C. Marin. Apartado 40. Tue., Th., Sat. 9-10 pm. Sun. 7-8 am.
9.690	LRA1	BUENOS AIRES, ARG., 30.96 m., 9.30 am-noon, 4.30-8 pm. Sat. and Sun. 6-8 pm.
9.685	TGWA	GUATEMALA CITY, GUAT., 30.96 m. Daily 10-11.30 pm.; Sun. 7-12 pm.
9.683	HNF	BAGHDAD, IRAQ. 30.98 m. 6 am.-3 pm.
9.680	XEQQ	MEXICO, D.F., MEXICO, 30.99 m. 5 pm.-1 am.
9.680	TPB	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.

(Continued on following page)

SUPER BARGAINS

Rockbottom Prices on New and Rebuilt Apparatus

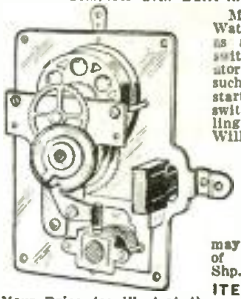
Many of the attractive items listed here are brand new, others are reconditioned like new; but ALL are in PERFECT WORKING ORDER. In many cases, the component parts alone total more than the complete price we are asking. 100% satisfaction guaranteed or your money refunded.

ORDER FROM THIS PAGE. Use the convenient coupon below. Be sure to include sufficient extra remittance for parcel post charges, else order will be shipped express, charges collect. Any excess will be refunded. C.O.D. shipments require a 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 TIME SWITCH

Complete with Built-in Holding Relay



Made by the famous Waterbury Clock Company, as an automatic defrosting switch for electric refrigerators and still usable as such. Has synchronous self-starting clock motor, and switch contacts for controlling any 1/3 H.P. motor. Will modernize any electric refrigerator by providing automatic defrosting. Merely plug refrigerator into clock outlet; and clock into 110 volt, 60 cycle A.C. line. Its maze of gears may be used for a variety of experimental purposes. Shp. Wt. 3 lbs.

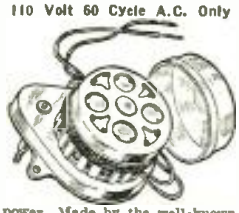
ITEM NO. 75

Your Price (as illustrated) **95c**

SUPER SPECIAL

3½ R.P.M. SYNCHRONOUS MOTOR

110 Volt 60 Cycle A.C. Only



There are 101 uses for a synchronous motor making only 3½ revolutions per minute. Ideal for crowd-catching dynamic, store-window displays, agitating film-developing tanks, as an electric winch on model motor boats, as derrick motor in erector sets, etc., etc. Built-in high-ratio step-down gears provide amazing amount of power. Made by the well-known Haydon Mfg. Co. of Waterbury, Conn. Measures but 2" in diameter x 2⅛" x 1" thick overall. Shp. wt. 2 lbs.

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

A.C. "SQUIRREL CAGE" SYNCHRONOUS MOTOR

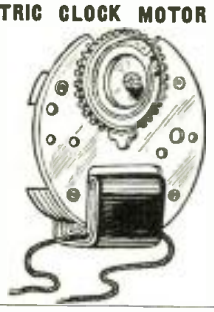
A self-starting shaded pole motor originally designed for use on radio chassis for Push Button Tuning. High speed and powerful. One lubrication lasts lifetime. Excellent for model railroad trains, small boats, humidifier water pumps and a host of other uses. Has ⅛" long shaft, 3/16" diameter. Complete with brass mounting posts. Measures 2⅛" x 2" x 2¼" overall. For 110 volts, 60 cycles, A.C. only. Shp. wt. 4 lbs.

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

SCOOP!

REPLACEMENT ELECTRIC CLOCK MOTOR

Complete with Rotor



STOP! Don't throw out your electric clock just because the field coil has burned out. Replace the entire motor quickly, economically with this new one, which fits 90% of all electric clocks. Where it does not fit, use the field winding only, on the old lamination. The result is the same; new life for the clock. For use on 110 volts 60 cycles only. Measures 2" in diameter.

ITEM NO. 78
YOUR PRICE ... **49c**

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 receivers or transformers of any kind are needed. Fits any standard lamp socket. Looks like ordinary light bulb except that it is made with special dark filter glass which permits nothing but ultra-violet rays to come through. Brings out beautiful opalescent hues in various types of materials—even non-fluorescent objects. Swell for amateur parties, plays, etc., to obtain unique lighting effects. Shp. Wt. 1 lb. Bulb only.

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

SPECIAL

LITTLE GIANT MAGNET. Lifts 8 lbs. easily. Weighs 4 oz. Made of ALNICO new high-magnetic steel. Complete with keeper. Most powerful magnet ever made for size. Shp. Wt. ¾ lbs.

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

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

Substantially constructed to General Electric specifications, this ball-bearing motor was originally designed as a high-quality phonograph unit. Its power and smooth-running characteristics make it excellent for home recording work. Its speed, governor-controlled, is variable both below and above 78 r.p.m. Designed for use on 110 volts, 60 cycles, A.C. Sold less turn-table and shaft. Overall dimensions are 7½" diameter x 5⅛" high. Shp. wt. 14 lbs. **Packed in Original Box**

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

MOTOR FOR ROTATING RADIO BEAM ANTENNAS

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 a remote point. Substantially constructed for hard usage. Motor has double-ended 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. Overall size 6½" x 6½" x 4½". Shp. Wt. 10 lbs.

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

HUDSON SPECIALTIES CO. 40-T West Broadway, N.Y.C.

WE HAVE NO CATALOG. IT'S EASY TO ORDER—CLIP COUPON—MAIL NOW ORDER FROM THIS PAGE.

HUDSON SPECIALTIES CO., 40-T West Broadway, New York, N. Y. RT-3-40

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, 78, 81, 82, 86, 87

Name ..... Address .....

City ..... State .....

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

(Continued from preceding page)

Mc.	Call	
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	2RO9	ROME, ITALY, 31.04 m. 12.20-1, 1.19-5.30, 6.16-6.30 pm.
9.660	LRX	BUENOS AIRES, ARG., 31.06 m., Addr. El Mundo. Relays LRI, 6-6.45 am.-9.15 am.-10 pm.
9.660	HVJ	VATICAN CITY, 31.06 m. Sun. 5-5.30 am.
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	CS2WA	LISBON, PORTUGAL, 31.09 m., Addr. Radio Colonial. Tues., Thurs. and Sat. 4-7 pm.
9.650	I2AA	ADDIS ABEBA, ETHIOPIA, 31.09 m., 3.30-5.30 am.,
9.645	XGOY	SZECHWAN, CHINA. 31.10 m. Test 1-3, 9-9.30 am.
9.645	JLT2	TOKYO, JAPAN, 31.10 m.
9.640	CXA8	COLONIA, URUGUAY, 31.12 m., Addr. Belgrano 1841, Buenos Aires, Argentina. Relays LR3, Buenos Aires 5 am.-10.45 pm. Sat. to 1 am.
9.640	CR7BE	LOURENCO MARQUES, MOZAMBIQUE. 31.12 m. Addr. P. O. Box 594. 2-4 pm to Europe.
9.635	KZRH	MANILA, PHILIPPINES, 31.14 m. 4-11 am. News 7.30 and 8.45.
9.635	2RO3	ROME, ITALY, 31.13 m., Addr. (See 11.810 mc.) Irrreg. 1-2 am. 12.07-3 pm., 5.30-9 pm. to N.A. News at 7.30 pm.
9.630	JFO	TAIHOKU, TAIWAN, 31.15 m. Relays JFAK. 4-10.30 am.
9.625	CXA6	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	TIRG	SAN JOSE, COSTA RICA, 31.19 m. 7-9.30 am., 12-2, 8-11.30 pm.
9.615	VLQ	SYDNEY, AUSTRALIA. 31.21 m. Addr. Dept. of Inform. 2-3.45 (Eur.) 4-5.45, 6-6.45 (S.A.), 7-8 (N.A.), 8.15-9 am. (India).
9.615	ZRL	KLIPHEUVEL, 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. 12-2.30, 4.15-4.30, 4.55-1 am. to N.A. News at 4.15, 6, 8.15, 10.30 pm. 12 Mid.
9.600	RAN	MOSCOW, U.S.S.R., 31.25 m. 3-7, 7-8 pm. to N.A. News at 7 pm.
9.600	CB960	SANTIAGO, CHILE, 31.25 m., 8-11.30 pm.
9.600	GRY	DAVENTRY, ENG., 31.25 m., Addr. See GSC, 9.58 mc. Irregular.
9.595	EIRE	MOYDRUM, ATHLONE, EIRE, 31.27 m. Radio Eireann. 2.30-4.30, 5.30-6 pm. on odd dates.
9.595	HBL	GENEVA, SWITZERLAND, 31.27 m., Addr. Radio Nations. Irregular.
9.595	HP5J	PANAMA CITY, PANAMA, 31.27 m. Addr. Apartado 867. 12 n. to 1.30 pm., 6.30-10.30 pm.
9.590	VUD2	DELHI, INDIA, 31.28 m. Addr. All India Radio, 1.30-3.30 am., 6.30 am.-12.30 pm., 9.30-11.30 pm. News at 7.45 am.
9.590	PCJ	HUIZEN, HOLLAND, 31.28 m., Addr. (See 15.220 mc.) Sun. 1.40-3, 7.15-8.15, 8.25-9.50 pm.; Tues. 1.45-3.30, 7-8.30, 8.45-10.15 pm.; Wed. 7.15-8.15, 8.25-8.40 pm. to N.A.; Fri. 8-9 pm.
9.590	VK6ME	PERTH, W. AUSTRALIA, 31.28 m., Addr. Amalgamated Wireless of Australasia, Ltd. 6-8 am. exc. Sun.
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.
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.

Mc.	Call	
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., 6.22-9.15, 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. Mid.-9 am. ex. Suns. Sun. 12-7.30 am.
9.570	CXA2	MONTEVIDEO, URUGUAY, 31.35 m. 11 am.-4, 4.30-9.30 pm.
9,570	KZRM	MANILA, P. I., 31.35 m., Addr. Erlanger & Galinger, Box 283. Wkdys. 4.30-6 pm. m. tof. 5-9 am., Sat. 5-10 am., Sun. 4-10 am.
9.570	WBOS	BOSTON, MASS., 31.35 m., Addr. Westinghouse Electric & Mfg. Co. 6-9 am. Rel. C8S 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. 6.30-10.50 pm. Also early am. prog.
9.556	OAX4T	LIMA, PERU, 31.39 m., 7-8, 11.30 am.-1.30 pm.
9.550	HVJ	VATICAN CITY, 31.41 m., Sun. 5-5.30 am., Wed. 2.30-3 pm.
9.550	TPBII	PARIS, FRANCE, 31.41 m. Addr. (See 15.245 mc.) 11.15 am.-7 pm., 9.30 pm.-mid. Irreg.
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.
9.550	VUB2	BOMBAY, INDIA. 31.41 m., Addr. All India Radio. 9.30-10.30 pm., 1-3.30 am. 5-6 am. also.
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.
9.538	VPD2	SUVA, FIJI ISLANDS, 31.46 m., Addr. Amalgamated Wireless of Australasia, Ltd. 5.30-7 am., exc. Sun.
9.535	SBU	MOTALA, SWEDEN. 31.46 m. 4.35-5.05 pm. 8-9 pm to N.A. News 8 pm.
9.535	JZI	TOKYO, JAPAN, 31.46 m. 7-9.30 am. 2-4 pm.
9.535	—	SCHWARZENBURG, SWITZERLAND, 31.46 m., 1-2 pm. 6.45-7.45, 8-9 pm.
9.530	KGEI	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. 2.06-4.06 am. 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.
9.523	ZRG	ROBERTS HEIGHTS, S. AFRICA. 31.5 m., Addr. (See ZRK. 9.606 mc.) Daily exc. Sun. 5-7 am.; Sun. 5.30-7 am.
9.520	OZF	SKAMLEBAK, DENMARK, 31.51 m., Addr. Statsradiofonien, Heibergsgade 7, Copenhagen, 8-11 pm. to N.A.
9.520	YSH	SAN SALVADOR, EL SALVADOR 31.51 m., Addr. (See 7.894 mc.) Irregular 6-10 pm.
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	GSB	DAVENTRY, ENGLAND, 31.55 m., Addr. (See 9.580 mc.—GSC) 12.57-3.15 am., 9-11.45 am. 3.50-6, 6.22-9.15, 9.37 pm.-12.30 am.
9.510	FIQA	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	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. 11.20 am.-1, 2.20-4.20 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. Suns.
9.500	VK3ME	MELBOURNE, AUSTRALIA, 31.58 m., Addr. Amalgamated Wireless of Australasia, 167 Queen St. Daily except Sun. 4-7 am.
9.500	OFD	LAHTI, FINLAND, 31.58 m., Addr. Finnish Brcst. 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'L'D, 31.67 m. 8.30 am.-1.30 pm. 4.30-9.30 pm. News 1 p.m. Irreg.

End of Broadcast Band

9.465	TAP	ANKARA, TURKEY, 31.70 m. 5.30-7, 11 am.-4.30 pm. Sat. 6.30-8.30 am. Sun. 5.30-7.30 am.
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. 8 am.-11 pm. Sun. 8 am.-10 pm.
9.400	OAX5C	ICA, PERU, 31.91 m., Radio Universal, 7-11.30 pm.
9.363	COBC	HAVANA, CUBA, 32.04 m. Addr. 12 mid. Sun. 7 am.-10.30 pm.
9.345	HBL	GENEVA, SWITZERLAND, 32.11 m., Addr. Radio Nations. Mon., Wed., 6.45-8.15, 8.45-10.15 pm.; Sun. 9-10 pm. to N.A.
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 12-12.40 am., and 2.30-3 pm. Sun. 1.30-2.15, 6-7.45, 11.30 am.-1.15 pm., 2-3.30 pm.
9.234	——	BUCHAREST, ROUMANIA. 32.54 m. 12.17-5 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.
9.170	HCIGQ	QUITO, ECUADOR, 32.72 m., Mon. Wed., Sat. 9-9.55 pm.
9.143	HC2CW	GUAYAQUIL, ECUADOR, 32.81 m., 11 am.-1, 7-11 pm.
9.125	HAT4	BUDAPEST, HUNGARY, 32.88 m., Addr. "Radiolabor," Gyali-ut. 22. Daily 7-8.30 pm.; Sat., 6-7.30 pm.
9.100	COCA	HAVANA, CUBA. 33.22 m., Radio Galiano No. 102. Relays CMCA Noon-1.15 am. Irreg. to 3 am.
9.091	PJCI	CURACAO, D. W. INDIES, 33 m., 6.36-8.36 pm., Sun. 10.36 am.-12.36 pm.
9.030	COBZ	HAVANA, CUBA, 33.22 m., Radio Salas Addr. P. O. Box 866. 7.45 am.-1 am. Sun. 7.45 am.-12 m. Relays CMBZ.
8.960	TPZ2	ALGIERS, ALGERIA. 33.48 m. Tues. 12.30-1.30 pm.
8.950	COKG	SANTIAGO, CUBA. 33.52 m. Addr. Box 137. 5-9.50 pm.
8.841	HCJB	QUITO, ECUADOR, 33.5 m. 7-8.30 am., 11.45 am.-2.30 pm., 5-10 pm., except Mon. Sun. 12 n.-1.30 pm., 5.30-10 pm.
8.830	COCQ	HAVANA, CUBA, 33.98 m., 6.50 am-1 am.
8.700	HKV	BOGOTA, COLOMBIA, 34.48 m. Tues. and Fri. 7-7.20 pm.

(Continued on following page)

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Scott, E. H., Radio Laboratories, Inc.	Set Mfr.	Literature		Free	667
Sigmon Radio Supply Co.	Set Mfr., Dealer	1940 Catalog		Free	681
Solar Mfg. Corp.	Parts Mfr.	General Parts Catalog	9S	Free	677
		Transmitting Catalog	2X	Free	
		Condenser Testers Cat.	CBCC-1	Free	
Sprayberry Acad. of Radio	Radio School	52-page Book		Free	669
Superior Instruments Co.	Test Equipment	Catalog		Free	657
Supreme Publications	Publisher	Information		Free	668, 671, 679
Teleplex Co.	Code Machine	Booklet	S-2	Free	672
Triplett Electrical Inst.Co	Parts Mfr.	Catalog		Free	679
Turner Co., The	Parts Mfr.	Catalog		Free	661
Vibroplex Co., Inc.	Code Machine	Illus. Catalog		Free	677

(Continued from preceding page)

Mc.	Call	
8.700	COCO	HAVANA, CUBA. 34.48 m. 7.50-12.50 am.
8.665	COJK	CAMAGUEY, CUBA, 34.62 m. Addr. Finlay No. 3 Altos. 11.30 am.-12.30 pm., 3.30-6, 8-8.30 pm.
8.665	W2XGB	HICKSVILLE, N. Y., 34.64 m., Addr. Press Wireless, Mon. to Fri. News at 9 am. and 5 pm.
8.580	YNPR	MANAGUA, NICARAGUA, 34.92 m. Radiodifusora Pilot. 12.45-2.15, 6.45-10.15 pm.
8.200	PSK	RIO DE JANEIRO, BRAZIL. 36.59 m. 5.55-7 pm.
8.000	HCIETC	QUITO, ECUADOR, 37.50 m. Addr. Teatro Bolivar, Sats. 8-10.30 pm.
7.894	YSD	SAN SALVADOR, EL SALVADOR, 37.99 m., Addr. Dir. Genl. Tel. & Tel. 7-10.30 pm.
7.870	HCIRB	QUITO, ECUADOR, 38.1 m. La Voz de Quito. 8.30-11.30 pm.
7.854	HC2JSB	GUAYAQUIL, ECUADOR, 38.2 m. 11 am.-2, 4-11 pm.
7.850	ZAA	TIRANA, ALBANIA. 38.25 m. 6.30-8 am., Sun. to 8.30, 12.20-5 pm.
7.797	HBP	GENEVA, SWITZERLAND, 38.48 m., Addr. Radio-Nations.
7.660	YNDG	LEON, NICARAGUA, 39.16 m., 8.30-9.30 pm. ex. Suns.
7.614	CR6AA	LOBITO, ANGOLA, 39.39 m., Mon., Wed., Sats. 2.30-4.30 pm. Also 7.177 mc.
7.520	RKI	MOSCOW, U.S.S.R., 39.89 m. 3-6.30 pm. (English 4.30-6 pm.) to N.A.
7.520	KKH	KAHUKU, HAWAII, 39.89 m. Sat., Sun. 8.30-9 pm. Irreg.
7.490	EAJ43	TENERIFE, CANARY ISL., 40.05 m., 7-8 pm.
7.450	TI2RS	SAN JOSE, COSTA RICA. 40.27 m. "Radioemisora Athena". 7-11 pm.
7.440	FG8AH	POINT-A-PITRE GUADELOUPE, F.W.I., 40.32 m., 6-7.10 pm., also 9-10.30 pm. Irreg. P. O. Box 125.
7.410	HCJB4	QUITO, ECUADOR, 40.46 m., 7-9.30 pm. irregularly.
7.380	XECR	MEXICO CITY, MEX., 40.65 m., Addr. Foreign Office. Sun. 6-7 pm.
7.310	VIG	PORT MORESBY, PAPUA, 41.01 m., 2nd & 4th Sats. each month. 3-5 am.
7.295	JIE	TYUREI, TAIWAN. 41.13 m. 9.05-10.20 am.
7.284	YN1IP	MANAGUA, NICARAGUA. 41.19 m. Sun. 10-11 am.
7.280	TPB11	PARIS, FRANCE, 41.21 m., 10.15, 12.45, 1.30-5 pm.
7.260	CSW8	LISBON, PORTUGAL, 41.32 m., addr. Emissora Nacional de Radiodifusao, rua do Quelhas. Tue., Thur., Sat. 5.05-6 pm.
7.260	GSU	DAVENTRY, ENGLAND, 41.32 m. Irregular.
7.260	OZU	SKAMLEBAK, DENMARK, 41.32 m. 2-5 pm.
7.258	JVW	TOKYO, JAPAN. 41.34 m., 2-4 pm.
7.250	YDA	TANDJONGPRIOK, JAVA, 41.38 m., Addr. N.I.R.O.M., Batavia, 10.30 pm.-2 am.; Sat. 7.30 pm.-2 am.
7.230	GSW	DAVENTRY, ENGLAND. 41.49 m. 5.42-11.30 am. to Europe.
7.220	HAD	BUDAPEST, HUNGARY, 41.55 m. 9 pm.-12 m. to N. A.
7.220	YDX	MEDAN, SUMATRA, N. E. I., 41.56 m. Daily exc. Sat., 10.30 pm.-2 am. 6-10.30 am. Sat. 7.30 pm.-1.30 am.
7.220	EAJ9	MALAGA, SPAIN, 41.55 m. 4-6 pm.
7.200	YI5KG	BAGHDAD, IRAQ, 41.67 m., 7.30 am.-4 pm.
7.200	YNAM	MANAGUA, NICARAGUA, 41.67 m. Irregular at 9 pm.
7.177	CR6AA	LOBITA, ANGOLA, PORT. WEST AFRICA. 41.75 m., Mon., Wed., and Sats. 2.45-4.30 pm. Also see 7.614 mc.
7.100	FO8AA	PAPEETE, TAHITI, 42.25 m., Addr. Radio Club Oceanien. Tues. and Fri. 11 pm.-12 mid.
7.088	PI1J	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.
6.990	XEME	MERIDA, YUCATAN, 42.89 m., Addr. Calle 59, No. 517, "La Voz de Yucatan desde Merida." Irregular.
6.977	XBA	TACUBAYA, D. F., MEX., 43 m. 9.30 am.-1 pm., 7-8.30 pm.

Mc.	Call	
6.960	2ZB	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. Emisoria Diaria de Commercio. 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.
6.690	TIEP	SAN JOSE, COSTA RICA. 44.84 m., Addr. Apartado 257, La Voz del Tropico. Daily 7-11 pm.
6.675	HBQ	GENEVA, SWITZERLAND, 44.94 m. Addr. Radio-Nations. Sun. 1.45-2.45 pm.
6.660	HI5G	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. Emisora Ruben Dario. 1.30-2.30, 6-10.15 pm.
6.565	HI5P	PUERTO PLATA, D. R., 45.70 m., 5.40-7.40, 9.40-11.40 pm.
6.556	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. Radioemisora Catolica 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.
6.470	YNLAT	GRANADA, NICARAGUA, 46.36 m., Addr. Leonidas Tenoria, "La Voz del Mombacho." Irregular.
6.465	HI4V	SAN FRANCISCO DE MACORIS, D. R., 46.44 m., 11.40 am.-1.40 pm., 5.10-9.40 pm.
6.445	TGWB	GUATEMALA CITY, GUAT. 46.55 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.
6.440	COHI	SANTA CLARA, CUBA, 46.58 m. Addr. Parque Vidal 5. 7 am.-12.15 am.
6.416	HIIS	SANTIAGO, D. R., 46.76 m. 5.40-7.35 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.
6.388	HI9B	SANTIAGO, D. R., 46.95 m., 4.50-8.45 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.
6.360	COCQ	HAVANA, CUBA, 47.17 m. 7 pm.-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, Casilla 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.-10 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.
6.298	OAX4G	LIMA, PERU, 47.63 m., Addr. Apartado 1242. Daily 6-12 mid.
6.280	HIIG	TRUJILLO CITY, D. R., 47.77 m. 6.40-8.40 am., 11.40 am.-2.10 pm., 3.40-9.40 pm.
6.255	CP12	LA PAZ, BOLIVIA, 47.96 m., 7-9 pm.
6.243	HIIN	CIUDAD TRUJILLO, D. R., 48 m., Addr. "La Voz del Partido Dominicano." 5.10-9.40 pm.
6.235	HRD	LA CEIBA, HONDURAS, 48.12 m., Addr. "La Voz de Atlantida." 8-11 pm.; Sat. 8 pm.-1 am.; Sun. 4-6 pm.
6.215	——	SAIGON, INDO-CHINA, 48.27 m., Addr. Radio Boy-Landry, 17 Place A. Foray. 7.30-9.45 am., 11.45 pm.-1 am.

49 Met. Broadcast Band

6.200	CP5	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.
6.190	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	HVJ	VATICAN CITY, 48.47 m., 4-5 pm. Wed. and Sats. to 5.30; Thurs. 4.30-5 pm. Sun. 1.30-2 pm.
6.190	TG2	GUATEMALA CITY, GUAT., 48.47 m., Addr. Dir. Genl. of Electr. Commun. Relays TGI Mon.-Fri. 7.30-10 am., 6-11.30 pm., Sat. 6 pm.-3 am. Suns. 7-11 am., 3-8 pm.
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.
6.185	LRA2	BUENOS AIRES, ARGENT., 5-8 pm. Sat. and Sun. 6-8 pm.
6.185	TIRCC	SAN JOSE, C. R., 48.51 m., Tu., Thur., Sat. 6-7 pm.; Sun. 8-10 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., in Jan.
6.160	HJCD	NUEVA GRANDE, COLOMBIA, 48.70 m. to 10.30 pm.; Sat. to 11.40 pm.
6.153	HI8N	MOCA CITY, D. R., 48.75 m. 6.40-9.10 pm.
6.150	HJDE	MEDELLIN, COLOMBIA, 48.78 m., 9.30 am.-1 pm., 5-11.30 pm.
6.150	CJRO	WINNIPEG, MAN., CANADA, 48.78 m., Addr. (See 11.720 mc.) 4-8.30 pm. Irreg. to 1.30 am.
6.150	ZP14	VILLARRICA, PARAGUAY, 48.78 m. 4-6 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 11.20-3.45 pm., Sat. till 4 pm., Sun. til 3.20 pm.
6.147	ZBW	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. 5-9 am. Sat. 5-10 am. Sun. 4-10 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. Suns. 5.35-7 am.
6.140	SP48*	WARSAW, POLAND, 48.86 m. Irregular.
6.138	COCD	HAVANA, CUBA, 48.88 m., 10 am.-11 pm.; Sun. 10 am.-9 pm.

(Continued on following page)

COMMERCIAL NOTICES 10¢ A WORD

Under this heading only advertisements of a commercial nature are accepted. Remittance of 10c per word should accompany all orders. Copy should reach us not later than the 10th of the month for the second following month's issue.

AGENTS WANTED

300% PROFIT SELLING GOLD Leaf Letters for Store Windows; Free samples. Metallic Co., 446 North Clark, Chicago.

CORRESPONDENCE COURSES

CORRESPONDENCE COURSES and educational books, slightly used. Sold, Rented, Exchanged. All subjects Satisfaction guaranteed. Cash paid for used courses. Comp'ete details and bargain catalog Free. Send name Nelson Company, C-210 Manhattan Building, Chicago.

USED CORRESPONDENCE Courses and Technical Books Bought, Sold, Rented, Exchanged, Catalog Free. V. W. Vernon, Henagar, Alabama.

DIATHERMY MACHINES

DIATHERMY, SHORT-WAVE Therapy, and ultra short-wave therapy machines custom-built by radio engineer at considerable saving over commercial machines; 6 meters, 16 meters or any other frequency specified can be furnished. Machines substantially built with high patient safety factor. 250-300 watts output. Neat professional appearance. Automatic safety time switches. All necessary pads and electrodes. For sale only to physicians, hospitals, and sanatariums. Prices from $195.00 to $300.00. Not for sale to the general public. Write for further information giving your own specifications and requirements. Allan Stuart, 1015 Wilson Ave., Teaneck, N. J.

EDUCATIONAL COURSES

NOW YOU CAN GET A COMPLETE Radio Course Free. Write Radio Center, 222 Portage, Winnipeg, Man.

INSTRUCTION

LEARN CODE. SIMPLE METHOD 25c. Codemaster, Box 8383, Pittsburgh, Pa.

$120.00 ELECTRICAL ENGINEERing Course; 60 cloth-bound lesson books. Good condition. $15.00. Harry Ackerson, Box 322, Ramsey, N. J.

PATENT ATTORNEYS

INVENTORS — PROTECT YOUR rights before disclosing your invention to anyone. Form "Evidence of Conception"; "Schedule of Government and Attorneys' Fees" and instructions sent free. Lancaster, Allwine & Rommel, 436 Bowen Building, Washington D. C.

QSL—CARDS—SWL

QSLs — SWLs. FREE SAMPLES. Meade. 819 Wyandotte, Kansas City, Mo.

RADIO DIAGRAMS

PLANS 18 RECORD-BREAKING Crystal Sets, SW record 4250 miles, with "Radiobuilder"—year, 25c. Laboratories, 7700-A East 14th, Oakland, Californta.

ANY RADIO DIAGRAM 25c. SPECIfy manufacturer, model. Radio magazine free. Supreme Publications, 3727 West 13th, Chicago.

RADIO KITS

RADIO KITS—$3.95 UP. COMplete. Single band; all-wave; 5-10 tubes. Save 50%. Parts catalog Free. McGee Radio, P-2045, K. C., Mo.

FOR SALE (NON COMMERCIAL) 3¢ A WORD

Under this heading we accept advertisements only when goods are offered for sale without profit. Remittance of 3c per word should accompany all orders. Copy should reach us not later than the 10th of the month for the second following month's issue.

SACRIFICE! A complete 1939 Radio Course. What offers. M. Smood, 3-313 Fort, Winnipeg, Manitoba.

DON'T BUY A RECEIVER UNTIL you get my free list of reconditioned, guaranteed Receivers! Practically all models at money saving prices. Tradeins. Time Payments. Send for list. W2AVA. 12 West Broadway, New York.

FOR SALE—3 TUBE SW SET WITH built in power supply; 7 tube 3 band 110 V. A.C. superhet. Also big assortment of SW parts and phonograph records. C. J. Coonfield, Jr., Box 191, Apache, Okla.

FOR SALE—SCOTT "16" EXCELlent condition or will exchange for Scott 20, 23 or 30 tube set. Full details. Carl Mater, Dresher, Penna.

SELL SURPLUS CRYSTALS. WRITE for list——W8NCJ.

FOR SALE: ALL SHIPPED ON ten day free trial. Sky Buddies $15.00, Sky Chiefs $19.00, Sky Champions $29.00, SX-11 Super-Skyrider $44.00, Skyrider Commercial SX-12 $44.00; HRO $139.00. Super Pro $139.00. NC100 $69.00. FB7s $9.00. SW3s $9.00; 25 cycle model ACR-175 $49.00. ACB-155 $29.00. Practically all other models cheap. Terms. Write for free list. W9ARA, Butler, Missouri.

SACRIFICE LATE SERVICE TEST Equipment, Radio Parts, Motor Scooter, etc. Send stamp for list. S. N. Hansen, 1021 Grove, Cedar Falls, Iowa.

COMMUNICATIONS RECEIVER. 8 tubes. $14.50. Write. Leo Gruetzmacher, Thayer, Kansas.

BARTER AND EXCHANGE — FREE!

NO ADVERTISEMENT TO EXCEED 35 WORDS, INCLUDING NAME AND ADDRESS

Space in this department is not sold. It is intended solely for the benefit of our readers, who wish to buy or exchange anything in the Radio, Television and Photographic fields for Radio, Photographic and other merchandise.

As we receive no money for these announcements, we cannot accept responsibility for any statements made by the readers.

Use these columns freely. Only one advertisement can be accepted from any reader in any one issue. All dealings MUST be above board. Remember you are using the U. S. mail in all these transactions and therefore you are bound by the U. S. Postal Laws. Describe anything you offer accurately and without exaggeration. Treat your fellowmen the way you wish to be treated.
We welcome suggestions that will help to make this department interesting and helpful to our readers.

Copy should reach us not later than the 20th of the month for the second following month's issue.

SWAP CAMERA, MICROSCOPE, compass, one tube radios, Parts, magic goods, courses in collecting roots, herbs, butterflies for profit, oil paintings. Want U.S. stamps and coins. John Haynes, Doe Run, Missouri.

WANT P.A. EQUIPT. OR INSTRUments. Have used dynamic speakers, power transformers, volume controls, by-pass condensers and resistors and radio tubes, good condition. W. J. Carlson, 5405 Cumming Ave., Superior, Wis.

HAVE COMPLETE 67 LESSON N.R.I. course in Communications, also radio books and radio parts. Want: Keystone 8 m.m. movie camera and projector. Fred Oldenburg, 18451—11 Mile, Roseville, Mich.

TRADE: "STOP FIRE" AUTOMObile fire extinguisher, including chromium plated case, bracket. Brand new. One quart burning gasoline can be extinguished with approximately 1/3 ounce of liquid. Want transmitting tubes. Irving Goldstene, 332 Alabama Avenue, Brooklyn, N. Y.

HAVE CLARINET, MANDOLIN, printing, instruction books to trade for radio, radio parts, typewriter, duplicator or what have you. Correspondence invited. J. Bell, 1216 So. Press St., San Antonio, Texas.

WANTED: HOWARD, SKY BUDDY, or similar receiver for 3 tube S.W. receiver (less tubes). Bb clarinet, 5000 stamps in album, midget broadcast receiver, trickle charger. Don Brate, 72 Adams Place, Delmar, N. Y.

WANTED SUPER SKYRIDER, SKY Chief, parts or outboard motor. Have used and unused U. S. and foreign stamps, Bay City new fishing reels and cash. Frank Szczur, 258 West York St., Phila., Pa.

WANTED 2½ METER TRANSceiver complete with tubes. Also other high frequency parts. I am interested in getting a 3 tube TRF receiver and other transmitting parts. QRA 685 Park Ave., Union City, N. J., Fred Arakelian, W2MQI.

WILL SWAP 3 KODAKS, RANGER motor-scooter, linotype keyboard and course and 41 railroad magazines. I want model plane engine. L. Hukill, 1484 W. Broad St., Columbus, Ohio.

OFFER NEW HOWARD 440 5-BAND 9-tube communications receiver with crystal, for used Leica, Contax, Robot or Speed Graphic. Robert Eichberg, 782 West End Ave., New York City.

PARTS, TUBES, CHASSIS. VARIable cond., 57, 56, 2A5, bandswitch and coils, dials, transformers and $2.00 for Knight Supergainer or Lafayette 4 super with coils, less tubes. Needn't work. Box 243, Packanack Lake, N. J.

TO TRADE ONE DAYRAD SIGNAL gen., allwave series 36, one Marvel converter with plug-in coils. Would like short wave receiver. Must be good. G. E. Temple, 12 Cross St., Westboro, Mass.

EITEN S.W. RECEIVER COMPLETE with coils for 20, 40, 80, 160 meters. Will swap. Need test meter or what have you. H. Licari, 50-21 71 Street, Woodside, N. Y.

WANT: 16 M.M. MOTION PICTURE projector. Will trade Remington electric shaver, etc., or pay cash. Have 110V electric blower suitable for small forge. C. W. Philpot, 315 W. Main St., Laurens, S. C.

WANTED: NEON PLATE, CRATER, 902, 1852 and acorn tubes; television I.F. transformers. Will trade or pay cash. Raymond Zitta, W2MOA, 28-26 47 St., Long Island City, N. Y.

TRADE 1937 HARLEY DAVIDSON "74" motorcycle and six Summer lots on beautiful Lake Erie for high power fone transmitter complete and in good condition. Jayne Arrance, Alfred University, Alfred, N. Y.

TRADE RADIO TUBE TESTER, "B" eliminator, stamps, radio parts, old books and magazines, antiques, and auto parts. Want factory made S.W. det., small radio, War and Indian relics. Russell Gunderson, Hawley, Minn.

WANTED: SMALL FONE TRANSmitter, will trade 7 tube radio or buy for cash. Tom Mills, 5711 Byron St., Chicago, Ill.

HAVE AMPLIFIER, MIKE, PHONO motor, pickup, cameras, projector, electric shaver, sporting goods, violin, many books, etc. Want photographic equipment, 16mm films. M. Epstein, 2953 Ruckle St., Indianapolis, Ind.

HAVE QUANTITY OF RADIO parts, new and used tubes, sockets, electro magnets and many other articles, transformers, chokes, etc. Box full for photo equipment or good candid camera. Edgar D. Growden, 818 Gephart Drive, Cumberland, Md.

WANTED—QSL'S PRINTED IN EXchange for Amateur Call Book, small 2 tube SW receiver, bias supply, 46's, 809's, T20's. Also want hi-power transmitting tubes. Mrs. Veronica King, 76 Hanover St., Wellsville, N. Y.

HAVE PLENTY OF STAMPS TO swap for radio equipment. Plenty of British Colonials. United States, mint and used, both old and new issues. J. Weiss, 547 E. 105 St., Cleveland, Ohio.

WANTED — HOWARD "600" B meter. Trade first edition of Handbook, parts, new high price "T" square. 1933 Amateur Call Book, old radio magazines. Morris Harwood, 3104 Edgewood Ave., Richmond, Va.

HAVE COMPLETE SET POPULAR Educator, Clip-Shave electric razor, V.P. Kodak and Ghirardi's Radio Physics Course, 2nd edition. Want A.C.-D.C. long and short wave radio, portable typewriter. Sam Spector, S.S. Maiden Creek, Mobile, Ala.

TRADE COMPLETE PROFESSIONAL tattooing outfit, midget radio, archery set, 4000 diff. postal cards, duplicate stamps, sign painting course, for rifles, pure bred milk goats, Flemish giant rabbits. Scott's 1938 stamp and album. Elmer Pence, P.O. Box 22, Griggsville, Ill.

(Continued on opposite page)

(Continued from preceding page)

Mc.	Call	
6.187	CR7AA	LAURENCO MARQUES, MOZAMBIQUE, PORT. E. AFRICA, 48.87 m. Daily 12-1, 4.30-6.30, 9.30-11 am., 12-4 pm.; Sun. 5-7 am., 10 am.-1.30 pm.
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	HS4PJ	BANGKOK, THAI, 48.94 m. Daily Ex. Mon. 8-10 am.
6.130	LKJ2	JELOY, NORWAY, 48.94 m. Noon-6 pm.
6.130	VLW	PERTH, W. AUST., 48.94 m. App. 5.30-7.45 am. on Sat and Sun.
6.125	CXA4	MONTEVIDEO, URUGUAY, 48.98 m., Addr. Radio Electrico de Montevideo, Mercedes 823. 8 am.-Noon. 2-10 pm.
6.125	MTCY	HSINGKING, MANCHUKUO, 48.98 m., 4-9 am.
6.122	HP5H	PANAMA CITY, PAN., 49 m., Addr. Box 1045. 6-10.30 pm. to mid. irreg.
6.122	FK8AA	NOUMEA, NEW CALEDONIA, 49.00 m., Radio Noumea, Addr. Charles Gaveau, 44 Rue de l'Alma., 2.30-3.30 am. ex. Sun.
6.120	WC8X	NEW YORK CITY, 49.01 m., Addr. See 6.170 mc., 12 m.-2 am. in Feb.
6.117	XEUZ	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	GSL	DAVENTRY, ENGLAND, 49.1 m. Addr. B.B.C. London. 3.50-6, 6.22-9.15 pm., 9.37 pm.-12.30 am.
6.110	XEGW	MEXICO CITY, MEX., 49.1 m., Addr. La Voz de Aguila Azteca desde Mex., Apartado 8403. Relays XEJW 11 pm.-1 am.
6.105	HJ6ABB	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	WNBI	BOUND BROOK, N. J., 49.18 m., Addr. Natl. Broad. Co. 12 mid.-1 am.
6.100	ZHJ	PENANG, FED. MALAY STATES, 49.18 m., 6.40-8.40 am., except 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.-3.20 pm.
6.097	ZRJ	JOHANNESBURG, S. AFRICA, 49.2 m. Addr. S. African Broad. Co. Daily 11.45 pm.-12 noon with interrupt. ex. Sat.
6.095	JZH	TOKYO, JAPAN, 49.22 m., Addr. (See 11.800 mc., JZJ.) Irregular.
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.
6.083	VQ7LO	NAIROBI, KENYA, BRIT. EAST AFRICA, 49.31 m., Addr. Cable and Wireless, Ltd. Mon., Fri. 5.30-6 am., 11.15 am.-2.15 pm., also Tues. and Thurs. 8.15-9.15 am.; Sat. 11.15 am.-3.15 am.; Sat. 11.15 am.-3.15 pm.; Sun. 10.45 am.-1.45 pm.
6.080	CFKX	VANCOUVER, CANADA, 49.84 m., 1-3 am. ex. Mon.
6.080	WCBI	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.
6.080	HP5F	COLON, PAN., 49.34 m., Addr. Carlton Hotel. 7-9 pm.

Mc.	Call	
6.079	DJM	BERLIN, GERMANY, 49.34 m., Addr., Broadcasting House. Irregular.
6.075	VP3MR	GEORGETOWN, BRI. GUIANA, 49.35 m. Sun. 7.45-10.15 am.; Daily 4.45-8.45 pm.
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. o..
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.
6.055	VK9MI	S.S. KANIMBLA, 49.54 m. (Travels between Australia and New Zealand.) Sun., Wed., Thurs. 7-7.30 am.
6.055	HJ6ABA	PEREIRA, COLOMBIA, 49.55 m., 9 am.-Noon, 6.30-10 pm.
6.050	GSA	DAVENTRY, ENGLAND, 49.59 m., 12.25-5.15, 11.52 am.-8 pm. to Europe.
6.050	HP5F	COLON, PANAMA, 49.56 m., 7-9 pm.
6.045	XETW	TAMPICO, MEXICO, 49.6 m. 7 pm.-1 am.
6.040	WDJM	MIAMI BEACH, FLA., 49.65 m. 1-3 pm., 9 pm.-1 am., Sun. 4-6 pm. Relays WIOD.
6.040	WRUL	BOSTON, MASS., 49.65 m., Addr. University Club. Sun. 2-8 pm., 5.30-8.30 pm. Daily.
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. 1-9 pm., 9-10 am.
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., Addr. (See 6.079 mc.) 11.30 am.-4.25, 9 pm.-1 am. to N.A.
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 CJCB 7 am.-1.30, 4-8.30 pm.
6.010	CFCX	MONTREAL, CAN., 49.92 m., Can. Marconi Co. Relays CFCF 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.) Daily exc. Sun. 9.30 am.-3.30 pm (to 4.45 pm. Sat.), Sun. 8.40 am.-12 n., 12-15-3.15 pm. Daily exc. Sat. 11.45 pm.-12.50 am.
6.006	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.

(Continued on following page)

BARTER and EXCHANGE FREE ADS (continued)

HAVE TUBES, SOCKETS, COILS, resistors, dials, volume controls, fence charger, pick-up, rectifiers, relays, radio magazines, manuals, etc. Want meters and short wave receiver. A. Wagner, 4743 Washington Blvd., Chicago.

WANTED: BACK ISSUES OF Service, R-Craft, SW-Craft, etc. Have to trade meters, radio parts, radio and electrical courses, mimeograph, radio books, etc. S. J. Nicewicz, 79 Church St., Broad Brook, Conn.

22 RIFLE WANTED FOR AC-DC or battery operated SW receiver 3 tubes each. Albert Hartman, 5713 5th Ave., Brooklyn, N. Y.

WHO HAS A REK-O-CUT RECORDing unit for sale or trade? Have radio parts, amplifiers, mikes, books, stamps for trade. Send list of what you want for unit. F. U. Dillon, 1224 Horne Ave., Hollywood, Calif.

TRADE LASALLE HIGHER ACcountancy Course, complete, new condition, for Series B Graflex, or good miniature camera. All letters answered. Vincent Maresca, West Fourth Street, Derby, Conn.

HAVE CRYSTAL 6L6s, 3 450V power supplies, 20 henry 300 mill. choke, Dayrad test oscillator, many recvg. parts. Want 0-1 milli. meter, any meters, test equipment, bug, 1000 V. transformer. W8SBP, Blanchester, Ohio.

WANTED GOOD SOUND AMPLIfiers, RCA 16mm sound movie camera Meissner Signal Shifter, Meissner preselector, DB20 or what have you. Have transmitters, phone-cw., Sky Buddies, mikes, variable frequency oscillator-exciter unit. Radio W8OQU, Wellsville, N. Y.

HAVE ULTRA STRATOSPHERE '10" with coils 2½ to 4000 meters, Ranger 2 tube S.W. set, Bb clarinet. Want console B.C. set, A.C. SW3 or? A. W. Hoover, 560 Lincoln St., Evanston, Ill.

SWAP EASTMAN AUTO-FOCUS f6.3 enlarger, $15, Eastman 3A f6.3 camera, $10, Univex f5.6 movie camera, $6, 5x7 Eastman printer, $7, for photographic equipment, good reflex, miniature, 8mm movie camera. Lunde, Evansville, Wis.

TRADE 1938 MOTOROLA 6-TUBE car radio, perfect, speakers, power packs equipped with 80 rectifier tapped at 400V., 350V., 90V., 6.3V., A.C., 45V., for transmitter or good short wave receiver. Gerald Hebert, Box 364, Kaplan, La.

WANTED: HAMMARLUND, 10M coils on Isolantite forms for Comet Pro and Weston 489 meter, 0-50, 0-250V 1000 ohms per volt. Harry C. Meier, 7 Roosevelt Ave., Cranford, N. J.

HAVE 1 BEEDE, 1 McINTOSH, 2 Jewell, 3 Weston, 2 Sterling, 6 Readrite meters, Brush mike, time relay, midget condensers, dials, tubes, magazines, pick-up, etc. Want short wave receiver. John Baer, 6303 Kenwood Ave., Chicago.

WANTED USED R.M.E. 69 RECeiver, will pay cash or will trade pocket hearing aid, Go'd Shield compass, sun lamp, 5 different 3 foot aeroplane kits, 3000 U.S. and foreign stamps. Aladdin, 3643 39th St., Woodhaven, N. Y.

SWAP QST'S FOR PHOTO EQUIPT., telephones, or? May, June, Aug., Oct. 1925; Feb.-Dec. '28; Feb.-Dec. '27; Jan., Dec. '28; Jan., June, Aug.-Nov. '29; Jan.-Dec. '30, Jan.-April, Nov., Dec. '31; Jan.-Oct. '32 (72 issues). Herman Yellin, W2AJL, 351 New Lots Ave., Brooklyn, N. Y.

WILL PAY CASH FOR TRANSformers or 1500 V. 300 m.a. and 600 V 250 m.a. power supplies. I can also use a good microphone. Will answer all letters. Wm. TrePak, W8TXX, 7224 Schoyer Ave., Swissvale, Pa.

HAVE JANETTE ROTARY CONverter 220V. D.C. to 110V. A.C. 60 cycles 175 W. Want anything of equal value, photography or transmitting equipment. Prefer camera with Tessar lens or RK-47. W2GWQ, Seven Avenue B, N. Y. C.

HAVE 2 UNIVEX CAMERAS, PHILco auto radio, motorcycle motor, small radios and parts. Trade for good rifles, shot guns, enlarger. E. J. France, Jr., 220 Orchard St., Mt. Airy, N. C.

HAVE NATIONAL SILVER STEEL guitar, 6 tube Zenith arm-chair Receiver, 25 watt CW transmitter. Want typewriter, preselector or what have you? J. R. Pruett, Box 62, Mooresville, N. C.

HAVE ANSLEY D7 PORTABLE radio phonograph (A.C.-D.C. 5 tube super), records. Sky Buddy 1939 model A-1 condition, flat back mandolin excellent condition, back issues R&T mag. 1938-1939 new, for what have you? John Basta, 31 Lake Street, Brooklyn, N. Y.

HAVE S.W. RADIOS, XMITTRS, parts. Want cameras, photographic equipment, mimeograph and equipment, stamps, or what have you. Will answer all letters. Rex Cheek, Box 568, Pikeville, Kentucky.

HAVE COMPLETE CW XMITTER with power supply for swap. Need portable typewriter. Rud Feenberg, 624 N.W. 17th, Okla. City, Okla.

COMPLETE LATEST N.R.I. RADIO and television course, experimental equipment, all lessons, questions and answers. What have you? B. Williams, 149 Pringle St., Kingston, Penna.

I HAVE TO SWAP ONE GAVITT stretched carbon hand mike, one Stewart Warner converter model 301A, one 24 bass piano accordion. What have you? Will ans. all mail. Quito Paolini, 88 South St., Westboro, Mass.

WILL SWAP A GENEMOTOR—INput twelve volts, output 750 volts at 250 mills, in perfect condition. Want typewriter, Bliley crystals, power supplies, mikes. William Blecha, Pawnee City, Nebraska.

WANTED 25 WATT CW JUNIOR transmitter. Have a stamp collection of U.S. and foreign of about 1000 or more all different. Carl Bruner, Stone Church Rd., Elm Grove, W. Va.

WANTED—MIDGET CAR RACER type, enlarger. Have $300 worth radio parts, new and used; three used radios, good condition; radio testers, meters, tubes, electric motors. J. C. Kelley, Colebrook, N. H.

WANTED — USED WIRELESS phono oscillator, printing press, cameras and photographic equipment, radio test equipment. I will pay cash. Swap lists. All letters promptly acknowledged. M. W. Smood, 3-313 Fort, Winnipeg, Manitoba.

HEY FELLOWS, HAVE YOU 25A7GT tube, filter cond., and used mini-camera or 35mm lens. Have 16MM f/1.9 lens, two 6F7, 6" Utah speaker, tennis rackets, etc. G. Chouinard, 4599 Papineau Ave., Montreal, Canada.

WANT A GOOD WIRELESS PHONO A.C. D.C. voltmeter, S.W. receiver and 5-four prong plug-in coils 10 to 600 meters. Raf Rozek, 712 So. Farragut St., Bay City, Mich.

OFFER COMPLETE POWER SUPply for amateur 750 volts—200 mills, Weston 0-200 voltmeter, Weston 0-100 milliamp Brunswick short wave adapter, for what have you. Harry Winthrop, 302—3rd Street, Jersey City, N. J.

HAVE—RIDEB MANUALS 1, 2, 3; N.R.I. course and analyzer, 440 Ranger tester, G.E. phono motor. Want:—8x10 studio camera and stand, 5x7 enlarger, 25mm enlarger or printer, 8x10 printer, typewriter, printing press. Maniss, Colorado, Tex.

TRADE 18 WATT P.A. SYSTEM with wireless mike, no trailing wires, for Sky Buddy or what have you. A. E. Haseman, Beecher, Ill.

WANT SKY BUDDY OR OTHER communications receiver, car radio, sporting equipment, N.R.I. radio course. Have Cooke's electric course (58 lessons), train transformer, electric motor. Please write. Roger Sprenkel, Haddam, Kansas.

TRADE—SINGLE BUTTON AND double button mikes, 27—P.P. 45's modulator, xmtr parts and tubes for good "buz." Write for trade list W9GZD, Paul Bossoletti, 825 Third St., So. Carrington, No. Dak.

TRADE READRITE 720-A ANALyzer, NRI radio and television course, power pack 110 volt primary, 2 volt battery receiver and mandolin for? William Phillips, Gypsy, West Virginia.

TRADE GOOD A AND B ELIMINAtors, twenty sections train track, and old RCA two-tuber for transmitter or receiver, or? D. F. Ridenour, 3131 W. Pikes Peak, Colorado Springs, Co'o.

WANTED LONG DISTANCE CRYStal set, old automobile radiator emblems, Indian head cents, stamps. Have 16 MM projector and films, coins, books, courses. Send me your swap list. Rudolph Zak, 2509 East 89th, Cleveland, Ohio.

TRADE: NATIONAL SW3, 20, 75, 160 meter bandspread coils and power supply. Old model but in good condition. Want: Argus camera C3 or any other Argus model. Hue Diament, George School, George School, Pa.

WANTED: TYPEWRITER, ELECtric motors, tools. Have brand new set of 4 I.F.T., same used in Super Sky-Rider, has hifi and sharp tap. Many other parts, your list for mine. W. Marx, 4839 Ohio St., Chicago, Ill.

EXCHANGE FOR TESTING INstruments, battery charger with bulb trickle charger, R.C.A. magnetic speaker, power transformers, variable condensers, Brown and Sharpe 1" micrometer. Joseph Marsh, 111 Van Liew Ave., Milltown, New Jersey.

WILL TRADE 110 V. A.C. 60 cycle phono motor for ink type Master Teleplex tapes. Prefer message tapes. Theo. Erickson, 2224—18th Ave. So., Minneapolis, Minn.

WANTED — RADIO PARTS AND correspondence with fellows interested in radio. Have radio parts. Write C. Seary, 21 Hawthorne W., Winnipeg, Manitoba, Canada.

MUST DISPOSE OF LOUD speaker system that has one mile range. Marvelous for outdoor events or sound truck. Trumpets, compressor, amplifier, etc. All inquiries answered. George Cook, 2031—149 St., Whitestone, N. Y.

HAVE NEW SKY BUDDY, S19R, V.A.C., Radio Physics Course, new tubes, stamps, other parts. Want National or Howard revr., volt-ohmmeter, Trimm headphones, radio parts. Send your list. Swap fotos? Daniel Platek, 225 Division Ave., Brooklyn, N. Y.

RARE BELGIAN POSTAGE STAMPS given for good short wave set. E. Jemison, 227 Fulton St., New York, N. Y.

7 TUBE RECEIVER, f.6.3 LENS, mimeograph, 110 V. transformer, 16 MM projector, microscope kit, heliograph, starting motor, etc., for small transmitter, 1 H.P. gas engine. Robert Wald, 1665 Townsend Ave., Bronx, N. Y. C.

HAVE NEW 35T, SWAP FOR T55 or similar tube with 7.5 or 6.3 volt filament. Also have 50 watt 160 meter phone rig, details on request. R. E. Murphy, 7311 Georgetown Rd., Bethesda, Md.

TRADE RADIO-CRAFT, JAN., NOV., Oct., Sept., Aug., May of '38, and RT Jan. '39, Dec., Nov., Sept., Aug., June, May, April '38, for c.b. mike, code osc., or what? Ray Davis, Hornick, Iowa.

HAVE LARGE ILLUSTRATED books, "Making Art Pay" and "How to Draw from Nudes." Will trade for earphones and code key or phono oscillator. R. L. Hawks, 303 Joplin St., Joplin, Mo.

WANT MIDGET RADIOS AND meters. Have xtals, tubes, Isolantite sockets, variable cond's., spkrs., pwr. transfrms. Gerald Samkofsky, 156 Taylor Street, Brooklyn, N. Y.

WANT METERS, HANDEE GRINDer, radio books (Ghirardi). Have xtals, T21, tubes, magazines, filter blocks, Eifen 7C, Helen Wax, 225 Rodney St., Brooklyn, N. Y.

HAVE RADIOS A.C. AND BATtery, lots radio parts, Majestic power supplies, books, magazines. Want crystal pickup and output meter. Send swap list for swap list. All letters answered. Bert Agnew, 79 West Vine, Alliance, Ohio.

INSTRUCTOGRAPH, TEN TAPES, built-in powerful A.C. oscillator and speaker. Want signal generator or any three Rider manuals, or what have you. Samuel Hornick, 8707 Twelfth St., Detroit, Mich.

WANTED—SCOTT 30 TUBE REceiver, have cash. Swap—Triplett tube-tester, Hallicrafter, auto radios, radio course, meters, tubes, oil condensers, books, magazines, eliminators, transformers, Hammarlund coils, parts, etc. Oliver Klein, 2225 N. 39 St., Milwaukee, Wisc.

WANTED—WESTON 476 0-15 V. A.C. Have broadcast Emerson latest 2 tube model. Cabinet slightly cracked. Plays perfectly. Model CF255, A.C.-D.C. Alexander Borysewick, 7 Ave. B., New York City.

HAVE RADIO OPERATING QUESTions and Answers; operators tests, rules, radio, photography, shorthand books, magazines, fishing equipment, cameras, projector, casting set, tools. Swap for any radio equipment. Letters answered. Thomas Skowronski, 118 Chittenden Street, Duryea, Penna.

HAVE A KNIGHT METAL TUBE "Ocean Hopper" complete with 2 tubes and set of coils 16 to 195 meters. Trade for a small broadcast set or anything else of value to me. Clarence Ginther, Box 187, Oatman, Arizona.

TRADE 6A7, 6F7, 6F7 TUBES, 18" slide rule, fast 16mm F/1.9 lens, many sets. Want midget P.M. speaker, burnt out meters, 35MM lens, photometer, used camera. G. Chouinard, 4599 Papineau Ave., Montreal, Canada.

HAVE "B" POWER SUPPLY working condition 110V. A.C. input, 300V. output and other things. Will swap for S.W. receiver or test equipment. Write William L. Bates, Jr., 274 Central Ave., Long Branch, N. J.

WANTED: NATIONAL FB-7, SW-3, SW-45, etc., need not work. Also want National power supplies and band spread coils, early Rider Manuals. Have rifles to trade, or? W. J. Closson, 295 8th St., Troy, N. Y.

WANTED: SKY BUDDY, SIMILAR S.W. receiver. Have 1/5 H.P. gas model airplane motor (less piston) 14" glazed prop., 2100 foreign stamps, modern U.S. post, album with 446 stamps, cheap guitar. John P. Snow, R.2, Jonesboro, Ark.

WANT RIDER'S VOLUME 5, CASH or trade. Will also consider vols. 1, 2, and 3. Have you swap list too? Robert Fleming, 722 No. James St., Rome, N. Y.

WANT CANDLER JUNIOR CODE course or code machine with tapes, also Sky Buddy receiver in first class condition. Tildon DeBruce, Big Sandy, Tenn.

(Continued on following page)

BARTER and EXCHANGE FREE ADS (continued)

TRADE ANTENNATROL, STRAIGHT line frequency variable condenser .0005 mfd., voltage regulator 0-3 dc., A.C.H. sharp tuner vernier dial. Want headphones, telescope, spotlight, exposure meter or what have you? Alexander Podstepny, 217 Pine St., Phila., Penna.

MAGAZINES—75 PERFECT 1938-39 issues (no antiques) Radio & Television, Radio-Craft, Radio News, Radir, etc., containing plenty data. Trade for ultra-short, short wave equipment, etc. Ladue, President Hotel, Long Beach, N. Y.

EXCHANGE 6 TEXT BOOKS ON machine shop, welding and metallurgy, etc. Want late model tube tester in trade. W. S. Crooks, Box 15, Stow, Ohio.

WANTED LITERATURE AND CIRcuit diagrams, new steamship transmitters. What am I offered in exchange, stamps unused or used, postcards, etc. Answer all. Jacques Bury, 16, Rue du Fondouck, Oran, Algeria.

WANTED—BH AND BA RECTIFIER tubes. Need three. Also 46 tubes. Have radio parts for same. W. Fuller, 709 Fenton St., Lansing, Mich.

HAVE OLD RADIOS GOOD FOR parts, also pedigreed Springer Spaniel pups. Will trade for 22 rifle, small radio or musical instruments. Write. Wilfred Hoos, Rural Route 2, Peru, Indiana.

HAVE STAMPS, STAMP BOOK with 600 stamps, tax tokens, geography books, 10 N.R.I. books, 15 decks of pinochle cards. Send your list. Matthew Komarski, 4424 N. 19th St., Phila., Pa.

WANT SIGNAL GENERATOR AND other service test instruments, factory built communications receiver and radio parts. Describe fully in first letter. W. C. Jensen, 330 Aberdeen St., Rochester, N. Y.

WANT: ABOUT 8 WATT AMPLIfier, crystal or magnetic pickup phonomotor, A.C. D.C. tester. Have: Brunswick model #18 condensers, vertical shaft, 2 tube S.W. set 32 and 33 tube. Parts, table model VV VIII Victrola, some money. John Hidley, 169 3rd St., Troy, N. Y.

HAVE: HICKOCK VIBRATOR tester, Weston three meter analyzer, home built P.Q.5 super-ten meter receiver, and Schick electric shaver. Want factory built communication receiver or what? Herschel McKenzie, 823 Shelby St., Indianapolis, Ind.

WANTED: RADIO PARTS. WILL trade or buy. State fully what you have and what you want. I want tubes, transformers, condensers, resistors, 'fones, mikes, dials, wire, etc. A. B. Perry, Eddyville, Iowa.

WANTED: SERVICE SHEETS ON Delco-United Motors auto radios. Parts in above sets, such as var. condenser are numbered 7234831. Other part numbers begin with 72- as above. Geo. Kell, 418½ W. Spring, Freeport, Ill.

HAVE SEVEN FOOT AUTO AN-tenna; several metal and glass type tubes, variable condensers and resistors, etc. Will exchange for other tubes or auto radio. Will answer letters. Edwin Romanak, 52 West End Ave., Newark, N. J.

HAVE SET OF AUTO BOOKS, SIX volumes. Cost $24.80 new. Swap for radio, camera or what have you. Charlie W. Gaisford, Box 333, Bethany, Mo.

HAVE NEW $32.50 ¼ INCH BLACK and Decker Holgun electric drill and lots of new and used transmitter and receiver parts and tubes to trade for small printing outfit. S. B. Robbins, Sunray, Texas.

HAVE: GHIRARDI RADIO PHYSics Course, brand new banjo, 7 tube broadcast receiver, salt water tackle, ice skates 10½, radio parts. Want: S.W. receiver, guitar, S.W.L. cards or headphones. Seymour Glickman, 225 Division Ave., Brooklyn, N. Y.

WANT S.W. RECEIVER OR CODE machine. Have Eb sax., Eastman camera, washing machine motor, encyclopedia—ten volumes, principles of obstetrics—1140 pages. 14" fan without guard, 100 Indianhead pennies. Earl, 309 Ontario St., S.E., Minneapolis, Minnesota.

WANT RADIO, PHOTOGRAPHIC equipment. Have late N.R.I., Public-Speaking, Civil Service Preparation for Clerk, Typist, Stenographic courses; hipboots; 150 fiction, Esquire, Readers' Digest, R&T, Engineering News Records magazines. Sam Racowsky, 2803½ First Avenue, Huntington, W. Va.

WANT TEST EQUIPMENT, RIDER'S Manuals 4 to 10, 6 volt battery radio, wired record player. Will swap radios, radio parts, S.W. converter, cash. Eugene Patterson, 745 South West St., Winchester, Indiana.

1939 ARRL HANDBOOK, S.W. radio, 3 gang condenser R.C.A. from R28P, Hammarlund 4 prong 10 meter coil, photo electric cell, circular slide rule, 5" R.C.A. dynamic speaker with output transformer, needs new cone. What have you. Edwin Davenport, Pittsford, Vt.

WANTED UNIVEX WORLD FAIR model camera in trade for 3 tube regenerative receiver from ARRL 1939 Handbook. Answer 100%. Robert C. Dole, 10 Clinton Ave., Rutland, Vt.

ALL KINDS RADIO PABTS, TUBES, sets, etc., for what have you? List for stamp. Also rare art photos. Joe Fixit, 675 40th St., Brooklyn, N. Y.

WILL TRADE SIXTY DOLLARS' worth of chemical equipment and chemicals for Hallicrafter, Howard, Breting, Meissner or National communications receiver. Fred Sharp, 736 East 105 St., Cleveland, Ohio.

HAVE CHEMISTRY SET, ALL kinds mags., Boy Scout Handbook, Cadet camera used twice. Want short wave recvr. or single shot .22 rifle. Write Roger Johns, 670 North Jackson, Lima, Ohio.

WANTED GOOD OSCILLATOR, other test equipment. Have G.E. B40 car radio complete, Radiola 26 portable less batteries, complete parts for 1000V power pack, Jewel thermo couple RF galvanometer 0-100 milliammeters. G. S. Patterson, 1231 So. Denver, Tulsa, Okla.

WANTED — CANDLER JUNIOR code course. Will pay cash. George Britting, RD #1, Middletown, N. Y.

HAVE 2 TUBE 80 METER CW xmtr, 6L6-G and 5Z3, 20 watts input. Wired on metal chassis. No meter or crystal. Want candid camera and developing supplies to go with. W7FQN, Ritzville, Wash.

STAMP COLLECTION—OVER 2000 —all different. Will trade for 1st class radio or what have you. James Riley, 141 So. Crescent, K. C., Mo.

WANTED: BROWNING 35H AMAteur tuner. Have model 35 all-wave tuner to trade. R. Cannon, 318 N. Maple, Oak Park, Ill.

WANT CODE INSTRUCTOR IN good condition. Complete with tapes, also Ghirardi Radio Physics Course. Have tubes, photo electric cell, slide rule for trade. What have you. Helen C. Dole, 10 Clinton Ave., Rutland, Vermont.

TRADE 3 TUBE A.C.-D.C. SHORT wave receiver (coils, phones) and 6 tube table "Automatic." Want 2½ to 10 M. receiver, preselector or converter, 16MM projector and camera. Elwood Brooks, 1636 E. 36, Cleveland, O.

WANTED THORDARSON T19P58 or T19P59 or like in good condition, also 2 866's, transmitting chokes and phonograph motor. Eugene Wright, Box 1794, Vernon, Texas.

WANTED GOOD S.W. RECEIVER. Have amplifier (1939) in, ARRL handbook, mike, Astatic pickup, turntable, 50 records, 12" speaker. Tubes used 6J7, 6K5, PP6C5, PP6L6, two 80's, electric razor, cash. Bill Richardson, 1531 N. Holyoke, Wichita, Kansas.

WILL SWAP 3 GUARANTEED RCA B52's and one 913 for a good Zeiss F4.5 or 3.5 camera. Mangan, RD3, Warren, Penna.

HAVE VIGA BANJO, VELVET lined case, sells for $60.00. Write for description. Want test equipment, communications receiver, transmitting equipment or what have you radio? Wm. Bunnell, 11 West 42nd St., Suite 1960, New York City.

WILL TRADE AMPLIFIER, POPUlar records, magazines (American Boy, Boy's Life, Open Road for Boys, Metronome, Radio Stars, Radio Mirror, etc., for new classical records. Joseph Monahan, Old Frankfort Pike, Lexington, Ky.

HAVE TELESCOPE, FIELD glasses, microscope, camera, saxophone, mandola, books, etc. Will swap for stamps, coins, cameras, typewriter, relics, curios, etc. What have you? What is wanted? J. Settel, 24 Crosby Ave., Brooklyn, N. Y.

SWAP 1,000 FOREIGN AND U.S. stamps for radio parts or receiver. Prefer receiver S.W.3. Charles Johnson, 413 Second St., South East, Jamestown, N. Dak.

WILL SWAP ELECTRIC AND BATtery radios, tubes and hundreds of radio parts for stamps, code machine, SW set, Radio Physics Course or? Billy Epps, Mineola, Texas.

WILL PAY CASH FOR SET OF band spread coils #13A or 63A for NC-SW3 receiver, which is for the 40 meter C.W. band. H. Fulmer, 327A N 69 St., Wauwatosa, Wis.

HAVE FIVE WATT PHONO AMplifier. Trade for small SW receiver in working condition; also fifteen watt PA system for what have you. Both above complete with speakers. Clarence Wilhelm, 5344 S. Richmond St., Chicago, Ill.

WANTED: ACSW58 OR DC34 WITH coils and tubes. Have 2 Kodaks, 3A plate and 1A, perfect, also Pflueger bait rod and reel, 150 mile limit. Schoonover Jr., Oakland, N. J.

I HAVE OLD AND NEW RADIOCraft from away back, also Radio Tel., that I will trade for radio test equip. W. Ballard, Lufkin, Tex.

HAVE ADJUSTABLE ROLL FILM tank, Ghirardi's Radio Physics Course, AC-DC amplifier with speaker. Want 0-150V. AC voltmeter, 160 meter crystal push button selector, or? Jack Kirin, 1983 Bryant Ave., Bronx, N. Y.

WANT — PORTABLE RADIO IN good condition. Give particulars. Have enlarger in perfect condition F6.3 lens and built-in easel. All letters answered. Leonard Weaver, 868 N. Front St., Steelton, Penna.

SWAP RADIANT GUNDLACH LENS and holder. Weston 0-150 volt D.C. meter, 23 Radio World, 40 Radio-Craft magazines for ¼ inch Black & Decker elec. drill, radio parts. John Kolb, 1628 N. Patton St., Phila., Pa.

WANT 1250 VOLT SUPPLY OR power equip. Have model airplane motor, volt ohm Isolantite coil forms, trans. tubes, transceiver, parts, bug, preselector, plenty parts. Send for list. Steve Vargo, 2355 Riverview, Dayton, Ohio.

TRADE ALL MY RADIO AND MIScellaneous parts for anything in the line of photography, such as lenses, cameras, etc. What would you like? Phil Loboy, 2843 N. Avers. Ave., Chicago, Ill.

WANTED GOOD S.W. RECEIVER, 10 meter equipment, trans. parts, tubes. Have Browning auto, shotgun 12 gauge, rink skates size 10. Many other parts. What trade am I offered. Bud Carson, 1618 W. Second St., Dayton, Ohio.

WANTED: PORTABLE RADIO, good make. Will swap good used tubes, speakers, condensers, parts, etc. What do you want? Will pay cash difference. All correspondence answered. Albert Buckner, Charleston, Mo.

TRADE 60 WATT PHONE XMITTER, complete ready for air for 16MM sound projector or 35 MM portable. Write L. Dean Taylor, W9ZAA, Athens, Ill.

WANTED SW COMMUNICATION receivers not in working condition. Have Hallicrafters SX11 Super Skyrider, film pack camera with f6.3 lens. Arvin 2v battery super. Remington portable typewriter. C. Brown, Milner Hotel, Lancaster, Pa.

TRADE NEW FIFTY-FIVE DOLLAR watch for communications receiver. Howard. Cisin, Hallicrafters or? Also automatic record changer in cabinet. Will pay some cash. W. J. Wallace, 1929 High St., Ashland, Ky.

HAVE ALL KINDS OF RADIO parts and books to trade for "0" gauge model train equipment. Clair Vander Meer, 208 S. Greene St., Spokane, Wash.

BEST TRADE OFFER TAKES RCA ACR-155 amateur communications receiver in perfect electrical and mechanical condition. Marvin W. Shellhamer, 224 Pitt Street, Tamaqua, Pa.

HAVE RADIO TEST EQUIPMENT, new parts, books, typewriter, motor scooter, etc. Want printing press, type, etc., power wood working tools, miniature camera. All letters answered. S. N. Hansen, 1021 Grove St., Cedar Falls, Iowa.

SWL EXCHANGE

UNITED STATES

MIGUEL ANGELO, W4H124, 318 East 70 St., New York City.
PAUL ANKERMAN, 404 Lima Street, Wapakoneta, Ohio.
JOHN ANTONIO, Box 32, Elkland, Penna.
JAMES ARP, 421 Mulberry St., Williamsport, Pa.
PAUL F. BAHR, 1205 W. 10th St., Marion, Indiana.
JOHN L. BALLIN, W40H56, 40 East 66 St., New York, N. Y.
O. BARNESON, 3060 Roswell St., Los Angeles, Calif.
LEONARD N. BARRETT, 1704 Barnard Avenue, Waco, Texas.
JOHN BASTA, 31 Lake St., Brooklyn, N. Y.
CHAS. E. BAXA, 2678 N. Halsted St., Chicago, Ill.
MILTON BENSON, 1 No. Main St., So. Hadley Falls, Mass.
DONALD G. BOCKO, V.P., Plymouth Radio Club, North 4th St., Plymouth, Indiana.
BOB BOYD, 515 N. McCadden Place, Hollywood, Calif.
PHILIP BRADY, Box 67, McComb, Miss.
ERIC BUTCHER, S/S Nemaha, Lykes Bros. S/S Co., New Orleans, La.
F. E. CAMPBELL, JR., 405 E. 4th St., Berwick, Pa.
ROBERT CHASE, 231 Henry St., New York, N. Y.
DONALD CHISHOLM, 18 Mountain Ave., Wakefield, Mass.
JOHN W. CLARK, 28-24 Utopia Parkway, Flushing, N. Y. C., N. Y.
OSCAR CORWIN, 753 S. Columbia St., Frankfort, Indiana.
GEORGE CRYDER, Box 299, Delaware, Ohio.
MERRIAL DAWSON, Wiley Ford, West Va.
CLAYTON DeWITT, RR No. 1, Kingston, Illinois.

(Continued on opposite page)

(Continued from preceding page)

Mc.	Call	
6.002	CXA2	MONTEVIDEO, URUGUAY, 49.98 m. Addr. Rio Negro 1631. Relays LS2, Radio Prieto, Buenos Aires. 5.30-10.30 pm.
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.
5.990	ZEA	SALISBURY, RHODESIA, S. AFRICA, 50.08 m. (See 6.147 mc., ZEB.) Sun. 3.30-5 am.
5.985	HH2S	PORT-AU-PRINCE, HAITI, 50.13 m., Addr. P. O. Box A103. 6.30-9 or 10 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.
5.970	VONG	ST. JOHNS, NEWF'L'D, 50.25 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	HIIJ	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., Tue., Thu., Sat., Sun. 7-10 pm.
5.900	ZNB	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	HI9B	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	TIX	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.
5.790	TGS	GUATEMALA CITY, GUAT., 51.75 m. Casa Preidencial, Senor J. M. Caballeroz. Irregular.
5.725	HCIPM	QUITO, ECUADOR, 52.40 m. Sun. 9-11 pm.
5.460	YNOP	MANAGUA, NICARAGUA, 52.40 m., 8.30-9.30 pm. Sun. 2-3 pm.
5.146	OKIMPT	PRAGUE, BOHEMIA, 58.31 m., Addr. (See OLR, 11.84 mc.) Irregular.
5.145	PMY	BANDOENG, JAVA, 58.31 m. 8.30-noon.

60 Met. Broadcast Band

5.035	YV5RN	CARACAS, VENEZUELA, 59.58 m., 4-11.30 pm., Sun. 8.30-11.30 am., 3.30-11 pm.
5.020	YV4RQ	PUERTO CABELLO, VENEZ., 59.76 m., testing nightly. Off 9.20 pm.
5.010	YV5RM	CARACAS, VENEZ., 59.88 m., 3.30-10 pm., Sun. 8 am.-10.30 pm.
4.990	YV3RX	BARQUISIMETO, VENEZ., 60.12 m., 10 am.-11 pm.
4.975	YVIRJ	CORO, VENEZ., 60.31 m., Eves. to 10 pm.
4.960	VUD2	DELHI, INDIA, 60.48 m., Addr. All India Radio. 7.30 am.-12.35 pm.
4.960	YV5RS	CARACAS, VENEZ., 60.48 m., 4.30 to 9.30 pm.
4.955	YV5RH	CARACAS, VENEZ., 60.85 m., 6.30-7.30, 10.30 am.-1, 3.30-10 pm.
4.950	YV4RO	VALENCIA, VENEZ., 60.61 m., Noon-1, 6-10 pm.
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, 6.30 am.-12.10 pm.
4.910	YVIRY	CORO, VENEZ., 61.10 m., 6.30-9.30 pm., ex. Sundays.
4.905	HJAG	BARRANQUILLA, COLOM., 61.16 m., 11 am.-11 pm., Sun. 11 am.-8 pm.
4.900	YV6RT	BOLIVAR, VEN., 61.22 m. Signs off at 9.30 pm.
4.895	HJCH	BOGOTA, COLOM., 61.29 m., 11.30 am.-2, 6-11 pm.
4.890	YVIRX	MARACAIBO, VENEZ., 61.35 m., 10.30 am.-1.30, 4.30-10.30 pm.

Mc.	Call	
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	VUB2	BOMBAY, INDIA, 61.48 m. Addr. All India Radio, 7.30 am.-12.30 pm.
4.880	YV6RU	BOLIVAR, VENEZ., 61.48 m., 6.30-9.30 pm. except. Sundays.
4.875	HJ6FAH	ARMENIA, COLOM., 61.54 m., 8-11 am., 6-10 pm.
4.865	HJBJ	SANTA MARTA, COLOM., 61.67 m., 5.30-10.30 pm.
4.860	YV1RL	MARACAIBO, VENEZ., 61.73 m., 11 am.-1 pm., 4.30-10.30 pm.
4.855	HJCF	BOGOTA, COLOM., 61.80 m., 7 pm.-mid. ex. Sundays.
4.850	YV1RZ	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	VUC2	CALCUTTA, INDIA, 61.98 m. Addr. All India Radio. 6.30 am.-12 n.
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., 7-11 pm. ex. Sundays.
4.820	YV3RN	BARQUISIMETO, VENEZ., 62.24 m., 11.30 am.-1.30, 5.30-9.30 pm.

Simple 2½ Meter Transmitter

(Continued from page 676)

Results

In the very short time we have had the little "rig" in operation, we have satisfied ourselves that the band has possiblities far beyond our expectations. Within a radius of thirty miles from our station we are reported R 8-9 most of the time, even though the antenna is just a few feet off the ground and is quite close to the stucco portion of the house, which is supported by wire lath.

The decks measure 9½" x 15½" and they are about 1" high. Any good grade of plywood may be used to make them. The front panels measure 7" x 17¾".

Deck No. 1, Power Supply

T1—THORDARSON power transformer, Type 6878.
T2—KENYON filament transformer, 7.5 volts, Type T-353
CH1—THORDARSON choke, Type 6877
CH3—THORDARSON choke, Type 2353-A (used in original set-up, but not in use now)
S1—NATIONAL four-prong socket, Type XC-4, for the Type 83 rectifier tube
C1 and C2—CORNELL-DUBILIER 8 mf. 1000 volt condensers (in same housing)
R1—I.R.C. 50,000 ohm, 50 watt resistor
R2—I.R.C. 25,000 ohm, 10 watt resistor
R3—I.R.C. 750 ohm, 10 watt resistor
SW1—Regular A.C. switch, fitted with pilot light
SW2—D.P.S.T., 600 A.C. switch (toggle). Half used to control plate voltage and half to operate antenna relay on Deck No. 3
Tube is RCA Type 83 rectifier

Deck No. 2, Modulator

CH2—THORDARSON choke, Type 6877
T3—SANGAMO audio transformer (any good transformer may be used here)
T4—KENYON double-button microphone transformer, Type KMG
C3—CORNELL-DUBILIER 10 mf. 50 volt condenser
C4—CORNELL-DUBILIER 8 mf. 450 volt condenser
S2—NATIONAL socket, Type XC-5
S3 and S4—NATIONAL sockets, Type XC-4
DC—Dry cell. It is economical to use the standard No. 6 type rather than any of the flashlight types
Tubes are RCA—1 Type 27 or 56; 2 Type 50
R4—I.R.C. 2,000 ohm, 1 watt
R5—I.R.C. 500,000 ohm gain control
J1 and J2—YAXLEY open circuit jacks
M1—TRIPLETT 0-50 milliammeter
M2—TRIPLETT 0-100 milliammeter

Deck No. 3, 2½ Meter "Lines" Oscillator

AR—WARD-LEONARD 110 volt, A.C. antenna relay. (A relay, with an additional pair of contacts for cutting the plate voltage of the receiver when in the operating position, would be more convenient than the one we are using)

S5 and S6—NATIONAL sockets, Type XC-4
L1—Two copper tubes, ½ inch, O.D. and 22 inches long
L2—Two lengths of copper tubing, 5/16 inch, O.D. and 25 inches long, worked into a dual hairpin, as described in the text
I1, 2, 3 and 4—NATIONAL Type GS-8 plain insulators. Mounts for L2
I5 and 6—NATIONAL insulators, Type GS-10, used to support the hairpin antenna coupling unit, L3
I7 and 8—NATIONAL insulators, Type GS-8, plain (these are not on Deck No. 3, but are used as feed-through insulators and are mounted through the wooden top of the rack, as shown in the pictures)
L3—Hairpin coupling, made from a 13-inch length of No. 12 solid copper wire, covered with insulating spaghetti
L4—NATIONAL R.F. choke, Type R-100
C5 and 6—CORNELL-DUBILIER .001 mf. 600 volt condensers
R6—I.R.C. 10,000 ohm, 10 watt resistor
R7—I.R.C. 75 ohm, center tap resistor
Tubes—2 RAYTHEON, RK-37
I9 and 10—NATIONAL Victron, 3/16 inch thick, 1¾ x 1 inch (4 pieces)
I11—NATIONAL Victron. 3/16 inch thick, 1¾ x ⅝ inch (Victron all cut from single sheet, 6 x 3 x 3/16 inches)
Contactors to connect grid terminals of RK-37s to Grid Lines are made by using 2 pieces of flexible wire, 3 inches long. One NATIONAL Grid Grip, Type 12, is attached to one end of each wire and one NATIONAL Grid Grip, Type 24, is attached to the other end of each.

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HIROSHI FUJINO, Acolia Drive, Auburn, Calif.
STANLEY GARNER, 29 W. Chestnut St., Norristown, Penna.
JOHN PETER GAWEL, 96 Jewett Parkway, Buffalo, N. Y.
NORMAN E. GLOVER, 1520 Proctor St., Port Arthur, Texas.
DAVID GUTHRIE, South Hill, Virginia.
ROBERT K. HARTLEY, 118 Temple St., Hinton, W. Va.
HENRY F. HECKERT, 901 Howard St., Indianola, Iowa.
DAVID HERBERT, JR., Box 709, Lancaster, Calif.
LARRY HILKOWITZ, 31 Post Ave., New York City.
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DR. J. P. HOTCHKISS, 1430 Hyde Park Blvd., Chicago, Ill.
MIKE HOYCHUK, 5547 Saxon Dr., Garfield Hts., Ohio.
BOB JOHNSON, P. O. Box 146, Logan, W. Va.
GORDON C. JOHNSON, 2908 E. 6th St., Superior, Wisc.
KAZUO KANAI, R.F.D. Box 84, Auburn, Calif.
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EDWARD LANG, 3508 South 83rd St. Phila., Pa.
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VERT MANDELSTAMM, 738 S. Park St., Saginaw, Mich.
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MERT MEADE, 819 Wyandotte St., Kansas City, Mo.
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BILL MILLER, 88 Greenwood Drive, Millburn, N. J.
LEWIS MOLTENI, 608 Seventh St., Union City, N. J.
WALTER MONK, 51 Vineyard St., Providence, R. I.
H. GEORGE MUELLER, 5250 N. Meridian St., Indianapolis, Ind.
LOYALL MUMBY, W1SWL, 36 Burr Avenue, Middletown, Conn.
ELMER NEUMAN, 2224 Woodstock Avenue, Swissvale, Pa.
RAYMOND NORRIS, W9SWL, 935 N. Humphrey Ave., Oak Park, Ill.
"CASH" F. OLIVER, 23 Beech Street, Dexter, Maine.
BOB W. PACKSCHER, 268 East 237 St., Woodlawn Hts., Bronx, N.Y.
W. C. PARKINSON, Box 864, Texas City, Tex.
PAT R. PATTERSON, 911 St. Charles Ave. N. E., Atlanta, Ga.
E. PAVLIDIS, 139 W. 7th Ave., Conshohocken, Pa.
ALBERT PICKERING, West Medway, Mass.
GLENN S. PIDGE, 431 Azusa Ave., Azusa, Calif.
DANIEL PLATEK, 225 Division Ave., Brooklyn, N. Y.
VICTOR POLITI, 1024 Unquowa Rd., Fairfield, Conn.
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JACK ROOMY, 429 Stratton Street, Logan, West Va.
JAMES E. RUST, R. R. 2, Greentown, Ind.
HENRY SKOTNICKI, W1SWL, 23 Woodley Court, Meriden, Conn.
ROBERT H. SMITH, 199—38 28th Ave., Bayside, L. I., N. Y.
GEORGE SMITH, JR., 79 Sewall St., Augusta, Maine.
NICHOLAS SPANOS, 340 Market St., Lowell, Mass.
RICHARD SPERLING, 100 Warner Street, Newport, R. I.
ED STANTON, Box 260, York, S. C.
VINCE and MARIE STASEN, 5347 Priscilla St., Philadelphia, Pa.
JAMES SUGIYAMA, R.F.D. Box 151, Auburn, Calif.
JAMES TOTH, 11702 Crofton Road, R.F.D. 10, Cleveland, Ohio.
J. I. VAUGHT, P. O. Box 1424, New Orleans, La.
FRANK VON PUTZ, 8612 55 Road El. Elmhurst, L. I., N. Y.
W. J. WALLACE, 1929 High St., Ashland, Ky.
AUSTIN WARDMAN, 832 Linden Avenue, East Pittsburgh, Pa.
DONALD D. WARNOCK, Eastern Howard County Radio Club, Converse, Ind.
W. J. WEIGHTMAN, 132 N. 5th, Middletown, Ind.
JACK WELSH, Kingston, Ill.
J. D. WHEATON, 2413 E. 7 St., Superior, Wis.
HERNARD and MICHAEL WOZNIAK, 4639 South Winchester Ave., Chicago, Ill.
GEORGE E. WOLFE, W6HPB, 1925 Railroad Ave., Oroville, Calif.
DON R. Yocum, Bettsville, Ohio.
CARL YOUNQUIST, 1121-12 St., Lorain, Ohio.

AUSTRALIA

ALLEN E. WATSON, Lloyd Street, Murto, Victoria.

CANADA

JACK DAVIS, SWL-VE1, 27 Vernon St., Halifax, N.S.
NORMAN E. LANK, 932 Wilder Ave., Montreal, P. Q.
CHARLES TAYLOR, 4 Water St., St. Catherines, Ont.

ENGLAND

M. COUTU, 51 Wingfield St., Portsmouth.
DOUGLAS HALL, 101 Fagley Road, Bradford, Yorkshire.
HENRIG HON-WILLIAMS, Radio 2FUW, 17, Glanselsig Road, Blaenycwn, Treherbert, Glamorganshire.
ERNEST J. LOGAN, BSWL-2, 4 Fanshawe St., Bengeo, Hertford.
A. OGLESBY, 81, Stockton Lane, York.
H. RICE, % 75 Norfolk St., King's Lynn, Norfolk.
FLORENCE TARBOTTON, 28 Curzon Rd., Bradford Moor, Bradford, Yorkshire.

NEW ZEALAND

LES. W. SUTHERLAND, 23 Milton St., Hamilton.

SOUTH AFRICA

LOU GRUSD, 34 Millbourne Rd., Bertrams, Johannesburg.
DAVE D. KRAMER, 84 Hillbrow St., Berea, Johannesburg, Transvaal.
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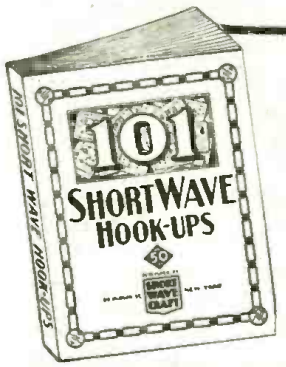

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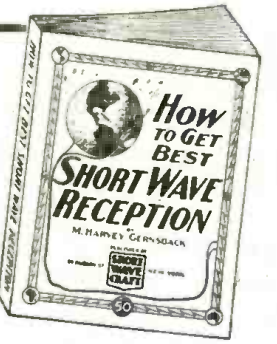

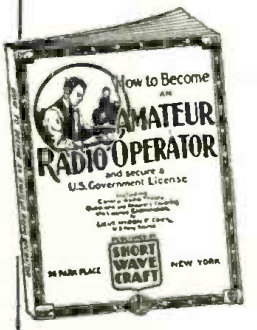

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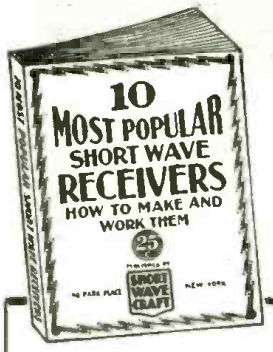

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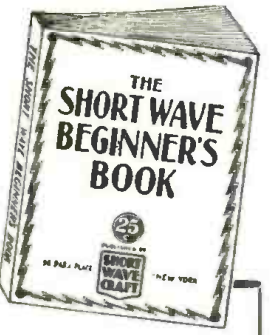

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STOP FAST ACTION!

FOTO-CRAFT SECTION

Edited by Robert Eichberg

Synched Flash Gun on Focal Plane Shutter Does It!

and

Dr. Robert Griffin tells how to make one

● HAVE you ever stood by while the press photographers have been shooting flash pictures with their Speed Graphic cameras, and wished that you had a flash on your good old Graflex?

I have—and when I inquired about a synchronizer, I was informed that a focal plane shutter could not be synchronized successfully at high speeds. However, I started experimenting, and at last I found a method that solved my problem.

First, I purchased a 3-cell flashlight. Then I removed the reflector and in its place fitted on a three-globe flash socket that had a reflector attachment. Next I removed the switch from the flashlight and attached two wires to the switch contacts, then attached the flashlight to the camera by two small steel bands.

Next, remove the film holder (A) and the rear plate that the film holder sets in (B). This will expose the curtain and rollers.

(Continued on page 699)

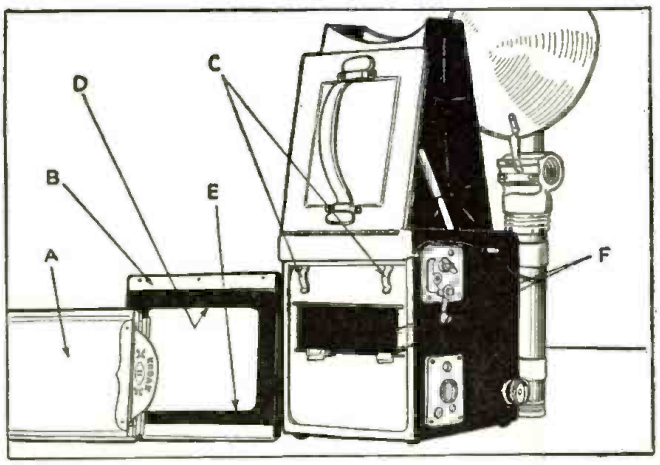
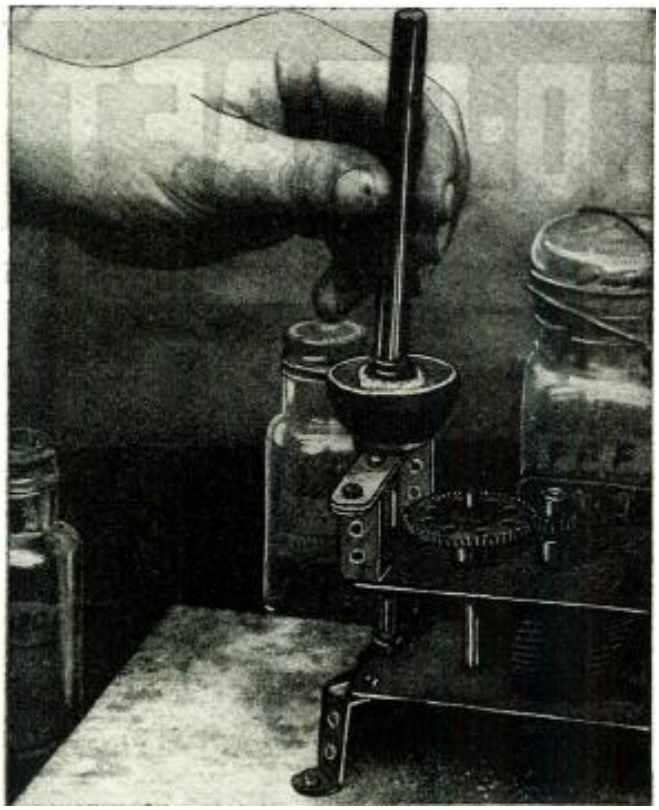


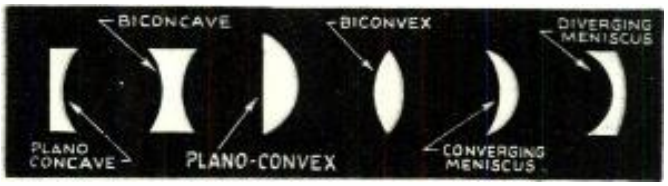
Diagram of synchronizer described in text.

Foto Data—Graflex (4 x 5) Model B used for both indoor shots. Top picture, on Agfa Superpan Press, with one No. 2 Wabash bulb, F6.3 at 1/1000th second. Picture at right on Eastman Super-XX, two No. 1 Wabash bulbs, F5.6 at 1/1000th second. No filter used on either picture.

GRIND Your Own LENSES



Grinding a lens on a phono-motor driven lap.



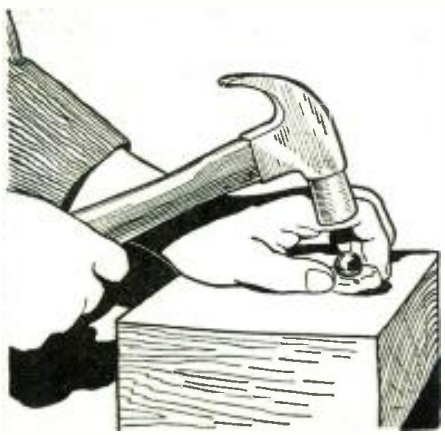
—for low-power hand magnifiers, medium-power focussing magnifiers, high-power magnifiers for negative inspection — and even picture-taking!

Dr. E. Bade

● THE majority of optical instruments employ lenses of one kind or another. The type known as plano-convex, in which one side is flat and the other an outward bulge, is most frequently used. And it is with these that practically any type of optical instrument can be made at home.

Short focus plano-convex lenses, when mounted, make excellent magnifying glasses. Two or more of such lenses may be joined so as to act as a low power microscope, enlarging the image sufficiently to detect grain on negatives. Those of lesser power are ideal as aids in focusing on the ground glass of the camera.

Since there are sure to be a number of uses to which plano-convex lenses are to be put, it is well to make quite a number of them of all possible focal lengths from ¼ of an inch to one or two inches. Since grinding and polishing small lenses is fascinating work and a lens can be turned out from a sheet of glass in from one to two hours, even by a beginner, one need have no hesitation in starting.



Ball bearing hammered into lead sheet makes grinding lap.

Glass for the lens can be double weight window glass of good quality or a small piece of plate glass from either windshield, mirror or window. The grinding is done with carborundum powder, rough grain, medium grain and FFF grain. Polishing is done with jewelers' rouge, pitch or bees wax (any will do). A small electric motor of about 1/32 H.P. will furnish sufficient power. A small block of lead and various sizes of ball bearings complete the list.

Cut out some paper disks the diameter of the desired lenses and paste these on the glass. When dry, cut out the disks with a glass cutter. Hold the rough disk of glass with a rag and "nibble off" excess glass with a pair of flat, wide-jawed pliers. When fairly round, grind the edges smooth. A hand emery wheel may be used for this operation. A small disk of glass can be held at the tip of a small dowel by using sealing wax as a cement; in this way, a fairly circular disk is quickly obtained in less than 10 minutes.

Rough out the curve of the lens to a hemispherical curve on a grinding stone or wheel. Do not worry if this rough lens is angular or lopsided—it will come to a perfect curve on grinding on the lap.

The grinding and polishing lap consists of a chunk of lead ¼- to ½-inch thick and from 1 to 2 inches in diameter. Hammer a ball bearing in the exact center about half way in and drill a tiny hole right through the deepest part of the curve. A ¼-inch ball bearing will give a plano-convex lens having a focus of about ¼-inch, a ½-inch bearing gives a lens of ½-inch focus while a 1-inch bearing gives a 1-inch lens. These figures are approximate.

Mount the lead lap, as the chunk of lead with its depression is called, on a spindle, polishing head, head end of a lathe or on the shaft of a motor. Sealing wax may be used. Provide a splash pan around this revolving lap to catch the dirt thrown off.

Now grind the lens to shape. To begin, moisten the glass and dip into the carborundum powder. Start the motor, hold

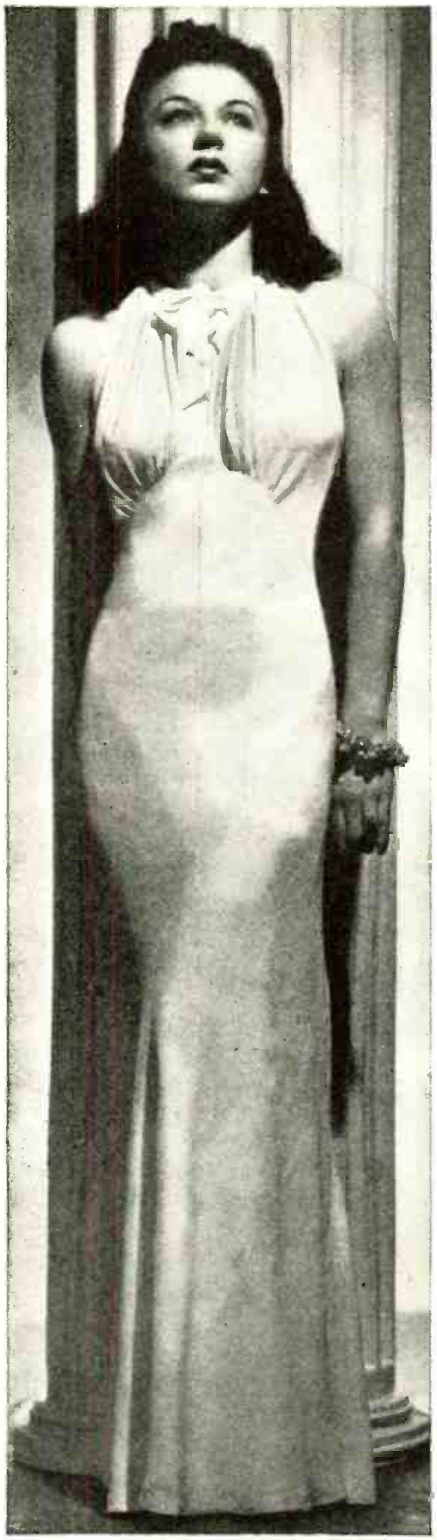
Roughing out glass lens blank on hand-operated grinding wheel.

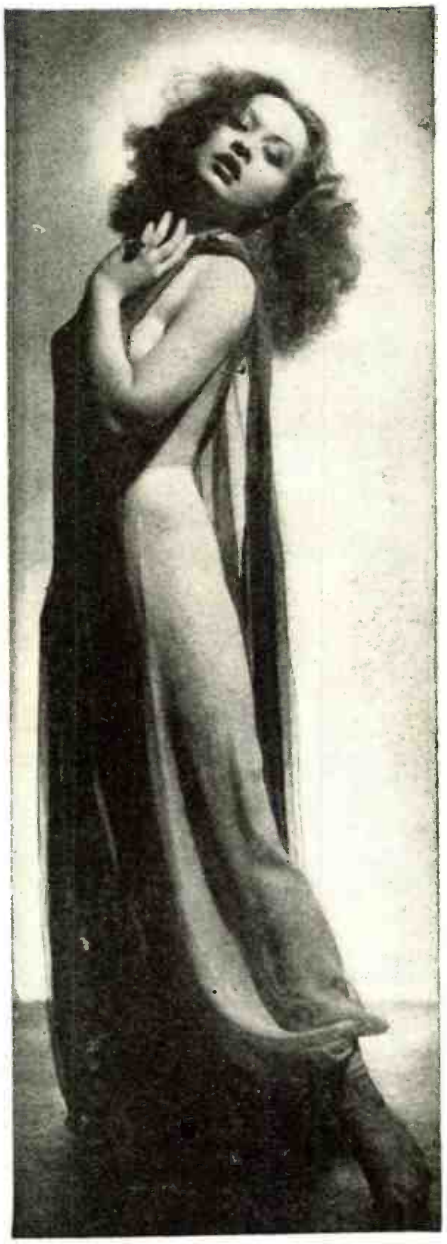
the glass by its wooden handle, press lightly upon the lead lap and oscillate the hand in a circular motion above the lap. This grinds the glass to hemispherical shape. *Be sure to keep the glass wet at all times.* When the entire glass is ground smooth and even, clean both the glass and lap. Then use the next finer carborundum powder. When all rough portions are smooth and even, clean again and use the finest grade powder. Here plenty of water is necessary and fine grinding is finished only when the glass has a nearly polished appearance.

(Continued on page 698)

Give Glamour to Your Girl Friend

America's Most Famous Photographer of the Feminine Form Tells How to Pose and Light Your Fair Subject





● ALMOST any girl can be given a goodly amount of glamour provided the photographer who poses and lights her knows his business.

The young ladies pictured on this page and on the cover are beautiful girls, but even these charming effects were achieved by using glamorous poses.

In the picture at the upper right, you will notice that the line from the young woman's head to her heel is a concave curve—accentuated by the flowing drape in which she is clad. In glamour effects, curved lines

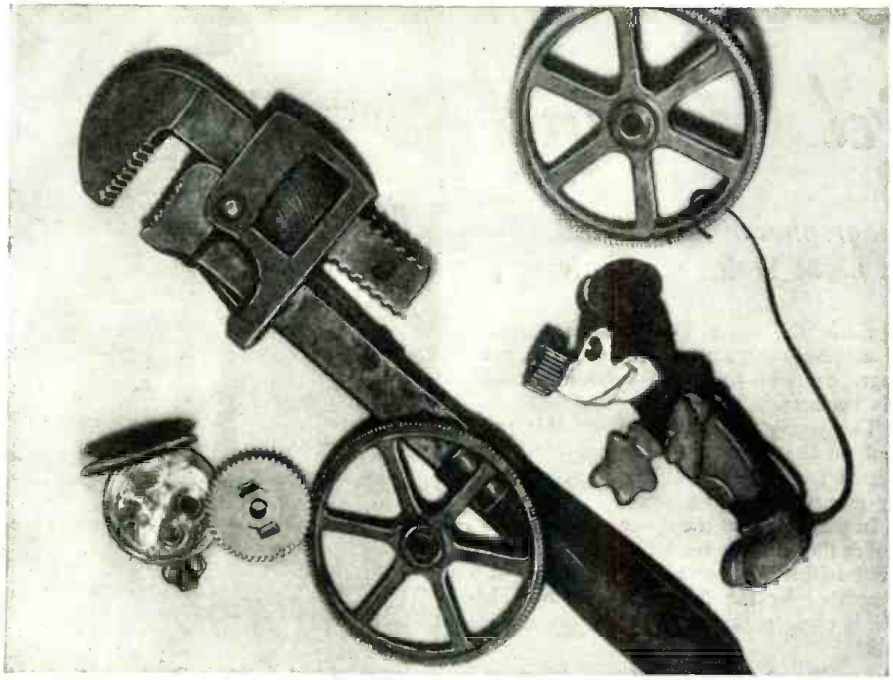
By Murray Korman

lend a charm that cannot be obtained from straight lines and angles. The convex curve—also lovely—is illustrated in the picture of the same woman at the bottom of the page. In this, the draperies around her body and her leg line form an arch. To keep this

(Continued on page 700)

The photos on this page and on the cover typify the true Korman glamour. The young lady at the left is Lynn Dale, dancer. At right and below are photos of Queenie King, dancing musical comedy star. The girl on the cover is Srta. Elba Valladres, dancer at the Havana-Madrid, a night-club. Notice how the expert eye of Murray Korman has posed and lighted these girls to bring out all the glamour which they possess in such abundance. ***You can do the same with your camera.***

NEW! Surrealistic Photo Contest



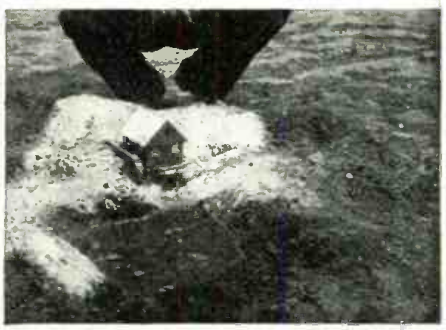
A watch, some gears, a 14" Stillson wrench, and a toy mouse, laid on the enlarging easel and shot from above, form this surrealistic conception of "*The Watchmaker's Apprentice.*" The equipment used was a Pilot reflex with Kodak portrait attachment; exposure 1/20 second at F:8 on Agfa Superpan Press film. Illumination was obtained from one No. 2 Photo flood, positioned directly at camera to kill shadows. Distance from camera and light to subject was 24 inches.

Dig through your junk box; pose what you find. The picture may win a five years' subscription to this magazine — or other valuable awards. An example of a Surrealistic Photo appears at the left. For rules in this contest, see below.

1. All photos must be original.
2. All photos must be glossy prints, 5 x 7 or larger.
3. Information must be attached to each photo, giving list of materials posed; make of camera; stop and shutter speed; film; and lighting. No photo will be considered without this information.
4. All photographs submitted become the property of this magazine. None will be returned; do NOT enclose return postage or envelopes.
5. No correspondence will be entered into in regard to this contest.
6. The editors of this publication will act as judges in the contest. Their decision will be final.
7. Announcement of awards will be made by mail as well as through these pages. It is NOT necessary that you be a subscriber or a newsstand buyer of this magazine in order to take part in the contest. Everybody is eligible.
8. Photos will be judged on the first of each month; winners will be announced in the issue published on the fifteenth of the following month.
9. The contest will be continued, with awards being made each month, until further notice.
10. First Prize each month will be a *5 years'* subscription to this magazine. All other pictures used will win one year's subscription. In case of ties, equal prizes will be awarded.
11. All entries must be addressed to *Surrealistic Photo Contest, Foto-Craft, Radio & Television, 99 Hudson Street, New York, N. Y.*

» » TABLE-TOP PHOTOGRAPHY CONTEST IS ENDED « «

O. M. Bennett, Jr., of San Angelo, Texas, wins first prize in this month's Table-Top Photography Contest. Second prize is won by August R. Maekelberghe, of Mt. Clemens, Mich.



The secret of the house shown at the left: It was set up in a back yard near a mud puddle and the snow is flour from a kitchen sifter. An Argus C2 camera was set up 2½ feet from the subject, and an exposure of 1/50 second at F:11 given in full daylight.

●

The quaint little house above was made from a 3 x 4 x 6 inch cardboard box, and the boards pencilled in. The water wheel is from a toy wagon, while twigs make the porch and trees. *(by O. M. Bennett)*

●

The romantic episode, right, was made with a small mantel ornament, set atop a heap of gravel. A 50-watt G.E. spot provided the dramatic lighting. *(by A. R. Maekelberghe)*

Here's the coach as it was set up on the bookcase. The 150-watt bulb was 12 feet distant, and an exposure of 12 seconds given at F:18, using an Argus C with copy lens, 14⅞ inches from the subject. The film was Agfa Superpan Supreme.

Amateur News Photographers! You're Up Against This—

The news cameras of CBS caught Special Events Announcer Jack Knell as he climbed the ladder to describe the arrival of the U. S. cruiser, *Tuscaloosa*, carrying the German crew of the scuttled *Columbus*. Michael J. Fish (inset) picks this as an example of good news photography.

Michael J. Fish
Head of the CBS Photo Dept.
tells of the troubles *you* will encounter.

● I DON'T like to start out on a pessimistic note, but I think it's pretty obvious that the first thing an amateur news photographer comes up against is an overcrowded field of professional news photographers.

But then it follows logically that if the amateur knows a little something about the problems, duties and behind-the-scene workings of the professional he's going to have a better chance of satisfying news editors when he tries to sell them his latest photographic masterpiece.

First off, anybody can take a picture. My seven-year-old youngster can use up a camera-full of film with the greatest of ease, but whenever he happens to get a good picture he doesn't know why it's good.

And that's the first thing an amateur should know about his work. Why is one picture better than another, and what was done to make it better? Where is the place to learn that? In the dark room, of course.

When I was Assistant City Editor in charge of photography on the Chicago *Times* we had to go through a period of reconstruction shortly after 1929. I don't have to tell you why. Because of a lack of funds, I took nine copy boys and made them into photographers—but not one of those boys went outside and took a picture (for me, at least) until he had spent from nine months to a year in the dark room.

They learned what those different fluids were for, how to handle negatives, why one picture had more grain in it than another. When they knew everything they needed to know about what goes on in a dark room, I put cameras in their hands and told them to go out and take pictures. What they lacked in experience, they made up in spirit because they were now given a chance to prove they could put into practice the theory and background they had learned.

So I say to amateur news photographers and embryo amateur news photographers, don't buy an expensive camera and think you can take pictures newspapers will want. Buy an inexpensive one first, experiment in your own dark room, study newspaper reproduction, find out something about the workings of a newspaper—and then when you've decided what kind of pictures you want to take, buy the camera best suited to your needs.

An amateur news photographer is most valuable to a newspaper for the "spot news" pictures he happens to pick up. But I think the amateur should understand the kind of newspaper organization he is up against in getting these "spot news" shots. Anyone who understands his competition can do a better job.

Naturally, I don't know the organization of every newspaper, but here's the set-up we had in the Chicago *Times* photography department.

(Continued on page 697)

CBS Photographic Head Mike Fish also picks this shot of Special Events Announcer Charles Stark interviewing the deck and dining room stewards of the *Columbus*. The picture has human interest and timeliness—and technical excellence.

So You're Buying a Movie Camera?

Your bankroll and needs will determine the apparatus you buy

● WITH the large variety of apparatus on the market today, anyone can afford to take *home movies* these days. Cameras are sold for less than $10.00 and projectors for less than $5.00, and film may be had for under a dollar a reel. On the other hand, several hundred dollars can be spent for the camera or projector, depending upon the user's bankroll and the service which he requires from his home motion picture equipment.

The writer has experimented with various cameras ranging from the cheapest to the more expensive and has no hesitancy in saying that *the value of each is relative to its price*. Pictures which are satisfactory—if not excellent—*can* be obtained and projected with low cost equipment. The pictures will not be as sharp, as large, nor as bright as those taken with precision apparatus and projected with high intensity equipment. However, if you wish merely to take shots outdoors in bright light, you can get usable films with cheap motion picture cameras having slow speed lenses. You will not be able to use such cameras, however, where lighting conditions are poor. The less expensive cameras, too, have but one speed. One speed is really all that is necessary when making straight motion pictures. However, a choice of speeds is essential when one wishes to make slow or "speed up" motion. The ability to expose a single frame at a time, inherent in some cameras, is likewise an advantage, for it enables them to make animated cartoons in the home.

Inexpensive projectors, which generally operate on standard house light bulbs, cannot be expected to produce the results that can be obtained with a larger and more costly machine. Most people realize this, although few are cognizant of the fact that film is far more subject to damage when being run through a cheaply made projector than if being used in one of the better ones. In fact, some authorities on amateur motion picture photography hold that, if an enthusiast must economize, spending the major portion of his money either for the camera or for the projector,

(Continued on page 697)

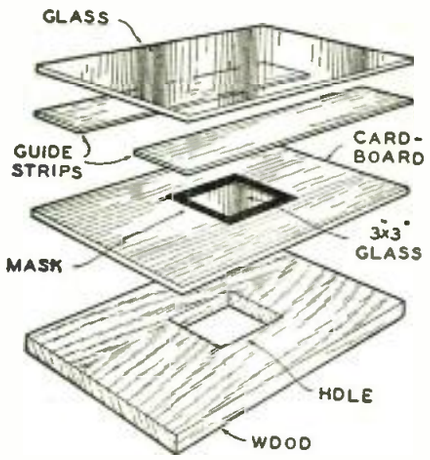
Foto Hints and Kinks

Speedy Miniature Film Enlarger

● IF you have an enlarger which is not adapted to miniature films, here is a simple way to alter your instrument so that it will do the work easily and quickly.

The enlarger itself it not changed; all that is required is a frame. This can be constructed with practically no effort in the following manner:

First, cut two pieces of glass which have the same thickness; one 3″ x 3″, and the other the same size as your frame, as shown in the illustration. Sandpaper the edges of the glass to prevent cutting yourself. Next, prepare a sheet of cardboard the same size but a bit thicker than the glass. In the center of the cardboard cut a 3″ x 3″ square with a razor blade to fit the small section of glass. Now cut a thick piece of paper (a fraction thicker than your film) and glue guide strips as illustrated. A space should be left to allow the film to slide into the center of the frame and glass. A mask



Detail of minifilm adapter.

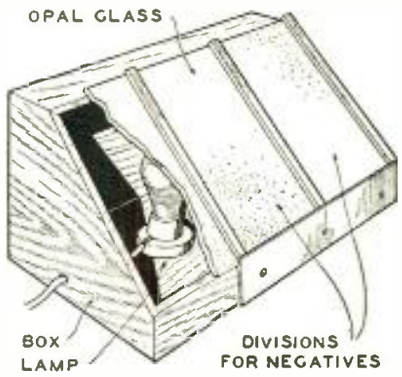
is then cut and glued to the glass in such a manner that when the film slides over the glass only one negative may be seen. To make this unit the same size as the frame in the enlarger, use a piece of board of the same dimensions as the frame and thick enough so that when the cardboard is glued to the bottom and the glass is placed on top, it will be the same thickness as your original frame. Cut an opening in this board a little smaller than that of the cardboard. Secure the glass firmly in place by means of elastic bands; in this way it may be removed when placing your film. When placing it in the enlarger, face the lower glass toward the lens.—*Raymond Pelletier, Methuen, Mass.*

Secure Uniform Negatives

● YOU can make a negative comparator like the one shown in the sketch. which is not difficult, and make it the size to fit the usual negative you are using. It should have three openings, each covered with opal glass, one for a light background, one for a dark background, and one for the negative you wish to compare. In each compartment you must have a small inside frosted electric lamp to illuminate the negative.

Now select from your best developed negatives one with a *light* ground and one with a *dark* ground, both of these will be called "standard" negatives. Place these in the two end frames.

The next time you develop and are taking your negatives out of your tank, lay your developed negative over the empty



Construction of Comparator Box; standard negatives go in end frames, with new negative between them.

opening and see how it compares with the standards. If the high lights are too strong and shadows weak, you must reduce the high lights; while the negative is soft and wet is the time to do this.

First you must wash well the negatives to be reduced; if the shadows are weak, you must use a reducer that will not attack them. Farmer's Reducer and also Permanganate Reducer will reduce both shadows and highlights and these will be O.K. if you wish to reduce the whole negative. However, here is a reducer that will work on the highlights alone. It is a *proportional reducer,* which will reduce density without reducing contrast. It is very useful when you wish to make a good negative print quickly.

Solution A—Water 32 ounces
Potassium Permanganate 4 ounces
Solution B—Water 64 ounces
Ammonium Persulphate 2 ounces
(For use, take one part of A and three parts of B.)

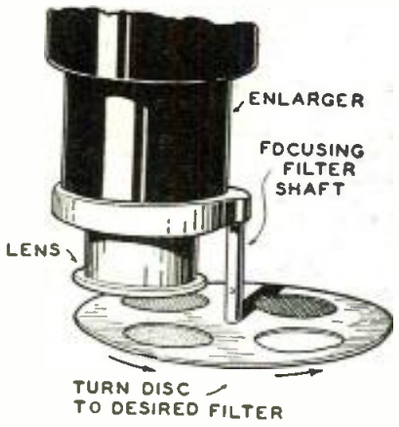
When sufficient reduction is secured, the negative should be cleared in a 1% solution of sodium bisulphite. Wash the negative well before drying.

If you wish to reduce only the highlights, use:
Water 32 ounces
Ammonium Persulphate 2 ounces
Sulphuric Acid, C.P. ¾ dram

Make this up 24 hours ahead. Take one part of the stock solution to two parts water. When sufficient reduction is secured, place in fresh, fixing bath five minutes and wash thoroughly.

Farmer's formula can be found in any booklet. It is quickly made and will be found in any good dark room.—*E. R. Trabold, Omaha, Nebr.*

An Aid to Enlarged Color Prints



How filter disc mounts on enlarger.

● SINCE interest in color is gaining by leaps and bounds, perhaps this kink will help ease the trouble of making color prints.

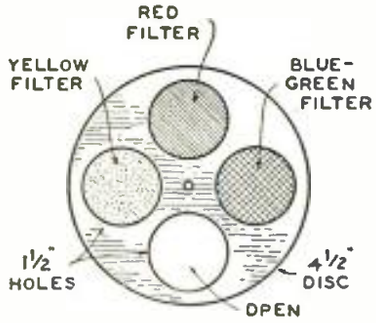
Most amateur color prints are made from 35 mm. color film. This entails the making of enlarged color separation negatives. After making a number of prints (three negatives to each), holding a filter under the enlarger for each negative, I devised a useful attachment for the enlarger.

The dimensions given are for the Argus E enlarger, but a few changes will adapt it to any enlarger using a swinging red focusing filter.

Cut a circular piece 4¼″ in diameter from ¼-inch masonite or pressed wood. Drill a hole ¼″ in diameter in the center. Now drill four holes 1½″ in diameter 3/16″ from the outer edge. The centers are to be equidistant.

Purchase from your local camera supply house three 2″ squares of gelatin filters. for Kodachrome or Dufay, whichever you use. The set consists of red, blue-green and yellow. Put a little dab of Duco cement on each corner of one of the pieces of gelatin. Place it over one of the holes on the circle you have cut out. Do the same with the other two pieces of gelatin, placing each over a different hole. This leaves one clear hole to use for straight enlarging.

To protect the gelatin, you can place 2-inch squares of microscope glass over each, securing with Duco cement.



Detail of color filter disc.

Remove the red focusing filter on the enlarger. Fasten the disc you have just made on the shaft in its place.

For each three-color separation negative you wish to make, all you have to do now is turn the disc to the filter wanted. There is still a red filter for focusing and a clear hole for enlarging without removing the disc from the enlarger.

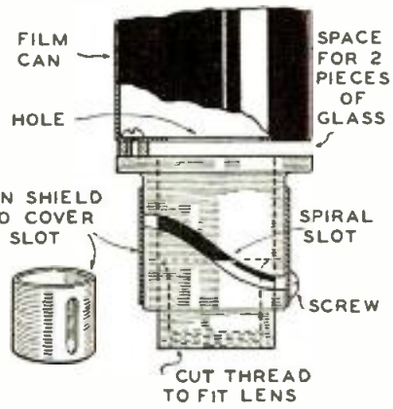
After losing three sets of filters (little squares of gelatin have a habit of hunting the most unlikely places to hide), I made one of these attachments for Kodachrome and also one for Dufay.—*E. R. Royce, Kansas City, Mo.*

Home Made Enlarger Cost $2

● MY enlarger is made of a large tomato-juice can, which is fastened to a short length of ½" pipe which, in turn, is screwed into a tee. The tee has been reamed out with a ⅞" reamer to permit the up-and-down movement on the vertical ½" standard.

Into the bottom of the can is inserted a 50-foot, 35 mm film can, the two being soldered together. The bottom of the film can is cut out in part, there being a hole just a little larger than a 35 mm negative. Below the film can is a turned-down hub from the steering wheel of an automobile. The hub is aluminum, and is easy to obtain at any auto wrecking yard. There is a spiral cut in the side of the hub, which I made with an ordinary drill and hacksaw, and then dressed down with a flat file.

The lens from my Model C Argus camera is screwed into a snug-fitting piece of aluminum, which travels inside the revamped hub. This part is made to rise in the spiral cut by means of a small screw fitted into the side of the traveling part. Light is retained inside this mechanism by means of a tin shield around the outside of the whole assembly. This shield has a vertical cut in one side, in which the screw travels. Focusing is accomplished by twisting the shield to the right or left,



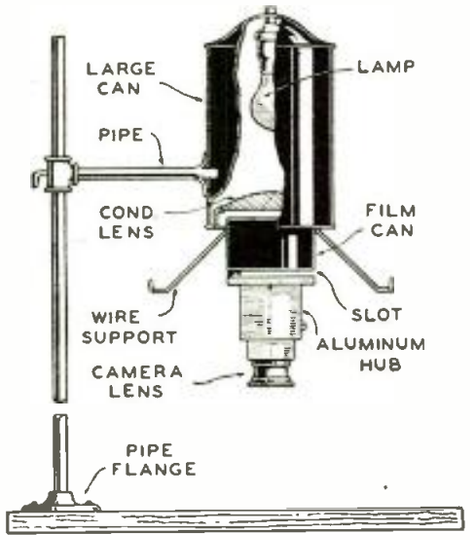
How focus slot is made light-tight.

and still finer focusing is done by adjusting the movable portion of the Argus lens.

I believe that this type of enlarger can be adapted to any lens on any miniature camera, provided that the lens is removable. The film carrier is made of two pieces of dressed glass having a hinge made of adhesive tape. I have a condenser lens inside the large can and use a White Ray bulb. I have made very large enlargements with this device. I sprayed the whole enlarger with lacquer, and lined the lamp housing with white paper.

I have since made a negative carrier from brass stock, having cups on each side to support the film.

The whole outfit didn't cost me over $2.00; one dollar for a 1⅝ condensing lens, and the other dollar for the necessary lathe work. All other parts were found among my junk, and could be duplicated easily. The large can is the size also used for grapefruit juice, pineapple juice, and other fruit juices; anyone should easily find one, even if they have to buy a can of juice and drink it first!—*Arthur W. Hendricks, Indianapolis, Ind.*



Cut-away view of completed enlarger.

FOR THE BEST photo hint published each month, a 2-years' subscription to **Radio & Television** will be awarded.

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.

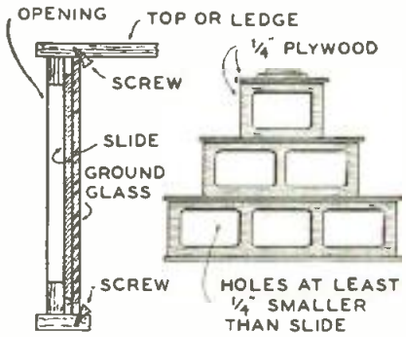
This month's Prize Winners are: 1st Prize, Arthur W. Hendricks, Indianapolis, Ind; other awards: E. R. Royce, Kansas City, Mo.; Raymond Pelletier, Methuen, Mass.; E. R. Trabold, Omaha, Neb.; Mads S. Moller, Inglewood, Calif.; Reg. O. Lissaman, Brandon, Man., Canada.

Two Novel Lamp Ideas

● CAMERA enthusiasts everywhere have many beautiful pictures and memories tucked away where they are sometimes forgotten. With this thought in mind and being a camera enthusiast myself, the idea occurred to me whereby one could enjoy many moments reviewing scenes of the past, as well as have a useful and ornamental lamp, interesting and entertaining to others.

Modern and Colonial transparency lamps.

Twenty or more years ago I designed and modeled a table-lamp in the mode of interior furnishings of that period—the Mission type—using lantern-slide transparencies printed from my best negatives, fitting them into the shade and the base. There are seventy transparencies in all.



Detail of lampshade construction.

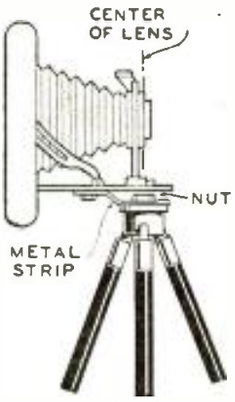
The shade is made of brass, and the standard (or base) of oak.

As time went on and with the accumulation of new views, I designed another lampshade: this one modernistic in design. It is suitable to use either on a table-lamp standard, a floor-lamp standard, or as an inverted ceiling fixture. It is constructed of walnut, having fret-work cut-out design on the two ledges (or step-offs), thereby relieving the plainness. It is designed and planned in such a way that it will accommodate the standard size 3¼" x 4" transparencies, of which it takes twenty-four

(Continued on page 699)

Making a Panoramic View with Your Regular Camera

● IN making several negatives with the idea of joining them together and making a panoramic picture, the most important thing to remember is that the optical center of the lens should be directly over the center of the tripod. If the lens projects several inches beyond the center of the tripod, it is moved several inches each time a new negative is made. If there are straight lines in the object to be photographed, they will not match perfectly in the prints from the several plates. If the center of the lens (the diaphragm) is directly over the center of the tripod, the lens merely turns like the hub of a wheel, the greatest movement being at the back of the camera, which is the greatest distance from the lens and moves like the ends of spokes in a wheel. With the lens centered in this way, there will be no trouble in matching your pictures. Some cameras allow you to move them over the center of the tripod. If yours does not, simply make a small extension that you can fasten a tripod screw through, and with an extra machine or stove bolt screw, fasten your camera to the end of the extension. You can make this out of a strip of metal or wood, and it will take only a few minutes of your time. The length of the extension will depend on your camera. If you happen to have a tripod with a large head on it, you can generally bore an extra mounting hole at one edge and fasten your camera to this, then rack your bellows over the center of the tripod. If it is a landscape, your lens will usually be set at infinity, so you can find out where to bore the extra hole by setting the lens at that point and placing it in position on the tripod.



Feature Articles Wanted

The FOTO-CRAFT section is in the market for feature articles showing how to use or construct *photographic equipment and accessories. All must be practical and should be accompanied with photographs or sketches. No material will be returned unless accompanied by self-addressed, stamped envelope.*

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

By RICARDO

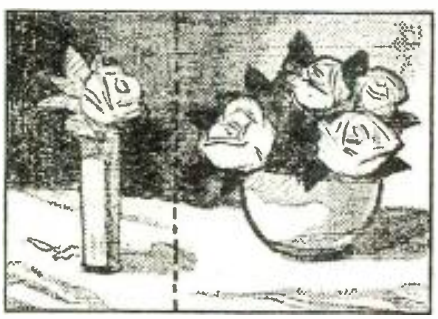
Lesson 4

Unity of Arrangement

IT has been suggested previously that, generally, it is a weak composition that has its main point of interest in the exact center of the picture space. But it can be even weaker if the picture is divided down the center and so offers the choice of two different schemes, particularly if they both happen to be equal in area.

An example of this arrangement is shown in the left sketch where the tree, although massive in structure and heavy in tone, is not really the most important item in the composition. It is dividing the picture into two parts, and as there is an interesting *motif* in each, the interest is also divided between the two. By all means leave the tree in, as it has an attractive contour, but trim the print so that it appears to one side. The dotted lines suggest a suitable trim and leave the houses as the more interesting half. Lay a paper mask on the picture to demonstrate this.

It need not necessarily be a defined mass such as the tree to divide the picture but, paradoxically, it can also be the *lack* of it. This is shown in the second sketch, where the absence of any linking tone, light or dark, allows the composition to be cut in two.



Dark Foregrounds

OFTEN described, very aptly, as the doorstep into the picture, a dark foreground can be a very useful and attractive device to employ in picture-making.

It not only provides a firm and stable base to the whole composition, but also helps keep the eye from wandering out of the print.

Glance for a few seconds at the second sketch. Now take a piece of white paper and lay it over the dark strip running across the base and note the difference. The picture is now top-heavy and lacks a firm base to balance the entire composition. The tree has no foot to support it, while the eye tends to run downwards out of the base instead of into it. The value of a dark foreground here can be fully appreciated.

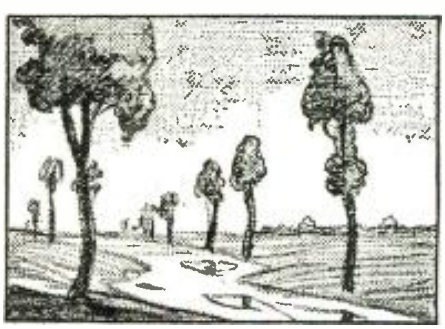
But not all subjects lend themselves to this arrangement and the top sketch is an example. This particular composition will look *better* if the paper is laid over the dark base! The reason is simple. The subject matter is quite complete in itself and does not require a dark foreground which is so unconnected and is competing for attention at the same time. Often something correct in one subject is wrong in another.

Leading into the Picture

A PICTURE is said to have good composition when its arrangement attracts the eye, surely but unknowingly, to a final and major point of interest. But whatever method of directing the eye is employed it must not be too obvious and direct; neither must it suffer from being too indefinite and unconnected, so that the eye has to jump from one item to another.

The happy medium has to be struck, and this depends entirely on the subject matter and the *motif*. In this seemingly simple explanation lies the whole art of the pictorialist.

The two comparative sketches offer but one of the many arrangements that can make a picture more interesting. The illustration on the left might well be taken by a beginner who has been advised to see that the main point of interest is on one of the trees and that all lines should lead to this one point.



On this advice everything is correct and all the lines do lead to one spot, but the trouble is that they are much *too* direct and take the eye far too quickly without allowing it to wander along (as one would in a subject like this) easily and pleasantly, to enjoy the path leading to the ultimate finish.

The second illustration of a similar type of subject has a much more subtle method of leading the eye along the road and this constitutes much of the charm of the picture. Some subjects can be improved in this way by choice of viewpoint; others have to be abandoned as beyond satisfactory treatment.

Amateur News Photographers!

(Continued from page 693)

I had my cameramen stationed in districts all over Chicago. Each district covered a radius of eight or ten miles. If one of my men had a car, he had a radio in it. If he didn't have a car, he stayed in a police station, with a taxi handy outside. If a police flash came through of a robbery, murder, accident, riot, or gang killing (this was Chicago, remember) one of the boys was on his way—often getting there before the police. Whether he got there before the police or not was unimportant, but it was important that he was usually on his way back to the office with his pictures before photographers from other newspapers had even arrived on the scene. And that is what we were interested in—being first with good pictures.

Any amateur who wants to have fun—and make a little incidental cash—by finding "spot news" pictures can't just wait for things to happen wherever he might be. He'll have to set himself up some kind of system whereby he has a good chance of knowing where and when things are going on.

Another very important thing for an amateur news photographer to know is what kind of pictures newspaper editors like. It must be remembered that a news editor sees pictures every day. He doesn't have the same enthusiastic interest in a picture that the amateur has. If he says he can't use it, there must be some reason why.

It might be a marvelous picture with the one basic fault that it won't reproduce well in a newspaper. The best newspaper picture has detail in it, with soft shadings of light and dark. The faster the film, the sharper the lights and shadows. A dark picture won't reproduce well on newsprint. Naturally, then, newspapers are more interested in pictures that have been taken with slow film. The only place where fast film is necessary is at sports events, or where problems of lighting and atmospheric conditions dictate the use of the faster film.

The amateur photographer is going to say it is more difficult to take pictures with slow film, but that's the kind of competition he's up against. Professional newspaper cameramen have learned to use slow or fast film and to take a picture in a hurry under any condition. A glance tells them what kind of light they are working in. Their cameras are set at ten feet, twelve feet, fifteen feet and they've learned to judge those distances accurately by eye. Their job is to get good pictures that will reproduce well in newspapers—and they get them.

There's another little tip along this line that I'd like to hand on to the amateur picture sleuths. Amateurs love to make interesting looking "studies"—heavy shadows relieved by bright sunlight—enlarge them, and take them in to editors. Don't tell me they don't. I've had them bring them in to my office at the Columbia Broadcasting System—16 x 20 works of art beautifully mounted on expensive paper. Some of them might be outstanding pictures which would reproduce wonderfully—in an art magazine. But they're not *news*.

Which brings me to a question I would like to try to answer right now. It has been asked me a number of times: "Just what is a good news picture?"

I've got one answer for that. It's the same thing I drummed into my nine copy boys in Chicago. A good news picture is one that isn't *faked*. That might sound cryptic, but I'll explain what I mean.

A good *news* picture has human interest in it—a mother at the first moment she sees her lost child. It has action and drama in every highlight and shadow. The picture is *alive!* **And it tells a story.** That's why I say a good news picture is one that isn't faked. It's impossible to fake that kind of a picture. because it is spontaneous and is packed with human emotions caught off guard.

I started this article on a pessimistic note, but I want to say this. Any amateur photographer who takes to an editor a picture which is not only a good news picture. but one which will *reproduce* as a good news picture. doesn't need to worry. The editor will buy it.

So You're Buying a Movie Camera?

(Continued from page 693)

he had best make his heaviest investment in the latter. These experts say that as film is injured by cheaply made machines, it is better to have it run through a well-made projector—it passes through the camera but once—through the projector, many times.

There are, of course, two main sizes of film for use in amateur photography. The 8 mm. has the advantage of low cost, both for the film itself and for the equipment; the 16 mm., while slightly more costly throughout, permits greater clarity of projected images of the same size, or greater size in projection.

Lenses are another subject of vital interest to the home movie enthusiast. It is desirable to have a camera in which various lenses may be used—a high speed lens for working under varying conditions, including indoor and outdoor shots under dull skies—a long focus lens for telephoto work to get large images of distant objects—and a wide angle lens to cover a large area on the film. If a compromise must be made, the amateur would be wise to choose a camera with as good a lens as possible in order that his films may be sharp and clear and that pictures may be taken when lighting is not at its best.

The camera should also have a smooth running motor to avoid vibration which will make fuzzy pictures, irrespective of how good the lens may be. The motor need not run for very long without rewinding, as the average shot will not be more than a few seconds in duration.

Cameras which are loaded with magazines are advantageous when one wishes to switch from one type of film to another without waiting for a reel to be completely exposed. Except for the convenience of magazine loading. this is its chief desirability.

Accurate finders—particularly those of the optical type—are highly desirable.

As far as projectors are concerned, the one which uses a high intensity light employing a bulb specially designed for motion picture projection, housed in a well ventilated compartment, will obviously give bigger and brighter pictures than will smaller models. The aperture of the lens is also a determining factor in picture brilliance. The focal length of the lens determines the length of projection necessary to secure a picture of any given size.

Decide what you want and what you can afford. Then buy the best equipment possible.

Grind Your Own Lenses

(Continued from page 690)

Clean the lap and glass again; then place a piece of pitch or bees wax on the lap, and heat it until it covers the entire inner surface of the lap. Let it cool; then reform the central hole in the wax. Finally polish the lens with rouge and water. *Do not let the lens run dry.* Polishing is completed in a few minutes. At this time the lens can be trued up roughly by grinding down any projecting edges.

When finished, gently heat the lens to soften the sealing wax, remove the lens from the dowel and drop it into denatured alcohol. This dissolves the sealing wax and the lens is ready for use.

The focal length of the lens can be roughly determined with a ruler and a sheet of white paper. The lens is placed at the low-numbered end of the ruler, with the flat side facing the sun, and a piece of white paper is held against the ruler in such a way that the beam of sunlight passing through the lens falls upon the flat surface of the paper. The paper is shifted along the ruler until the image of the sun is brought to the smallest, brightest point. The distance between the lens and the paper is then the focal length of the lens.

The Ramsden magnifier is made of two plano convex lenses of equal focal length. The curved surfaces are placed facing each other and they are separated 2/3 of the focal length of either lens. The magnifying power of the combination is equal to ¼ of the focal length of either lens.

Magnifying power of system	5 diam.	10 diam.	20 diam.
Focus of each of the two lenses	2½	1¼	⅝
Separation of lenses	1⅞	15/16	15/32

A single lens used as a magnifier does not work well. Its field is small and there is no correction for curvature. The Ramsden type of lens is a combination which gives a much flatter field and serves well as a hand magnifier and also as an eye piece in optical instruments.

The Nachet's doublet is also constructed of two plano convex lenses of equal focal length but of different diameters. The larger is the one held toward the object, the smaller is held to the eye. A diaphragm is usually placed between the two lenses.

Lenses of other focal length can, of course, be used to obtain other magnifying powers. The low and medium powered lenses (say from 5 to 10 diameters) serve well for critical focusing on the ground glass of the camera; the higher powered lenses—and 20 and more diameters can easily be made—serve to detect graininess in negative material. A negative correctly processed does not show grain and so, if grain is visible, it is an indication that something was wrong during processing.

It is also possible for the experienced amateur to grind lenses of types other than plano convex. Several types of lenses are illustrated at the head of this article, for those who wish to experiment with their construction. One thing which must be kept in mind, however, is that the inner and outer curves must be accurately centered; this can be done only through the use of precision optical equipment, or after long experience. A concave surface may be ground by using a lap made by pouring molten lead into a concave container, such as a hollow ball.

Do not expect to turn out fine photographic lenses on your own workbench, although it is possible to take pictures through lenses thus made. The author has had fair success with some lenses he has produced—and there is a real thrill in such an achievement. But the main reason for doing this sort of work is to gain a knowledge of lenses, which is obtainable in no other way.

BOOK REVIEWS

PICTORIAL JOURNALISM, by Laura Vitray, John Mills, Jr., and Roscoe Ellard. 437 pages, illustrated. McGraw-Hill Co. N.Y.C., $4.00.

There are hundreds of books on journalism, and about an equal number on photography, but "Pictorial Journalism" is among the first books to dedicate itself exclusively to integrating the two fields.

From the picture point of view, it discusses photography, typography, picture editing, photo-judging, photo-engraving and allied arts, picture layouts, page make-up, the elements of photography, and the libel and copyright laws, always keeping well in mind the editorial as well as the advertising points of view.

The news-minded amateur will find this book a veritable encyclopedia in which the basic methods of converting the glossy print into a newspaper picture are given. But most important, every amateur should read the chapter titled "Judging Newsphotos". A complete systematized sympathetic analysis shows how it is possible for the aspiring "hocus-focus" man to learn to evaluate the merit of his picture with respect to subject, news, action, copy, and cropping possibilities; he can learn why some of his photos are salable while others are not. He can discover the essential characteristics of a foto-feature, as well as uncover the necessary attributes of rotogravure material.

A parting word to ambitious lensmen who wish to join the ranks of newsphotographers: "Buy this book and increase your sales." This book is highly recommended.—**Eugene Goddess.**

FLASH! by Harold E. Edgerton and James R. Killian, Jr., 203 pages, 317 photographs. Hale, Cushman, and Flint, Boston, Mass., $3.00.

It seems that "Flash!" was written especially for SHORT WAVE & TELEVISION & FOTOCRAFT. As the authors explain in describing the manufacture of the speed photo-equipment, "It is possible for the competent amateur, particularly those expert in building radio equipment, to assemble a satisfactory light source for high speed photography . . . ."

According to the authors, as explained in the book, the problem of photographing rapid action substantially involves the following problems:

The old method of making a high speed photo is to use a high speed mechanical shutter in combination with a photo-flash bulb. But when it is desired to stop very rapid action, such as a plane propeller, a zooming golf ball, etc., speeds up to 1/1,000,000 sec. are needed. Briefly the method consists of having the subject in action in a room too dark to affect the sensitized film. While the action is taking place, a flash of light of the desired duration occurs. Since only that portion of the action which is illuminated will affect the film, a high speed photograph has been made.

The details of the construction of the high intensity high speed flash are given in the latter part of the book. It is interesting to note that the average photoflash light lasts about 25,000 times as long as the light devised by Professor Edgerton.

While this type of pictorial work cannot and will not replace standard methods, nevertheless it must be counted on as an active competitor in the fields of commercial and exhibition photography. It may very well pay the amateur and professional alike to master this new art, and be commensurately rewarded for being among the first in a new field.

From the point of view of make-up, the book is excellent. The pictorial matter is of high quality, both with respect to subject and composition. A clear but short description of the methods of executing the photos on the various subjects is placed in the proper places throughout the entire volume.

THE CHEMISTRY OF PHOTOGRAPHY by The Mallinckrodt Chemical Works, 110 pages, amply illustrated. Compiled by the experts of the Mallinckrodt Chemical Works of St. Louis, Missouri.

"The Chemistry of Photography" is a simple explanation which features advice on avoiding the headaches which commonly show up in the various finishing processes.

The chapters cover The History of Photographic Chemistry, The Chemistry of Development, Fine Grain Development, The Chemistry of Fixation, The Chemistry of Toning, The Chemistry of Reduction, The Chemistry of Intensification, and Tips and Tables for Photographers. Appended to the book proper is a brief discussion of various states of physical and chemical perfection. For the amateur, this book will be most interesting in two points. First, for the uninitiated the book discusses chemistry without a complex discussion of formulas. Second, there are two tables which list the troubles of the fixing bath and of developers together with their causes and cures.

Synchronized Flash Gun

(Continued from page 689)

Get a small strip of spring brass, the thinner the better, and about 3 inches long by ¼-inch wide. Cut this in two pieces 1½ inches long by ¼-inch wide. The correct length is very important and will have to be fitted to your camera.

One end of the spring contact is fastened to the top of the frame as shown at (C) by small wood screws. It is well to cut two notches into the wood frame so the spring and screw-head will set flush with the frame. Now connect the wires from the flashlight switch, one to each spring contact.

The length of the spring is determined by placing the back plate (B) into position on the camera. The end of the spring should be where (D) comes on your camera. Be sure to allow for a slight turn up on the end of the spring so it won't catch in the curtain when this is wound up. In some cameras there has to be a slight bend made in the spring to accommodate the curve of the roller.

It is most important that, when the curtain is released, the metal bar at the top of the curtain slot makes contact with the two springs (C-C), at the point (D), when plate (B) is in position on the camera. The lower edge of the slot is insulated from the springs by bits of scotch tape (F-F).

The top bar of the curtain slot contacts the two springs (C) at point (D). The flash occurs while the curtain travels from (D) to (E) on plate (B), which allows ample time shooting at a speed of from 1/200 to 1/1000 of a second.

There may be some delayed action of the curtain due to the tension on the spring contacts if they are not adjusted right. *Don't have any more tension than is needed, and that isn't much.*

I have had satisfactory results with this synchronizer, as is shown by the two fast action photographs accompanying this article.

Two Novel Lamp Ideas

(Continued from page 695)

in all. Openings should be long, to give better proportions to the shade.

Both of the shades and the base are so constructed to enable one to redesign them from time to time with new or different sets of views, thereby creating renewed interest periodically.

The transparencies are backed up or lined with ground glass which serves the dual purpose of diffusing the highlights, also eliminating the glare. It also keeps the slides rigid and in place.

In one of the shades I have hand-colored slides; in the other the slides are sepia-toned.—*Mads S. Moller, Inglewood, Calif.*

Tested by the Editor

Marshall's Make-A-Tube is a developing powder which is easy to use, extremely economical, keeps fairly well after compounding, and gives good results for bromide and contact papers as well as for film. It keeps indefinitely in the crystal form. Several rolls of films can be developed with each batch mixed. Each can contains enough for 24 mixings.

Jomar Liquid Universal Developer comes in tubes about the size of M-Q tubes and serves the same purpose. It is quicker and easier to use than crystal developers for it needs only be poured into the requisite amount of water. Results obtained are satisfactory.

Glamour for Your Girl

(Continued from page 691)

from becoming to formally stylized, the right leg was raised to break the excessive continuity of the curve.

A different effect was desired in the picture at the left of the page. In this, by adhering to simplicity and straightness of line, together with the uptilted face and raised eyes, an almost saintly effect was obtained.

A low camera angle has been used to accentuate the height of the subject, and the straight line effect is carried out by posing her against the pillar.

Lighting is an important problem in glamourizing feminine subjects. In order to portray them in their soft, feminine beauty, harsh lights are to be avoided. Floodlights are used from the front at both sides, two lights being necessary to kill excessive shadow effects. A spotlight is used behind the head to bring out the aureole of hair which frames the face. Without such backlighting, the hair would be lifeless—adequately backlighted, it apparently gives off a radiance of its own. Spotlights are used if strong shadows are desired for a background effect, for accentuation of form or features. Such effects, however, lack the sublety and charm of those which are used on these pages, although they are attractive.

The feminine form is, perhaps, one of the most beautiful combinations of planes and curves which nature has produced. While nudes make graceful pictures, if produced by the inexperienced they are all too often anatomical studies rather than objects of art.

The draped or fully clad pictures, such as appear here, retain all the artistic appeal of the nude, yet are of the type for which any young woman is less reluctant to pose.

Important advice to the amateur photographer who wishes to take a truly artistic photograph of a feminine friend or relative is to have her wear some garment or drape with long flowing lines which can be moved to make harmonious composition in a picture. She should wear a smooth make-up for eradicating lines and blemishes from her face. She should then be placed before a plain background for the average picture. However, if some special background is desired, it should be one which should have its main movement congruous to the sweep of her costume. (Miss Dale before the pillar is the latter type.) The young woman should be posed in a natural manner and asked to move around until her pose is most attractive from the camera's viewpoint. For example, a better leg line in a standing figure is generally achieved when the leg nearest the camera is slightly bent at the knee and the heel raised. The hands should be well back from the camera for the average picture so that their size will be minimized. After a satisfactory pose has been found, the subject's head should be turned in various directions in order to make the features appear small. Slightly parted lips give a very "interesting" expression to the face, and the eyes should not stare directly into the lens, unless for some special purpose.

Take plenty of time in posing your subject—head as well as body. When you have finished and have achieved a pose that you believe perfect, keep right on experimenting with your lights, moving them around until you kill the strong shadows, while still leaving enough general shadows to mold the curves of her face and form.

If this advice is followed, you will have little difficulty in achieving a truly glamorous photograph of any woman, irrespective of whom she may be.

Minicams for Airplane Pix

(Concluded from last issue)

(LAST MONTH the author, Duane Featherstonehaugh, *told what types of minicams are best suited to airplane photography, and suggested shutter speeds, diaphragm openings, and satisfactory films to use. He gave additional suggestions for holding the camera to obtain best results.)*

In processing aerial shots, it is necessary to use the finest grain developers as many pictures will be made from a small portion of a 35 mm. negative. The standard *paraphenyene-diamine* type of developer is among the best for this work. Negatives should be developed to a *low gamma* and printed on *contrast paper* for best results.

The reader should not confuse ability to enlarge with ability to record. A relatively large-grained film will give satisfactory enlargements of single objects such as a house or a person's face. It is only when there are many objects appearing in the negative that the fine-grain film is a necessity. Not that the finished print may actually be finer-grained but that it will preserve the identity of the many small objects appearing in it. There is a decided difference between *grain* and *lack of detail.*

Also to be considered is the choice of a plane. For the average shot a plane of the Taylor Cub type is the best. The Cub is a high-winged monoplane on which the right side lets down, allowing the photographer to point his camera in all directions without interference.

Travelers in commercial transports also are offered picture taking possibilities although in most instances photographs must be taken through window glass. If traveling on a transport you may easily arrange to have the window at your seat cleaned before the ship leaves the ground.

In taking the picture, a few rules should be observed. If possible hold the hands and arms free from the ship in order to minimize vibration, which is even more dangerous than movement. Follow the object to be photographed in the finder rather than holding the camera still and snapping it as you pass by. In this manner much movement is eliminated and it is sometimes possible to take successful shots as slow as 1/50 or 1/75 of a second although higher speeds are to be preferred. Use of an exposure meter is advisable because of the difficulty of judging light conditions from above.

There always is a certain amount of aerial haze and for this reason *it is advisable to use a filter of the K-2 type* for nearly all shots.

Leave the business of flying up to the pilot excepting that (if you are in a chartered plane) he should be instructed before leaving the ground as to just what type of a picture you are seeking. If flying in country districts he will be able to approach within 400 or 500 feet of the ground, while over cities Department of Commerce regulations require him to stay at least 1,200 feet up. It is a good plan to circle the area to be photographed several times in order to determine the best angle before making the exposure. If the pilot has a light ship and is an experienced flyer it is sometimes possible to have him cut the engine while flying over the desired territory, thus eliminating danger of vibration and allowing the photographer to rest his camera on the side of the ship. Needless to say, however, this practice is dangerous over cities.

If much aerial work is contemplated, it will be found desirable to mount the camera on a *weighted* board. A satisfactory method of making such a mount is to take an ordi-

(Continued from preceding page)

nary 2 by 4 board about two feet in length and cut down at each end so as to make suitable handles. The camera is strapped at the center of the front and two weights of about 10 pounds each are attached to the ends. A cable release is run from the camera to one of the handles. Focusing and sighting can be ignored as the lens always is left at infinity and in 99 out of 100 cases the area covered is more than sufficient to cover the view desired.

The photographer who uses a board of this type will find it possible to take pictures at a much lower shutter speed than will the man using a camera in the ordinary manner.

The Reader Speaks

Home Movie Fan

Editor: I've read your magazine for quite a while. You added my favorite hobby this last issue—Photography. But please do something no other magazine in photography does. Put useful dope on movies—plenty of it. And of course, both 8 mm and 16 mm. Personally, I use 16 mm but there are plenty of 8 mm boosters. I use a Victor No. 4-16 mm camera and a Keystone 16 mm projector 500 watts. I also use a Rolleicord roll film camera and Praxidos enlarger for still work. But my pet is *movies*. I have had a lot of still photos published, but still crave movies.

HEYWARD CROWSON, JR.,
Highland Ave., Sumter, S. C.

Wants Foto Section Only

Editor: I have just received my first copy of your new magazine in which you have incorporated the Radio Section.

To say I am disappointed is putting it mildly. I subscribed to what I thought was a "swell" magazine and even went so far as to build a special section in my bookcase to hold the small size magazine. You certainly had a nice size and very useful magazine in the first issues.

Since you requested readers' opinions of your new set-up I am giving mine to you. The photography section of the book I just received is merely a supplement to a radio magazine and is certainly not worth very much to a photography fan. If I wanted a radio magazine I would have subscribed to one.

CHESTER WOOLDRIDGE,
P. O. Box 1332,
Cincinnati, O.

Registers a Protest

Editor: I protest most vigorously to your combining FOTO-CRAFT with RADIO & TELEVISION. When I subscribed to FOTO-CRAFT, it was a good 96-page magazine, now it is a sixteen-page addition to a magazine for which I have no use, and a large part of those sixteen pages consists of advertising. May I remind you of your editorial in the August issue, in which you say, *"After all, an editor is not worthy of his salt if he tries to cram down the throats of his readers his own likes and dislikes"*, and the balance of this same editorial should prove reflective reading for you.

CHARLES W. FRICK, Judge,
Chambers of The Superior Court,
Los Angeles, Calif.

Likes New Combination

Editor: RADIO & TELEVISION Incorporating FOTO-CRAFT, is an excellent radio magazine with a very good photo section, but it is no longer FOTO-CRAFT. I liked the small size of FOTO-CRAFT—it was a magazine that stood apart from other magazines. I guess you have almost as much material in the new form as in the old, but I sadly fear that it is going to lose its individuality. I cannot stick this new magazine into my pocket. Would it be too much trouble to make the new magazine in the small size? I'll guarantee there are many FOTO-CRAFT Fans searching in vain in the photo sections of the newsstands, as I did.

GORDON H. GILLIS,
Box 201,
Duquesne, Penna.

(Cont. on next page)

What's New

Two New P & H Units

● TWO new units, the R-35 for 35 mm. film and the R-20 for Univex 120-127 and Eastman 831 size film, have been added to the Oxford Products Company line. These pieces of apparatus are claimed to increase film speed two to four times, provide more brilliant highlights, better shadow detail, clear-cut contrasts, freedom from fog, compensation for incorrect exposure, and minimum graininess. The process is further said to create the illusion of three dimensions, due to the greater clarity of the resulting negatives.

"Mighty Midget"

● SMALLER even than a golf ball, this ingenious little flash bulb, wire-filled Mazda Photoflash Lamp No. 5, has just been released by G-E. It is so small that more than two dozen of the peewee lamps can be carried in the pocket of a suit coat, more than three dozen in an overcoat pocket, or in a lady's handbag. Besides being the world's smallest flash bulb, the "mighty midget" is also a much more efficient producer of light for photoflash photography. It gives nearly a million lumens at peak of flash.

The "mighty midget" employs the bayonet-type base, designed for rapid-fire loading and unloading in reflector equipments. The bulb is protected inside and out with a lacquer safety jacket.

Price Industries Introduces a New-Type Model

● THE Princeton Easel, just announced by Price Industries Corp., is of the constant-center type. The masks consist of four strips of heavy gauge formed steel, 1½ inches wide. Margins are instantly variable from a hairline to the full width of the masking strip. Each pair of masks is operated by a single control button. Moving the control button simultaneously moves both border strips symmetrically toward or away from each other. The baseboard is provided with set grooves for 4 x 5, 5 x 7, 8 x 10 and 11 x 14 inch paper.

Photrix Filters

● INTERCONTINENTAL MARKETING CORPORATION has added filters to its Photrix line of American made quality products. These filters are made of finest optical glass, uniformly colored, precisely ground and polished, and free of distortion. They are unaffected by heat or moisture in any climate, and are offered in all popular colors and densities.

Also available is a Photrix Filter Mount made of aluminum, obtainable for any popular lens size; it acts simultaneously as a lens shade. An elastic front ring permits quick and easy interchanging of filter discs. The mount may remain on the lens barrel when exchanging filter glasses.

Burke & James Catalog

● A NEW 80-page Burke & James, Inc., catalog lists their complete line of cameras, accessories and dark room supplies.

New Darkroom Lamp and Filter Outfit

● AGFA ANSCO CORPORATION'S new outfit includes an Agfa 3¼ x 4¼-inch Safelight Lamp housing and socket, one A3 Green Filter, one A6 Yellow-Green Filter and one A7 Red Filter, which are all 3¼ x 4¼ inches in size. The Safelight provides proper darkroom illumination for panchromatic films with the A3 filter, orthochromatic films with the A7 filter, and chloride, chloro-bromide or bromide papers with the A6 filter.

Inexpensive Box Cameras with Detachable Flash Units Provide Simple, Dependable Operation

● THE B2 Shur-Flash Camera and the A8 Cadet-Flash, make the snapshot day 24 hours long. At night, or indoors, the separate flash unit can be quickly and easily attached to adapt the camera for making synchronized flashlight exposures. The flash unit is light and compact. It uses two penlight-size batteries and can be fitted with any one of several types and sizes of standard photographic flashlamps.

The B2 Shur-Flash camera takes eight 2¼ x 3¼-inch pictures per roll of B2 film. It provides a high-quality, meniscus lens; two diaphragm openings, an optical, direct-view finder; easy loading arrangements with a hinged back. The A8 Cadet-Flash takes eight 1⅝ x 2½-inch pictures per roll of A8 film. Both of these inexpensive cameras are made by Agfa Ansco Corporation.

Questions & Answers

A Color Problem.

Regarding that article, "Color in Photography" (my bigest interest is color photography), is there some way to prove to my partner that in additive colors, red and green make yellow. He's more experienced, and somewhat set in his ways. What do you suggest?—*Gene Haltke, W9YRJ, Peoria Amateur Radio Association, Peoria, Ill.*

The easiest way to prove this point is to demonstrate it. Get a small piece of red cellophane and another of green. Place two projectors or enlargers side by side and into the film carrier of each put one of the pieces of cellophane. Project the colors, and where they overlap, the area will be lighter. Remember that you have a certain quantity of light of one color, when you add to this another quantity of light of another color at the point of overlap, you are getting more light.

Roll Film Camera and Ground-Glass Focusing.

I have an old Cartridge No. 4 Kodak which takes a 5" x 4" negative on roll film. Has anyone that you know of invented a means of using such a camera with film taking a smaller picture which at the same time provides for use of a ground glass? The camera has a double extension bellows so that a ground glass is a necessity for table-tops and other close-up work, as well as landscapes.—*William Johnston, Center Island.*

The most practical system would be to make some sort of an adapter to take film packs. This should not be difficult for you to do.

Pinhole Photography.

In your recent article on pinhole photography you mentioned that the only expense would be a piece of clear glass. Could I get an explanation of its use?—*Fred Walters, Detroit, Mich.*

The clear glass is used merely for the purpose of keeping the "enlarging" or projection paper or the film absolutely flat, and it allows for a more speedy change than if you fastened the paper or film to the back of the box.

The Reader Speaks

(Continued from page 702)

Creates His Own Now

Editor:

I especially enjoyed the article "Creator of Illusions" by Bernsohn. After reading this I tried some of the negative stain which is mentioned in the article and produced some very gratifying results.

MORTON BLANC.

Edgerton, Wisc.

Satisfied

Editor:

Thanks very much for the information about "Argus Photo Exposure Meter" which I received. I followed your instructions and I am satisfied with the results.

FRANK BACH.

Brooklyn, N. Y.

Index to Advertisers

PHOTOGRAPHY SECTION

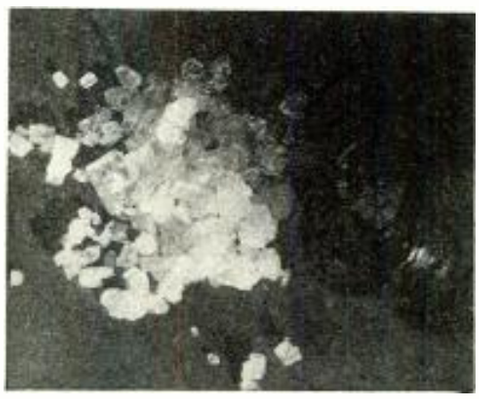
(While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.)

Larger Close-Ups Directly on the Negative

● WORKERS using cameras permitting ground glass focusing, in the quarter plate and 2¼ x 3¼ sizes, will find that the acquisition of a second-hand anastigmat lens and shutter from a vest pocket camera will make a very useful accessory.

Using a lens of this nature temporarily on a larger camera is equivalent to having a much greater bellows extension on a smaller camera. This naturally permits closer working distances for photographing small objects and insets, etc. A relative increase in image size is readily apparent from a study of the accompanying illustrations.

A vest pocket camera lens, used with reasonably long bellows draw and small iris stop, will cover a larger plate than it would at normal extension. Exposure must be increased, however, to compensate for the extra bellows draw. After focusing, stop down as much as possible; depth of focus is very shallow at close distances. Effect of this may be also noted in the accompanying illustrations. Since older models of vest pocket cameras, equipped with relatively slow but quite good anastigmat lenses, may be picked up for very little, the addition of one to your camera's bag of tricks is well worth while.—*Reg. O. Lissaman, Brandon, Man., Can.*



These two photos show the marked difference between "close up" and "long distance" focussing on a subject.

Hypo Meter Easily Made

An old ohm-meter, milliammeter, or low voltage D.C. volt meter can be used to test hypo. As the alkali content is changed there will be a change in the resistance of the liquid between the test prod tips.

Bind the two ordinary test prods together with rubber bands. Connect the meter in series with a small battery, and immerse the test prod tips in the hypo tray, using freshly made hypo. Note the meter reading on the meter scale or make a separate table. Then when hypo starts turning milky or gets foamy take another reading. This will give you the two extremes; the scale can be calibrated accordingly. This will depend on the type meter available, battery, etc. But once these points are found, the hypo can be judged quite accurately. If no meter is available, one suitable can be purchased for around fifty cents.—*W. E. McLain.*

Index to Advertisers

RADIO SECTION

(While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.)

"Rain-In-The-Face" might have been Liquidated *by Radio*

Misled by faulty information from his scouts, General Custer was trapped in ambush at the junction of the Big Horn and Little Big Horn rivers on June 25, 1876. Modern communications might have prevented this tragedy. Scouts could have reported the vast number of Indians present under the command of the Chief, Rain-In-The-Face, and stayed Custer's attack. Custer could have sent word back to the main army of which he was the advance guard.

How the Family of RCA would save Custer

WHEN General Custer arrived at the junction of the Big Horn and Little Big Horn rivers, he'd send up scouting planes immediately. Pilots noting the vast numbers of the enemy, would report back to Custer by means of a light efficient airplane radio transmitter designed in RCA Laboratories built by the RCA Manufacturing Company, one of the members of the family of the Radio Corporation of America. General Custer would, of course, abandon his intention to attack. Using portable RCA broadcasting equipment he'd radio back to the main army for help, and dig in to await rescue.

Word of his plight would be broadcast to the whole nation by the two great NBC networks which provide the broadcasting service of the Radio Corporation of America. Forty-three foreign nations would listen via RCA Communications, the world-wide radio message service of RCA.

Tens of thousands of listeners would sit glued by their RCA Victor Radios. And shortly motion picture audiences throughout the world would see and hear talking pictures describing the rescue of General Custer . . . the scenes voiced by the RCA Photophone Magic Voice of the Screen.

Naturally there would be a great rush on Victor Record Dealers for Victor and Bluebird Records of patriotic character. And Americans everywhere would play these records on RCA Victrolas.

. . . Since, fortunately, no American General is now in need of rescue . . . RCA stands ready to serve the American people in every other respect in every field of radio.

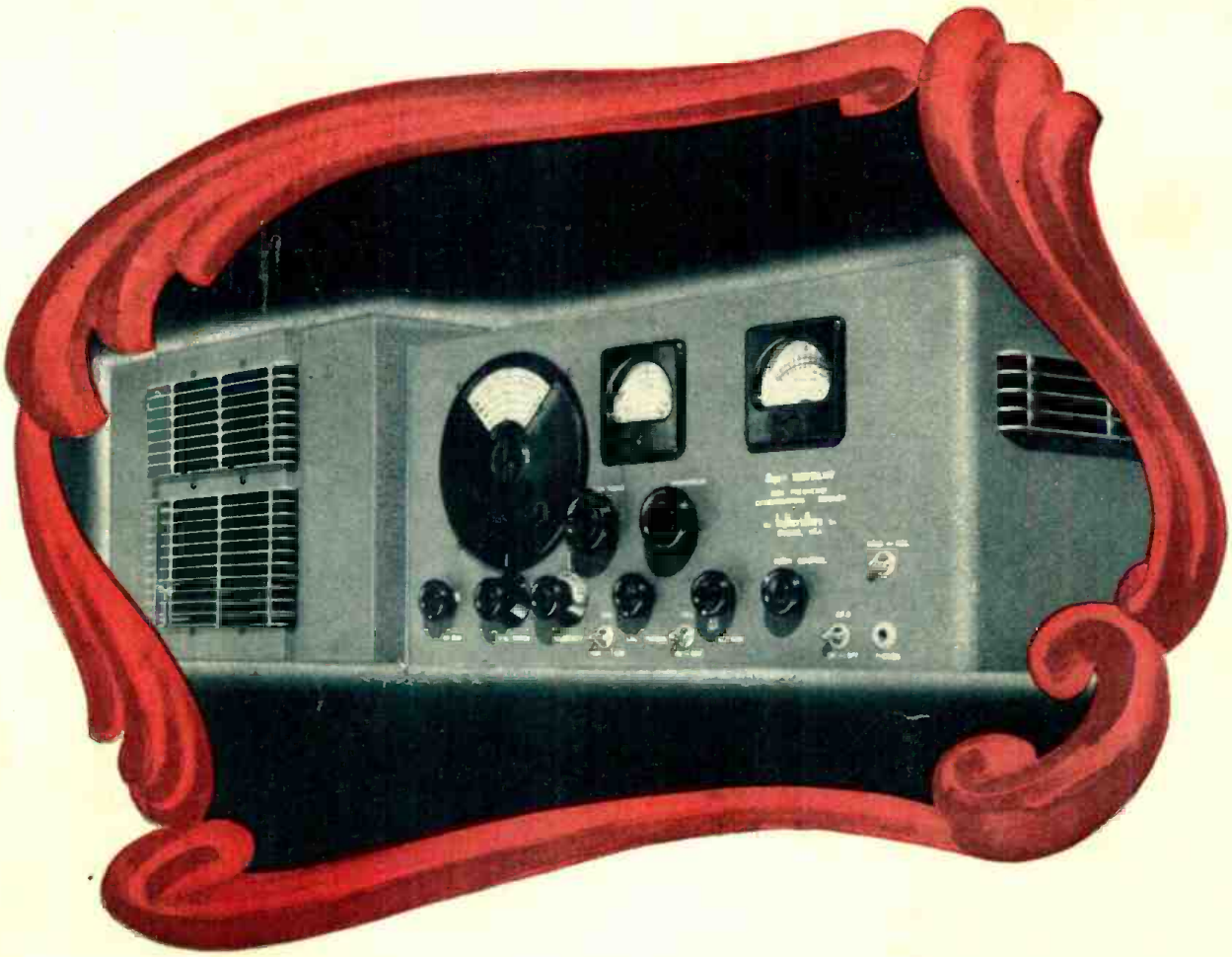
Radio Corporation of America

RADIO CITY, NEW YORK

RCA Manufacturing Co., Inc.
Radiomarine Corp. of America

National Broadcasting Company
R.C.A. Communications, Inc.

RCA Laboratories
RCA Institutes, Inc.



The New SUPER DEFIANT

A receiver *even better* than the famed SX-17 for *$50.00 less!* It represents a definite peak in communications science.

The general circuit design is based on America's best selling amateur receiver—the Skyrider Defiant. But the SUPER Defiant has MORE PRESELECTION and MORE AND BETTER AUDIO and general perfections throughout—a much better image and signal-to-noise ratio through an automatic noise limiter, giving even more usable sensitivity than ever before. Improved crystal action, giving far better CW reception through the reduction of interference. Its push-pull output stage gives it *eight watts* of undistorted output. Compensation in oscillator circuit for frequency stability. Six-step variable selectivity covering wider range from extreme CW crystal to high fidelity. S meter calibrated in "S" and DB units.

Every function of the circuit is controlled from the front panel: R.F. Gain, Selectivity Switch, Crystal Phasing, Audio Gain, Pitch Control, Main Tuning Control, Bandspread Tuning Control, ANL Switch, Hi-Lo Tone, Send-Receive Switch and BFO Switch, Headphone Jack, etc.

It has a continuous range from 540 kc to 42 mc in 4 bands. There is a separate calibrated electrical bandspread dial for the 10, 20, 40 and 80 meter bands—affording Frequency Meter Tuning on these bands. And the SUPER DEFIANT sells COMPLETE with CRYSTAL, SPEAKER and TUBES for only $99.50.

Such a price on such a receiver is possible, we believe, only from the "world's largest." You can see it at your Jobber's TODAY!

ANOTHER hallicrafters TRIUMPH!

"WORLD'S LARGEST BUILDERS OF AMATEUR COMMUNICATIONS EQUIPMENT"