ALL-WAVE RADIO

NOVEMBER • 1936

NEW NOISE SILENCER

BACKYARD ANTENNAS
for congested locations

HAM LINGO
the voice of the amateur

FIVE-METER SUPER
for the 56-mc fone ham

5c U.S. and CANADA

THE JOURNAL of WORLD RADIO

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(Signed)
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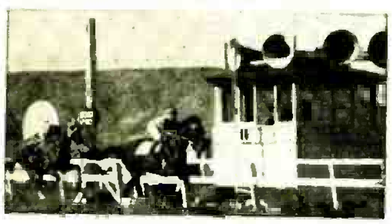

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Radio broadcasting stations employ engineers, operators, station managers and pay up to $5,000 a year. Spare time Radio set servicing pays as much as $200 to $500 a year—full time jobs with Radio jobbers, manufacturers and dealers pay as much as $30, $50, $75 a week. Many Radio Experts own and operate their own full time or part time Radio sales and service businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, paying up to $6,000 a year. Automobile, police, aviation, commercial Radio, and loud speaker systems are newer fields offering good opportunities now and for the future. Television promises to open many good jobs soon. Men I have trained are holding good jobs in these branches of Radio. Read their statements in my 64-Page Book. Mail the coupon.

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My Course is not all book training. I send you special Radio equipment and show you how to conduct experiments and build circuits which illustrate important principles used in modern Radio receivers, broadcast stations and loud speaker installations. I show you how to build testing apparatus for use in spare time service work from this equipment. You work out with your hands many of the things you read in the lesson books. My Free Book tells you about this 50-50 method of training—how it makes learning at home interesting, fascinating, practical. Mail Coupon.

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I am so sure that I can train you at home successfully that I agree in writing to refund every penny you pay me if you are not satisfied with my Lessons and Instruction Service when you finish my Course. I'll send you a copy of this agreement.

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Get My Lesson and 64-Page Book Free Mail Coupon

In addition to my Sample Lesson, I will send you my 64-Page Book, "Rich Rewards in Radio." Both are free to any fellow over 16 years old. My book describes Radio's spare time and full time opportunities and those coming in Television; describes my Training in Radio and Television; shows you actual letters from men I have trained, telling what they are doing and earning. Find out what Radio offers YOU! MAIL THE COUPON in an envelope, or paste it on a penny postcard—NOW!

J. E. Smith, President
National Radio Institute,
Dept.6MSI, Washington, D.C.

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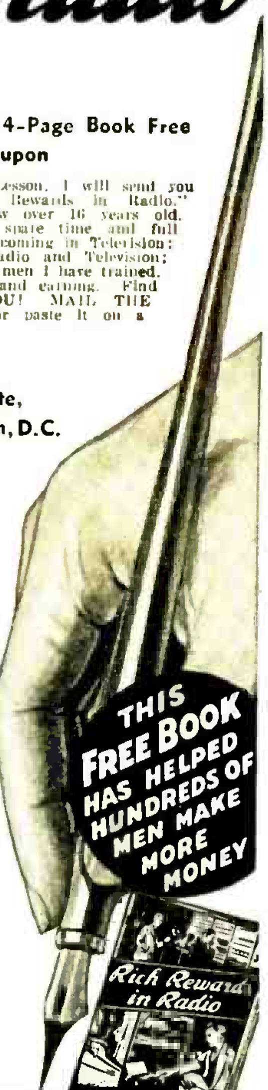

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Washington, D.C.

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Edited by M. L. Muhleman

CONTENTS - NOVEMBER - 1936

ALL-WAVE RADIO

Reg. U. S. Pat. Off.

VOLUME 2 • NUMBER 10

GENERAL

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COVER

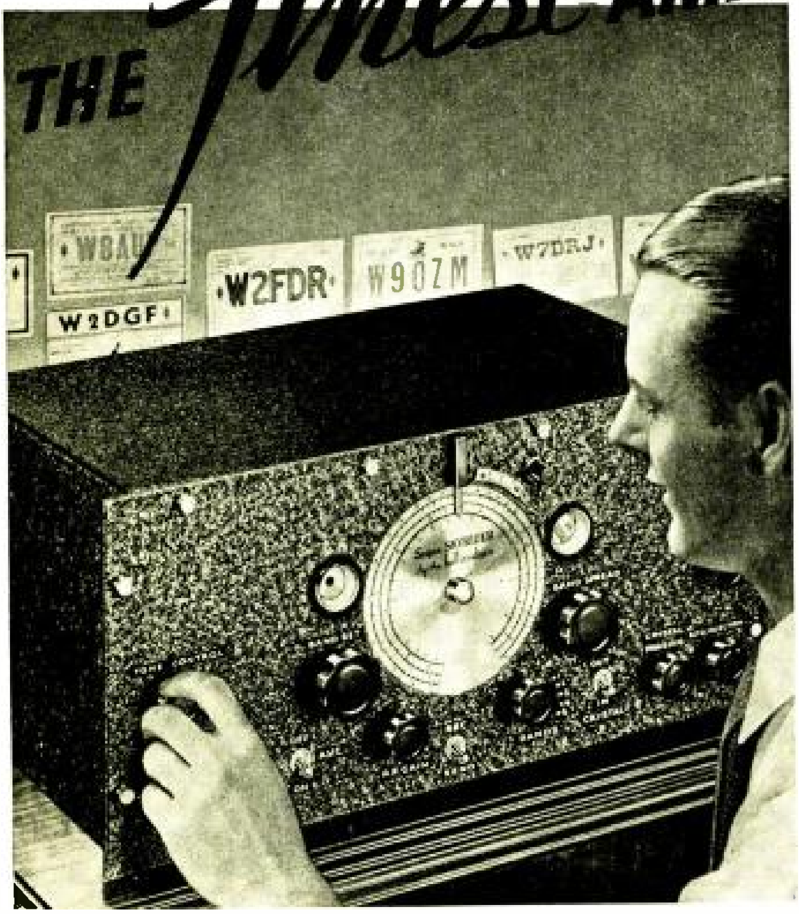
Frank L. McKenna at the mike of his station W2GNT. Candid camera shot by Ken Bohlen.

FEATURES

DEPARTMENTS

NEW 1937 hallicrafter SUPER SKYRIDER

THE *Finest* AMATEUR RECEIVER BUILT *at Any Price!*



THE NEW 1937 11-tube Super Sky Rider is *unsurpassed!* There are many exclusive new features of engineering,—design—construction, not to be found on *any* other communication radio *no matter how much it costs!*

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NOW YOU CAN BUY ANY NEW 1937 HALLICRAFTERS COMMUNICATION RECEIVER ON TIME PAYMENTS FROM YOUR LOCAL RADIO JOBBER

EDITORIAL QUOTES

BY THE EDITOR

THE leaves are turning on the trees, and there is a chill to the night air. The days are shorter and the nights longer. The unseen things are also changing as Fall arrives; the ionosphere is altering its character, atmospherics are subsiding and radio signals from 5 to 500 are stretching their fingers out over greater areas of the earth.

The DX season is rolling in. The 5-meter band is good; 10 meters has opened up for the first time in months; 20 is swinging into its winter tempo. Signals are looking up in the short-wave broadcast bands, and the foreign stations are cutting their way through to the United States in the standard broadcast band.

The newly arrived radio season is to be a good one; probably a good deal better than last year. There will be fewer poor reception periods and a concurrent reduction in the intensity of natural atmospheric disturbances. This year marks the termination of a cycle in natural changes according to statistical data. It is a crest year, and we should make the best of it.

The new season will be particularly good for another reason; since last Fall, many new stations have come on the air and many of the old stand-bys have increased power. Moreover, there is today an increased use of beam or directional transmitting antennas which serve to increase signal strength tremendously in many areas and at the same time decrease the extent of world station interference.

No doubt previous DX records will be shattered this season, and more listeners will shatter them. The rare catches of yesterday may turn out to be commonplace.

◆

The Noise Damper

FEW THINGS REMAIN unchanged for any great length of time. The natural curiosity of mankind is much too vital and probing to allow a development to settle down to a long and undisturbed life. There is always room for some improvement, no matter how slight.

The announcement last February of the development of a noise silencer created widespread interest in the radio field. Many amateurs and listeners put the system to use and found it practical if not foolproof. Time has proven the basic principle to have been sound, but the device itself, in built-in or adapter form, has in some instances been found to be slightly temperamental if not properly humored.

We are pleased to present in this issue a new form of noise silencer which we consider to be a distinct improvement over the former system. It has the merit of simplicity for one thing and of non-critical operation for another. It requires the use of but one additional tube and will function satisfactorily in conjunction with any type of good superheterodyne receiver, regardless of whether the set has high or low gain. It may be used as an adapter or it may be built into the receiver. In either case it is not apt to disturb normal receiver functions. The circuit is such a simple one that the system can be tried out in conjunction with a receiver without the necessity of rebuilding.

But, read the article. Sufficient details are provided for the immediate use of the device in the form of an adapter or as an integral part of a receiver.

◆

Amateur Radio

AS A RESULT OF persuasion by the American Radio Relay League, the Federal Communications Commission has boosted the required code receiving speed necessary for Class B and C Amateur Licenses from 10 to 13 words per minute, and added as part of the examination a code-sending test of equal speed.

The ARRL and the FCC are presumably in agreement that some such step was required to check the large influx of neophytes to the already overcrowded amateur bands. Both bodies seem to be of the mind that the revision in code requirements will discourage would-be amateurs and thus reduce the percentage of newcomers.

Perhaps this will be the case, but we doubt if the new regulation will turn the trick. If the student doesn't balk at 10 words per minute he won't balk at 13 per, and if he attains the latter speed the sending test is not apt to discourage him. We are more inclined to believe that most applicants will consider the new regulation as a form of penalty imposed upon them for not having gotten into amateur radio on the ground floor.

The tightening up of examination requirements for Class B and C tickets is a commendable move if the principal thought in so doing is to turn out better amateurs—in which case it might also be an excellent idea to re-examine lids—but if the purpose is to first restrict and then stunt the growth of amateur radio, the move has little to commend it.

Licensed amateurs have been so preoccupied with the problems brought on by overcrowded bands that they have lost sight of the fact that a small minority is powerless in the face of adversity, and viewed from the standpoint of numbers alone, amateurs are very much in the minority. They stand in the good graces of the public and the government by virtue of the services they have rendered. But services rendered are soon forgotten when there are such factors to account to as "the convenience of the public."

The more amateurs there are the better chance amateur radio will have of maintaining itself, for there is power in numbers. The present attempt to discourage newcomers and shave down the number in the game to fit the bands may in the long run endanger the hold the amateur now has on the few spots in the ether allotted him to carry on his pioneering work. The 5-meter position is already shaky. It may be commandeered for the convenience of the public—an ambiguous phrase if ever there was one.

◆

The 1937 Receivers

THE NEW BATCH of receivers shown at the recent New York Radio Show are distinctly superior to the sets of last year. As usual, the major features are hidden in the circuit design and are not apparent to the layman. For this reason there is not much for the average person to go by since there have been no marked changes in fundamental cabinet designs.

But it's performance that counts, and on this score, the set manufacturers have something on the ball. The new receivers have greater sensitivity, better control action, improved frequency response and increased power output.

Many of the higher priced sets have automatic frequency control—that unseen hand that corrects manual tuning faults and compensates for frequency drift in the receiver circuit itself. This feature is definite insurance against side-band cutting and resultant contraction of the frequency response of the receiver. It makes unnecessary the use of a tuning meter on local stations.

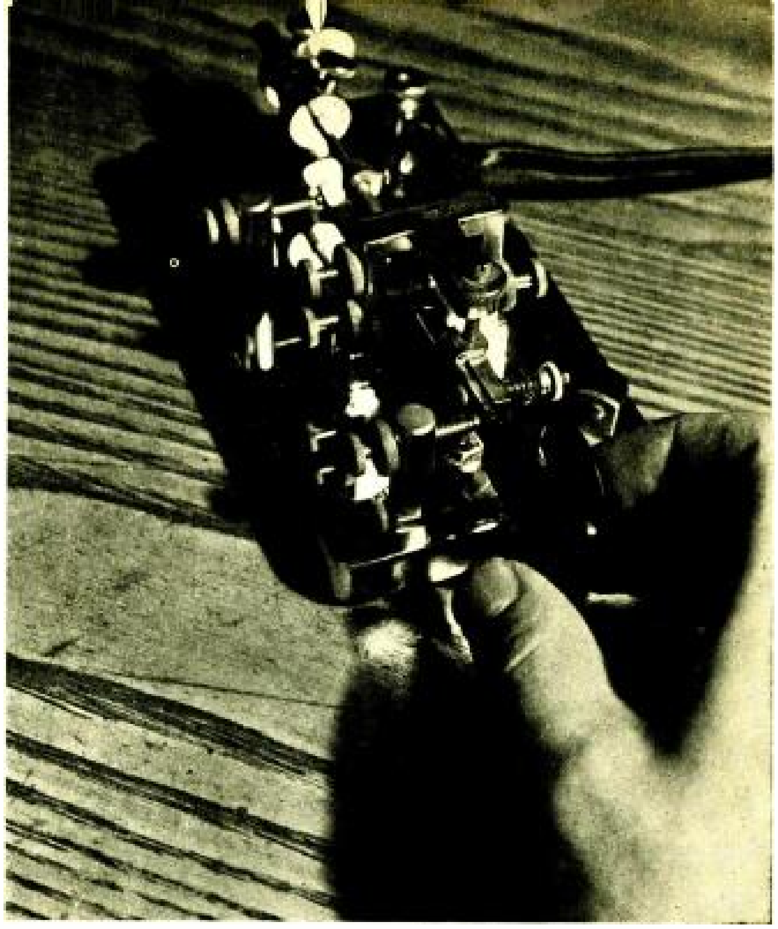
A number of manufacturers have gone in for larger loudspeakers and beam-

[*Continued on page 536*]

HAM LINGO

THE VOICE OF THE AMATEUR

By G. S. Granger



A "bug", the dispenser of plenty ham lingo. Hand courtesy of W2CNT—photo by Ken Bohlen.

HAM LINGO—the language of the radio amateur—is cockeyed, amusing, snappy and highly descriptive. It is made up of idioms, abbreviations, technical terms and phonetic words. It's Greek to the public and a source of distress to the beginner. It is enough to set anyone on his ear.

Some of the idioms used by the ham have their roots in the fields of commercial wire and radio telegraphy. The old-time Morse telegraphists originated the word "bug" as a happy and brief tag for the semi-automatic code keys used then, and now, for high-speed transmission. The early type hand keys were made of brass, and therefore the operators of such keys were dubbed "brass pounders." If an operator worked his key well, it was said of him that he had a good "fist," just as you might say that a singer has a good voice. Hand-key operators were often subject to a temporary or permanent loss of muscle reaction which affected their sending, in which case they were said to have developed "glass arms." Double-acting keys were known as "side swipers." These and other idioms originating with the old timers have been kept alive by the ham.

Short-Cuts

Many of the abbreviations also had their origin in the fields of telegraphy. Such short-cuts as "abt" for about, "ck" for check, "fm" for from, "hr" for here, "sig" for signature and "tks" or "tnx" for thanks, are good examples of a few of the many abbreviations the early amateur radio telegrapher appropriated for his own use. The substitution of the letter "x" for parts of a word, such as "tnx" for thanks, "dx" for distance, "px" for press, and "wx" for weather, had also been taken up by the ham, and he has added a few of his own, with the "x" tacked on to the front end of the word, such as "xtal" for crystal and "xmtr" for transmitter.

The ham also uses the International "Q" Code, together with a few letter combinations of his own making. He employs such universal signs as "R," meaning okay; "K," meaning to go ahead; "SK," indicating the termination of a transmission; "73," meaning best regards, and "88," meaning love and kisses!

But Ham Lingo is far from being a borrowed language. When it comes to trick idioms and phonetic spelling, the ham has it all over the commercial crew. It all started 'way back before vacuum tubes were in use, when powerful spark transmitters were called "rock crushers," synchronous rotary spark gaps were called "sinks" and headphones were called "cans." The first continuous-wave (c.w.) tube transmitters were cynically referred to as "peanut whistles" and their operators as ?#X&! A particular make of transformer was called a "coffin" and an aerial was known as a "sky hook." When licenses came into being they were known as "tickets," and transmitting tubes lovingly became "bottles." The district radio inspector was simply the "R. I."

Phonetics Et Al

There were no radiophone stations in those days, and it was a task for one ham to carry on a lengthy "rag chew" with another ham by means of telegraphy unless he resorted to various forms of abbreviation. It thus developed that laughter was registered by simply transmitting the letters "HI," and the natural enthusiasm the ham had for the game was aired every few minutes by merely sending the letters "FB"—which, to you, is "fine business." Then, surprisingly enough, all hams, no matter their age, became old men, or simply "OM," over the air. Mother was referred to as the "OW," which was all right since she couldn't decipher the code, and the girl friend became the "YL." If the ham married the girl she immediately turned into an "XYL"—which has never seemed quite complimentary, but the gals seem to lap it up.

And then there was the phonetic spelling interspersed with abbreviations. Typical copy would read something like this: "SA OM IS TT UR YL I SAW U WID LAST NITE? SHES A SWL NO ES HW! HI." Translated into English, this copy reads: "Say old man, is that your girl friend I saw you with last night? She's a swell number, and how! (laughter)."

The c.w. ham of today continues the use of the abbreviated form in his transmissions, hut he is not, as a rule, apt to carry it to extremes. Aside from "es" for and, "tt" for that, "hr" for here, "hw" for how, and a few other straightforward short-cuts, he sticks fairly close to phonetic spelling. A few examples are; "fone" for phone, "gud" for good, "cum" for come, "sez" for says, "cud" for could, "ur" for your, and "sed" for said. Some words are given the phonetic spelling and abbreviated as well, such as; "sked" for schedule, "freak" for frequency, and "sine" for sign or signature.

Improvement in vacuum-tube transmitters brought on a new group of words. Communication was established with hams in Australia, who were immediately dubbed "Aussies"—a name given Australian soldiers during the world war—and with New Zealanders, who were called "Zedders." High-voltage, radio-frequency currents were being used, and the word "hot," employed by electricians to denote a live wire circuit, came into use. Later on, high-power radio-frequency current came to be known as "soup." This term is also used to denote background noise in reception, and if a signal is lost in such interference it is said that the signal is "down in the soup" or "in the mud."

Fone Talk

When the ham commenced using radiophone equipment, such phonetic abbreviations as "mike" for microphone and "fone" for radiophone came into use. Some of the lingo of the c.w. ham was carrier over, and it is far from uncommon today to hear a ham on fone use the abbreviation "HI" when he could just as well laugh. It's just a case of habit. It's the same with "K" and "SK;" most fone hams have resorted to "take it away," "over," "come on in" or some such phrase when they are turning it back to the other fellow, but some of the fellows stick to the old "K" of their code days, and to "SK" when they are signing off.

The "Q" signals used by the ham are identical with those established by the International Radiotelegraph Convention. Each signal can be formed as a question or an answer. QRA? for instance, means; What is the name of your station? The answer would be, "QRA . . . " with the name of the station. There are a raft of these "Q" signals, many of which are of no use to the ham. The ones he does use are often given a slightly different or broader meaning that they may better fit conditions. For instance, the original meaning of QSO? is: Can you communicate with . . . direct (or through the medium of . . .)? But the ham also uses QSO to mean a two-way contact or conversation. In talking to another ham, he may pass the remark that he had a fine QSO with such-and-such a station, and in this sense the signal has practically the same meaning as the word talk.

The "Q" Code

The following list of "Q" signals is not complete, but it contains the letter combinations most commonly used in amateur communication. The meanings are those given the signals by the amateur and are not necessarily identical with the originals. Each one can be posed as a question or an answer.

QRA—What is your address?
QRG—What is my frequency?
QRK—Are my signals good?
QRM—Man-made interference
QRN—Static interference
QRP—Shall I decrease power?
QRT—Shall I stop sending?
QRX—Stand by
QSA—What is my signal strength?
QSB—Do my signals fade?
QSL—Please acknowledge our QSO
QSO—Two-way contact
QSY—Shall I change frequency?
QTR—What is your time?

Aside from these signals, the amateur has adopted the abbreviation QST, which is a general call to all stations, and QRR, which is the amateur distress signal—a virtual "land SOS" call. QST is used quite generally, but QRR is used in cases of emergency only. The well-known CQ differs from QST in that it is merely a call of inquiry, and is used to make contact with a station. QST precedes a general broadcast and is more or less of a radio "hear ye, hear ye."

Signal Report Systems

The signal QSA in conjunction with the numbers 1 to 5, is used as a measure of signal readibility, as follows:

QSA1—Barely readable
QSA2—Occasionally readable
QSA3—Fair; hard to read
QSA4—Good; readable
QSA5—Perfectly readable

This system is used in conjunction with the "R-System" of signal strength, which is as follows:

R1—Faint, just audible
R2—Weak, barely audible
R3—Weak, but readable
R4—Fair, readable
R5—Moderately strong
R6—Strong
R7—Strong; over-rides QRM
R8—Very strong
R9—Extremely strong

By the use of this dual system of signal reporting both readibility in the face of interference, and actual signal strength can be determined. Thus a Q5-R4 signal report would indicate a weak signal but excellent receiving conditions, whereas a report of Q2-R7 would indicate a strong signal and heavy interference at the receiving end. The R signals alone are handy for reporting the degree of fading on a signal. It is simple, for instance, to state that a signal went from R9 to R6, thus indicating a fade of three R's.

Some hams use the R-S-T system of signal reporting. The R report indicates readability, the S report signal strength and the T report signal tone. The R gradients are about the same as those for QSA reports and run from 1 to 5. The S gradients are practically the same as the R gradients listed. The T reports run from 1 to 9 and indicate the various tones of code signals, from an extremely rough hissing note to a pure d-c signal.

Technical Idioms

There are many technical or semi-

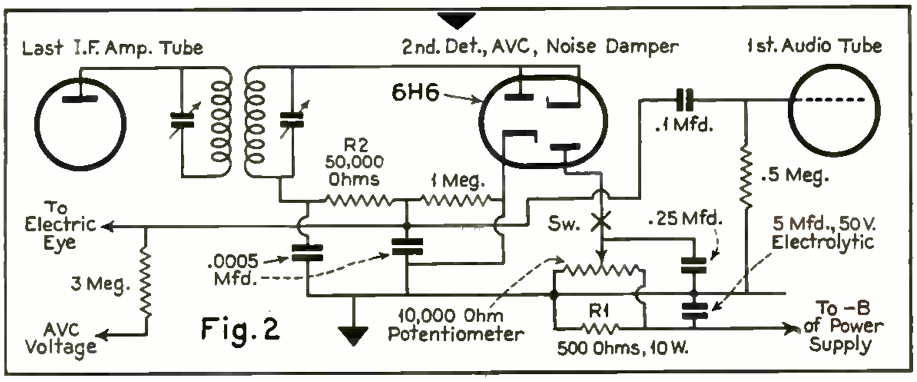
[*Continued on page 532*]

Frank McKenna, the "ham with a dialect," raising a mean eyebrow.

A SIMPLIFIED

FOOLPROOF, EFFECTIVE AND APPLICABLE TO ANY SUPER

By Chester E. Watzel • W2AIF

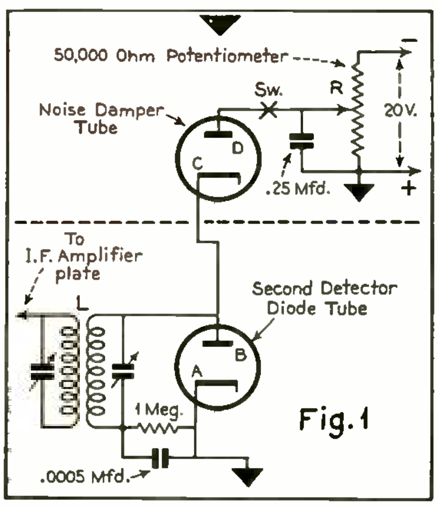


NOISE-SILENCER circuits have in recent months aroused a high degree of interest among amateurs and short-wave listeners.

A circuit for the suppression of certain types of man-made electrical interference was described in the February 1936 issue of All-Wave Radio in an article by G. S. Granger. Readers who have not read this article are referred to it for an understanding of the principles used in this particular method of noise suppression. They will not be repeated here. Suffice it to say that this system works on the theory that noise pulses of certain types of man-made interference are of extremely short duration, on the order of 1/1000th of a second, and that merely blocking the receiver for the duration of each of these short pulses, by means of suitable circuits, will remove the noise from the receiver output and leave the signal unmarred.

"Noise Silencer" Drawbacks

The fly in the ointment is the above phrase "by means of suitable circuits." The circuit being used for this purpose, up to the present time, takes the form of a quick-acting automatic volume control system, as described in G. S. Granger's paper in full. While the fundamental idea is simple and sound, the actual circuits are somewhat complex in nature and in adjustment. They are a potential source of troublesome complications in the receiver to which they are applied. This circuit has been applied successfully, in both an "adapter" and "built-in" form, to a great many different superheterodyne receivers. It has, however, caused difficulties in application to many of these receivers which took considerable time to correct, and has not worked successfully at all in still other receivers.



Fundamental noise damper circuit. In Fig. 2, above, the same applied to a superheterodyne receiver.

The three drawbacks accompanying the use of this "fast avc" system of noise silencing are: introduction of unwanted regeneration and oscillation into the receiver i-f amplifier, capacity loading of certain of the i-f amplifier tuned circuits so that they will not tune to resonance, and the necessity for extremely high gain in the receiver in order to effect complete noise silencing. The first difficulty is caused by the addition of one or two extra i-f stages and the accompanying tuned i-f transformers. The second results from the paralleling of tubes across the tuned circuits, as well as the added capacity across these circuits from the shielded cables when an adapter is used. The third difficulty results from the inherent requirements of this type of blocking circuit.

Simplified Damping System

A much simpler and more easily installed noise-suppression circuit will result if the "fast avc" method of blocking the i-f amplifier during noise pulses is discarded. Another way of blocking the receiver during noise pulses is to highly damp, or "short circuit" one of the circuits in the receiver during these pulses. Fig. 1 represents, in its simplest form, a circuit which will successfully damp, or "short circuit" the second detector stage of a superhet.

The principle of operation of this circuit is as simple as the circuit appears in the diagram. When a signal is being received an r-f voltage appears across the secondary of the i-f input transformer, L. The second detector diode tube rectifies this r-f voltage, causing plate B of the detector diode to become negative with respect to cathode A, the value of this negative voltage depending on the strength of the signal being received. With its plate negative with respect to its cathode this detector diode tube presents a fairly high impedance across the circuit.

With the noise damper control, R, set with the slider at the negative end, plate D of the noise damper tube will remain at a negative potential of 20 volts in respect to ground and cathode A of the detector diode. As long as the incoming signal generates a negative voltage of less than 20 volts at plate B, cathode C, connected directly to plate B, will remain positive in respect to plate D (or conversely plate D will remain negative with respect to cathode C) and the noise damper tube will present a high impedance across the detector tube and not affect its operation. But as soon as a noise pulse of sufficient intensity to drive plate B more than 5 volts negative is received, cathode C becomes more negative than plate D. Plate D then becomes positive with respect to cathode C, current flows through the noise damper tube, which in turn "short circuits" the detector tube. This effectively blocks the second detector for the duration of the noise pulse, removing it from the receiver output. However, this momentary blocking of the receiver is of much too short a time period to be perceived and the incoming signal will be apparently undisturbed. The voltage values given are arbitrary ones chosen to illustrate the operation of the circuit.

For proper noise suppression with the noise damping system it is, of course, necessary that the amplitude of the noise

NOISE DAMPER

peaks be above the amplitude of the desired signal, the same as in the "fast avc" system of noise silencing. This will be better understood by reference to the above mentioned article in February ALL-WAVE RADIO. Fortunately, noise interference is negligible in effect when the signal is louder than the noise. It is on the weak signals that noise suppression is necessary, and where it is completely effective with either system of noise blocking.

Application to Receivers

Fig. 2 shows the noise damping circuit as applied to a receiver into which it can be wired. The 6H6 is used as a combined second detector and noise damper tube, connections to the plate of the previous i-f amplifier stage and also to the grid of the first a-f amplifier tube being shown. The minus B lead from the power supply is disconnected from its usual chassis point and connected as shown. This will generate a negative voltage drop across the 500-ohm resistor, R-1, of around 20 volts or so in the usual receiver. This voltage, as well as the other constants of the circuit, are not critical and may be changed to other values without usually affecting the operation of the circuit. The combination of the 50,000-ohm resistor, R-2, and the two .0005-mfd condensers is merely used as an r-f filter.

The avc voltage may be taken off from the point shown. If instantaneous operation of the electric eye is desired so that the noise can be seen as well as the signal carrier, the grid of the electric eye, either a 6E5 or a 6G5, should be taken off as indicated. If the action of the electric eye is desired to correspond with the same time constant as that of the avc action, the grid should connect to the "AVC Voltage" point.

Application of the noise damper circuit to existing receivers requires a bit of study of the receiver circuit. If possible a 6H6 should be mounted in the receiver so that the second detector circuit may be converted to that of Fig. 2. A species of "adapter" may be constructed by using only those few parts shown above the dotted line in Fig. 1. The noise-damper tube may be either a 6H6 or else the diode section of any of the many duo-diode tubes available, either 2.5 volt or 6.3 volt tubes being suitable. On these tubes only the heater, cathode and one of the diode plates need be used, the remaining elements being left unconnected. The damper tube should be in, or close to, the receiver so that the connection from B to C in Fig. 1 is as short as possible. Use of a 6H6 will permit this tube to be shoved into almost any position in the receiver so that this B-to-C lead may be kept down to a length of about 3 inches or less. The ¼-mfd bypass condenser from plate D should run directly to the nearest point on the chassis. The 20 volts or so necessary for operation of the noise damper tube may be obtained wherever convenient. A small 22½-volt battery of the midget "B" or "C" type will be satisfactory. It should be disconnected when not in use so as to reduce any unnecessary drain through the potentiometer connected across it. This potentiometer should be of a fairly high ohmage—50,000 or 100,000 ohms—to prevent undue drain on the battery. The heater voltage for the noise damper tube may be obtained either from the set heater circuits or from an external filament transformer.

Damper Adapter

Fig. 3 illustrates one form an "adapter" may take. The diode tube is placed so that the two leads drawn heavy are kept only a few inches long, particularly the lead "to diode plate of 2nd detector." The four lightly drawn wires from the noise damper tube may be run as a cable of any convenient length. This will permit the noise damping control to be placed in a convenient position for operation.

If a superheterodyne receiver uses a triode second detector, this tube must be replaced with a diode. Fig. 4 illustrates how this may be done. The audio section of either a 55, 58 or 6R7 is low-mu and will give the same approximate audio output as the triode detector it replaces. If possible, Fig. 2 should be used in a receiver employing 6.3- volt tubes. The particular receiver being converted will dictate the simplest method of installing the noise-damping system. When the circuit of Fig. 4 is put into any receiver previously employing a triode detector tube the "to diode plate" lead of Fig. 3 should be connected to the 55, 85 or 6R7 diode plate.

Advantages of System

Two important advantages are to be had when the noise-damping system is employed. First, the lack of extra i-f stages and tuned i-f transformers means that absolutely no tendency to either regeneration or oscillation of the i-f amplifier of the receiver will be caused. Second, high receiver gain is not necessary for complete noise suppression, this suppression being just as effective in a low-gain receiver. Superhets using only one i-f stage, and no r-f stage, may successfully employ this circuit. It has already been used in a 5-meter superhet for the suppression of auto ignition noise.

When using a beat oscillator for c-w reception, better noise suppression is had by using loose coupling between the beat oscillator and the second detector. A wire from the detector diode plate run near a wire from the oscillator plate for an inch or so is sufficient.

Other methods of applying noise damping to a superhet are possible, but the ones described here should permit the sucessful installation of this type of circuit in any type of superhet receiver.

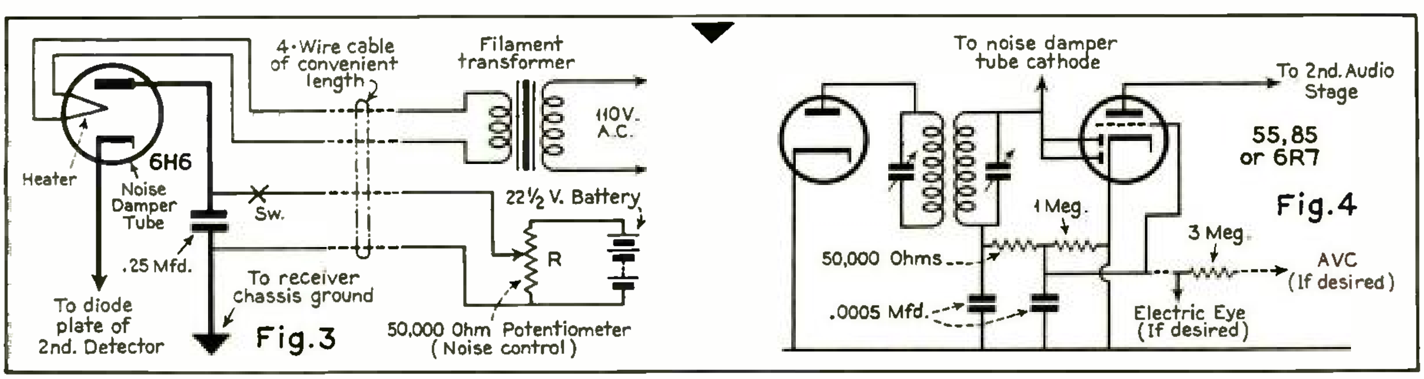


Fig. 3 is the circuit for a noise damper adapter. Fig. 4 shows method of adapting the noise damper to a receiver having a triode detector. The switch "X" in the circuits of Figs. 1, 2 and 3, is used to prevent blocking on very strong signals.

Radio in the Soviet Union

By George C. Sholin

Director, 1939 Golden Gate World DX Convention

The charming young pianist who frequently broadcasts over the short- and long-wave stations at Moscow. You will know her next time.

A LITTLE over twelve years ago, in 1924, the first wireless transmission in the Union of Soviet Socialist Republics was carried out. The occasion was a concert broadcast from the newly built 1-kilowatt radio station at Shabolov.

Broadcasting Development

During the next ten years a most powerful broadcasting network was put into operation. At the beginning of 1934, sixty-two radio stations were working—their combined power having a total of over 1,500,000 watts. It is interesting to note here that the great majority of these stations were built of Soviet resources without the assistance of foreign firms. Even the "Comintern" Station the largest in Europe with a power of 500 kilowatts was built independently by Soviet specialists and entirely with Soviet material. This powerful radio station which was inaugurated on the first of May, 1933. is located about thirty-seven miles from Moscow—in Noginsk.

In the near future, the Soviet Union contemplates the institution of a very powerful broadcasting network. It is reported that twenty new super-power transmitters will be constructed—each station to have a power of 100 or 150 kilowatts.

Long-Wave Stations

For you DXers who enjoy tuning-in distant radio stations on the higher wavelengths, here is a complete list of Soviet long-wave transmitters:

Station	Frequency	Wave-length	Power (kw.)
Moscow Comintern, RV1	173.9	1724	500
Irkutsk, RV14	187.5	1600	20
Minsk, RV10	208	1442	35
Novo-Sibirsk, RV76	217.5	1379	100
Irkutsk, RV62	226.9	1321	10
Kharkov, RV4	232	1292	20
Baku, RV8	238	1260.5	10
Kolpino, RV53	245	1224	100
Tashkent, RV11	256.4	1170	25
Moscow RTzZ, RV43	271	1107	100
Tiflis, RV7	283	1060	35
Alma Ata, RV60	310	967.7	10
Ashkhabad, RV19	333.3	900	10
Krasnoyarsk, RV66	333.3	900	1
Saratov, RV3	340	882.3	20
Igarka, RV85	340	882.3	2
Verkhneudinsk, RV63	350	857.1	10
Rostov-on-Don, RV12	355	845.1	20
Smolensk, RV24	364	824	2
Sverdlovsk, RV5	375	800	40
Erivan, RV21	380	789.5	10
Makhach Kala, RV27	390	769	4
Moscow VTzSPS, RV49	401	748	100
Voronezh, RV25	413.5	726	10
Stalinabad, RV47	421.3	712	2
Ufa, RV37	436	688	10
Oirat-Tyra, RV83	450	667	1
Orenburg, RV45	461.5	650	1
Ciktivkar, RV41	472	635.6	1
Omsk, RV44	472	635.6	1
Chebskaria, RV74	472	635.6	1

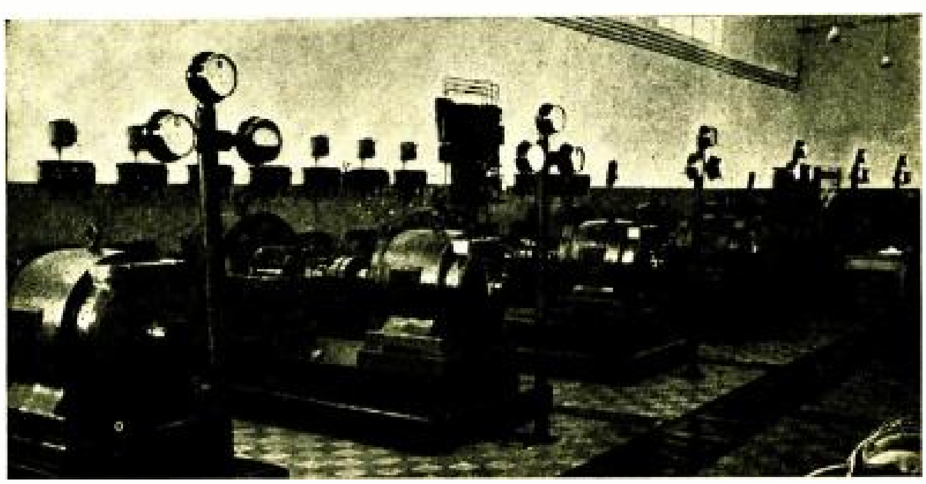
Medium-Wave Stations

And here is a complete list of Soviet medium-wave stations—commonly called "broadcast-band" stations in America:

Station	Frequency	Wave-length	Power (kw.)
Stalingrad, RV34	522	574.7	10
Chita, RV52	556	539.2	20
Gorki, RV42	565	531	10
Cheliabinski, RV68	577	519.3	10
Khabarovsk, RV54	580	516.9	10
Archangel, RV36	586	512	10
Astrakhan, RV35	598	501.7	10
Frounze, RV82	608	493.1	3
Pratigorsk, RV18	610	491.5	1
Murmansk, RV79	610	491.5	10
Ufa, RV22	617	485.9	10
Ust Abakansk, RV50	617	485.9	3
Ivanova, RV31	625	480	10
Vladivostock, RV28	635	472.4	.8
Vladivostock, RV32	635	472.4	10
Ust Abakansk, RV84	635	472.4	2
Penza, RV56	640	468.5	2
Petrozavodsk, RV29	648	463	10
Sakhalin, RV38	662	453.1	2
Grozni, RV23	676	443.8	1
Kazan, RV17	686	437.3	10
Karganda, RV46	686	437.3	1
Petropavlovsk, RV71	689	435.2	2
Elista, RV48	704	425.9	3
Kuibishev, RV16	713	420.8	10
Kiev, RV9	722	415.5	35
Saransk, RV65	734	408.7	1
Ordjonikidze, RV64	749	400.5	10
Izhivsk, RV78	767	391.1	3
Stalino, RV26	776	386.6	10
Nalchik, RV51	794	377.8	1
Moscow Stalin, RV39	832	360.4	100
Simferopol, RV73	859	349.2	10
Ioshka-Ola, RV61	888	337.8	1
Dniepropetrovsk, RV30	913	328.7	10
Engelsk, RV55	937	321.9	1
Gomel, RV40	959	312.6	1
Odessa, RV13	968	309.9	10
Ukhta, RV67	968	309.9	2
Chernigov, RV86	1013	296.2	5
Leningrad, RV70	1040	233.6	10
Krasnodar, RV33	1050	235.7	1
Tirapolsk, RV57	1068	280.9	4
Vinitsa, RV75	1095	274	10
Kharkov, RV20	1185	253.3	10

Far East Station

One of the easiest Soviet stations to receive is RV15, at Khabarovsk. Situated in the far eastern region of Siberia, this station operates on 4273.5 kilocycles (70.2 meters) with a power of 20 kilowatts. Many enjoyable programs of classical and light music are broadcast, as well as delightful programs of typical Russian music. RV15 is on the air from 7:00 A.M. to 12 midnight, Khabarovsk Time (daily). An English broadcast is presented every odd day of the month at 3:20 P.M. (Khabarovsk Time is nine hours ahead of Greenwich Mean Time and fourteen hours in advance of Eastern Standard Time). Although RV15 has been rather delinquent in answering re-



Power room of the Comintern Station, at Moscow. Note that the meters are mounted on stanchions.

ception reports in the past, this condition has been cleared up and the station is now issuing verifications. Your reports should be sent to the Radio Committee, Far East Radio Station RV15, Khabarovsk, U.S.S.R.

Outstanding Broadcasts

During 1935, Soviet stations were on the air for a total period of 126,039 hours. These broadcasts were conducted in fifty-three languages including Avar, Adygeian, Armenian, Balkar, Greek, Bashkerian, Mountain Mari, Georgian, Uzbek, Cossack, Chinese and Esperanto, the "international language."

The program of the Self-Education Department for November, 1935, included daily talks on Agrarian-Technical Instruction, book reviews, a calendar of noteworthy dates, what to observe in Nature during the month, short lives of remarkable people, and several broadcasts by the Academy of Sciences and the All-Union Institute of Experimental Medecine.

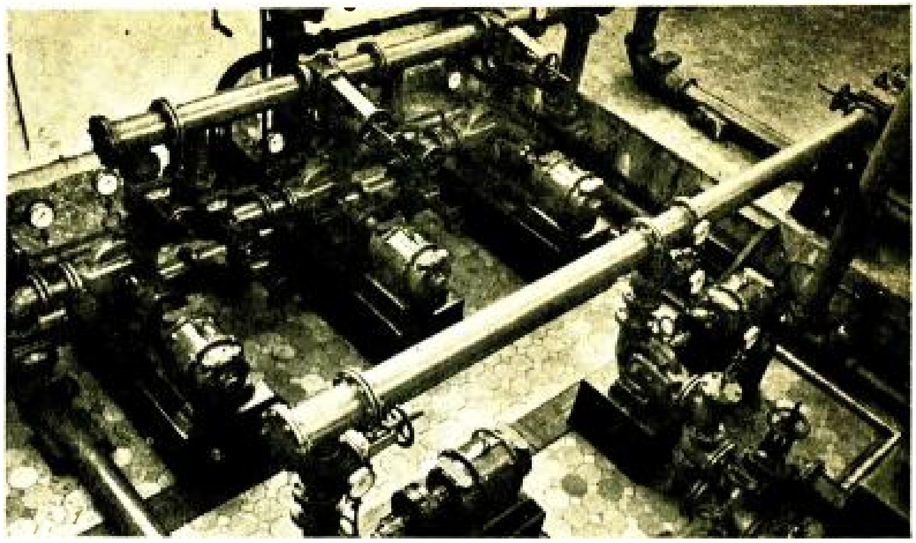
The famous theatrical producer, Meyerhold, adapted two plays especially for the radio; Pushkin's "Stone Guest" and Shakespeare's "As You Like It." Both proved exceedingly popular throughout the Soviet Union. One of the most popular plays broadcast during 1935 was Tolstoy's "Resurrection." Over 600 letters were received by the Moscow Radio Committee about the broadcast of this play—some of them from neighboring countries and even from Palestine. Dramatic productions over the Moscow radio stations are now performed only by experienced casts from leading theaters.

The celebrated French author, Romain Rolland, consented to have several of his works broadcast from Moscow, and gave valuable advice respecting the adaptation of the text for radio. One of the big productions of the Literary Broadcast Department of the Moscow Radio Committee was the "Winter Tale" by Heine, a satire on old Germany. A montage of Heine's letters was used successfully together with the satirical music by Nikolsky. Many writers gave readings from their own works in front of the microphone. Writers from Mexico, Austria, France, Germany, Spain and China participated in these broadcasts.

Receiving Apparatus

Although the Soviet Union occupies one of the foremost places in the world as far as the power of its broadcasting stations is concerned, conditions are far from being satisfactory regarding its receiving apparatus. This is true, not only in comparison with the power of its broadcasting network, but also when one bears in mind the vast territories of the U.S.S.R. and the rapidly growing cultural demands of the population.

The majority of Soviet receivers are



Another view of the power room at the 500-kilowatt Comintern Station.

connected with relaying stations; i.e., reception is transmitted via wires. At the beginning of the current year there were over 5,200 relaying stations in the U.S.S.R. to which more than 1,500,000 plugs were connected. If this is added to all the individual receiving sets, the total number of reception points amounts to about 2,500,000.

It should be pointed out, however, that collective listening-in is very widespread in the Soviet Union and consequently the actual number of listeners would be at least about 12 million. But even this number is quite insufficient, since the population of the U.S.S.R. at the present time amounts to nearly 170 million. As a consequence, in the near future, a considerable increase in reception points is being planned. By 1937, the circuit will consist of 10 million reception points. This, together with collective listening-in, will mean that practically the whole population of the Soviet Union will be served.

Short-Wave Broadcasts

Short-wave radio is used extensively in the U.S.S.R. to disseminate news of Soviet activities throughout the world. The short-wave stations at Moscow can often be heard relaying programs of the Comintern Station and other Soviet long-wave broadcasters. These broadcasts are carried out in many languages, including French, German, Swedish, Czech, Spanish, Portuguese, Dutch and English.

A complete list of Moscow short-wave broadcasts has just been received from Radio Centre and is given here in its entirety.

E.S.T.	*Language*	*Frequency*	*Call*
SUNDAY			
6:00-7:00 a.m.	English	12000	RNE
7:00-8:00 a.m.	French	12000	RNE
8:00-8:45 a.m.	Dutch	12000	RNE
10:00-11:00 a.m.	English	12000 15145	RNE RKI
1:00-1:30 p.m.	Spanish	15183	RV96
1:30-2:00 p.m.	English	15183	RV96
3:00-4:00 p.m.	German	12000	RNE
4:00-5:00 p.m.	English	12000	RNE
5:00-6:00 p.m.	German	12000	RNE
6:00-7:00 p.m.	Spanish	9600	RAN
7:00-7:30 p.m.	English	9600	RAN
7:30-8:00 p.m.	German	9600	RAN
MONDAY			
3:00-4:00 p.m.	German	12000	RNE
4:00-5:00 p.m.	English	12000	RNE
5:00-6:00 p.m.	Swedish	12000	RNE
6:00-7:00 p.m.	Spanish	9600	RAN
7:00-7:30 p.m.	English	9600	RAN
TUESDAY			
3:00-4:00 p.m.	French	12000	RNE
4:00-5:00 p.m.	Dutch	12000	RNE
5:00-6:00 p.m.	Swedish	12000	RNE
6:00-7:00 p.m.	Spanish	9600	RAN
7:00-7:30 p.m.	English	9600	RAN
WEDNESDAY			
6:00-7:00 a.m.	English	12000	RNE
3:00-4:00 p.m.	Czech	12000	RNE
4:00-5:00 p.m.	English	12000	RNE
5:00-6:00 p.m.	German	12000	RNE
6:00-7:00 p.m.	Spanish	9600	RAN
7:00-7:30 p.m.	English	9600	RAN
7:30-8:00 p.m.	German	9600	RAN
THURSDAY			
3:00-4:00 p.m.	German	12000	RNE
4:00-5:00 p.m.	French	12000	RNE
5:00-5:30 p.m.	Spanish	12000	RNE
5:30-6:00 p.m.	Portuguese	12000	RNE
6:00-7:00 p.m.	Spanish	9600	RAN
7:00-8:00 p.m.	English	9600	RAN
FRIDAY			
3:00-4:00 p.m.	Czech	12000	RNE
4:00-5:00 p.m.	English	12000	RNE
5:00-6:00 p.m.	German	12000	RNE
6:00-7:00 p.m.	Spanish	9600	RAN
7:00-7:30 p.m.	English	9600	RAN
7:30-8:00 p.m.	German	9600	RAN
SATURDAY			
3:00-4:00 p.m.	German	12000	RNE
4:00-5:00 p.m.	French	12000	RNE
5:00-6:00 p.m.	Spanish	12000	RNE
6:00-7:00 p.m.	Spanish	9600	RAN
7:00-7:30 p.m.	English	9600	RAN

The half-hour broadcasts, listed above, include a news bulletin, a short talk and occasionally a little music. Dramatic productions, Russian music and songs, talks and news dispatches are presented on the one-hour broadcasts. Other regular features of the one-hour broadcasts are as follows: Every Sunday—Questions and Answers. Every Monday—Review of the Week. A special talk on "Soviet Opinion and World Affairs" is given during the later part of the Wednesday broadcasts. The Monday and Friday broadcasts also include a five-minute Russian lesson.

During the winter months, RNE on 12,000 kilocycles may be replaced by RV59 on 6,000 kilocycles. Station RAN, 9,600 kc, may operate occasionally on its optional frequency of 9,521 kilocycles. Your reports on these stations should be sent to the Chief Editor, Radio Centre, Solianka 12, Moscow, U.S.S.R.

DX With The Backyard Antenna

By George B. Hart

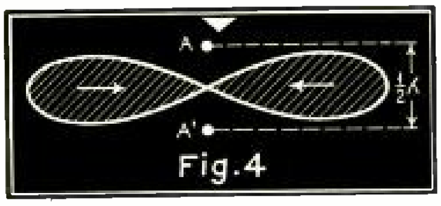
No problem so irritates the radio manufacturer as that of supplying an efficient antenna system with each new radio purchased by the listener, for no matter how efficient he makes his receiver it will not perform at its best if the antenna is not efficient. Likewise, the purchaser of a new radio wants to hear those elusive foreigners and he wants to hear them in a manner that makes them enjoyable. If he doesn't he blames the set.

Yet no backyard is so restricted, no apartment house roof so small that a reasonably efficient antenna system cannot be designed and built that will make everybody happy, including the landlord and, indirectly, the manufacturer.

Directional Selectivity

To achieve a high signal-to-noise-ratio it is necessary to supply as effective a directional antenna as possible. The value of the directional antenna lies in its ability to *discriminate* against *unwanted* signals rather than its inherent ability to respond to particular signals. Receiving most of its signal voltage from one direction only without the reception of interfering signals or noise originating in other directions, the antenna's effective signal voltage is increased by fifty or more times. Such an increase is identical to raising the signal of a 100-watt station (and there are plenty of these on the short-waves) to that of a 5000-watt station while the static or noise level is not increased proportionately.

In use on the Bell System's short-wave transoceanic circuits, directive antennas for both receiving and transmitting have amply proved their value. Their selectivity of direction has increased the ratio of signal in receivers above that of noise coming from static, from local electrical



Directional characteristics of a half-wave vertical dipole antenna.

equipment and from sources inherent in the receiver circuit.

The first thing to consider when constructing a directional antenna is the amount of directional selectivity desirable for maximum results. Too much directive selectivity is not desired as our purpose is to receive as many signals as possible yet obtain the advantage of increased signal-to-noise ratio offered by this type of antenna. In general, it is found that radio waves travel very closely along the great circle path to the receiver. This permits of sharp directivity along the horizontal plane. Experience, however, has shown that the vertical directivity cannot be too sharp, since the best angle above the horizon varies from time to time.

We next must consider space limitations. If there just isn't enough space available to put up a Marconi-grounded or Hertz doublet antenna of the proper length needed for effective operation, the best plan is to use some other system that can be both simple and efficient.

Antenna Lengths

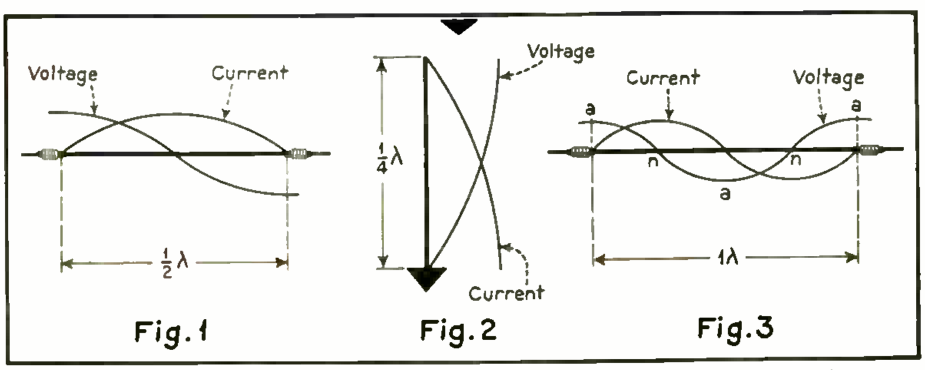
Possibly antenna length with respect to quarter-waves, half-waves, full-waves and voltage distribution means little or nothing to you. So let's look at Fig. 1, which shows a simple half-wave signal-excited Hertz antenna with its normal current and voltage distribution. The current and voltage distribution will be such that the current at extreme ends of the antenna will be zero and maximum at the center; the voltage will be maximum at the extreme ends of the antenna and zero at the center.

Such an ideal situation can only exist when the length of the antenna is equal to one-half the wavelength on which resonance is desired. For example, an antenna to have a resonant frequency of 31 meters will be approximately 15.5 meters long (or one-half of 31, the resonant frequency). Now this figure can be changed to a still more intelligible one by reducing it to good old American feet. Again assuming our 31 meters, we multiply 15.5 meters by 3.28, the number of feet in one meter. In our example this would be 40 feet and 9 inches.

Looking again at Fig. 1, we see that the voltage is zero at the center of the antenna, and there is therefore no difference of potential between this point and ground. We can therefore connect the center to ground without disturbing the signal current or voltage distribution. Since this is true we can substitute a ground for one-half the antenna if space is limited. This arrangement is shown in Fig. 2—our old friend the Marconi or quarter-wave antenna.

A full-wave antenna, one a wavelength long, has a voltage and current distribution similar to that of two one-half wave antennas tied end to end, as in Fig. 3. This is a true wave motion and illustrates the manner in which the electrical wave disturbance travels along the conductor. The points marked "n" are the nodes or points of zero voltage, and the points marked "a" are the anti-nodes or points of maximum voltage. The distance between two anti-nodes or peaks *of the same polarity* is *one wavelength.*

Using these principles of voltage and current distribution we can design antennas occupying minimum space yet providing effective results. Directional antennas, however, need a little further elaboration and we recommend one or both of the two types to be described.



Illustrating the current and voltage distribution in quarter-wave, half-wave and full-wave antennas.

Vertical Doublet Antenna

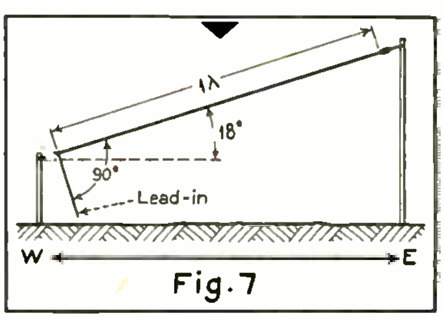
An almost ideal bi-directional arrangement for short-wave reception is a simple dipole system permitting of reception along a great circle path in two opposite directions. This is the principle of the doublet-antenna, but using vertical antennas the effect is more pronounced. Assuming that the two one-half wave antennas shown in Fig. 4 are connected so that they are in phase, an incoming signal will produce a disturbance in both vertical wires. If the signal arrives from a direction normal to the plane of the two wires the voltage induced in each will be in phase and the two resulting antenna currents will add. If the signal comes from any other direction, an impulse will arrive at one wire before it reaches the other with the result that the current will be out of phase and cancel.

For such an antenna the masts should be made of wood to reduce the directional properties introduced by unwanted reflection from metal towers.

An antenna such as this one can be made quite efficient if each leg is 21 feet in length and separated by 21 feet. The average listener would have difficulty in connecting the antenna leads to such an arrangement, however, as the connection must be made to maintain signal phasing. As a simple expedient to permit the enjoyment of this limited-space antenna with its directional effects, we simply extend the lower ends of the wires 10 feet to a transmission line, as shown in Fig. 5. The introduction of these two elements tends to reduce the directive selectivity as we find two small loops now extending at right angles to the original field pattern and at right angles to the plane of the added wires. However, we have obtained simplicity with effectiveness. A 12-inch insulator is connected between the two 10-foot leads and the transmission line of No. 16 rubber-covered wire is coupled to the antennas by a "V" whose sides are 12". Be sure to fan these sides so that they make a triangle.

The Transmission Line

The two ends of the transmission line may then be connected either directly to the doublet posts on the receiver or to these posts through .0001-mfd. variable midget condensers, C, as shown in Fig. 6. The tuned circuit increases the effectiveness over a wide band of frequencies, but necessitates the use of a transmission line of proper length. The presence of the tuning capacitors, C, in the circuit makes the transmission line "hot"; i.e., it becomes a loop of the antenna and must be 10, 30 or 60 feet long. Variation in these lengths and in the tuning capacities will reduce directive selectivity since such variations will materially disturb the phase relationship existing between the two antennas.

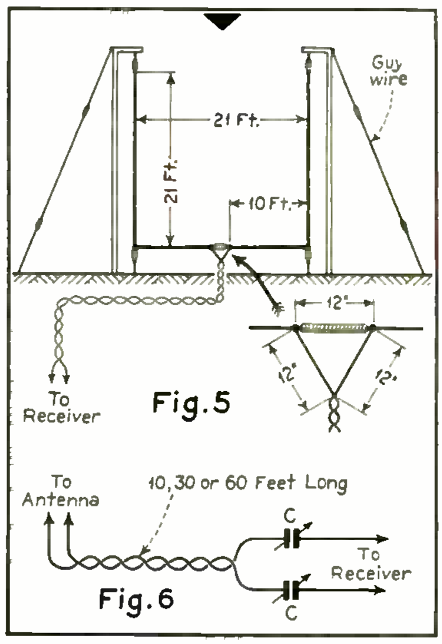


A full-wave tilted antenna. This type of aerial is partial to both vertically and horizontally polarized waves.

We have used this arrangement with considerable success on apartment house-tops, the directional selectivity being made to follow the great circle path through the British Isles and Europe in one direction and Australia in the other.

The Tilted Antenna

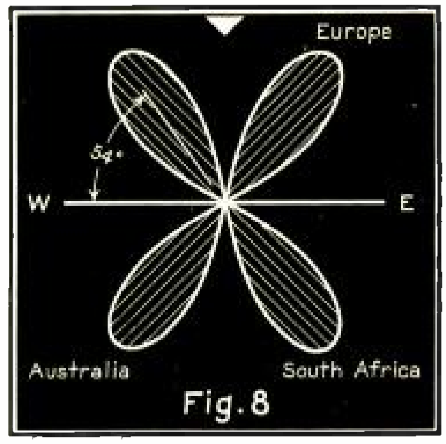
Another easily constructed antenna for the backyard or roof-top was made by simply placing a single, full-wave antenna in a due east-and-west line, as shown in Fig. 7. The antenna was elevated



Details of directional vertical dipole antenna. Fig. 6 shows a tuned transmission line that may be used with the dipole.

at the eastern end; the elevation being one-fourth the length of the antenna or one-quarter wavelength high. The low end should be at such a height as to make the angle of incidence with the ground not more than 20 degrees, with about 18 degrees preferable. Such an antenna uses the ground as a reflector, is a high-angle affair, and discriminates against the ground wave. As illustrated in Fig. 7, the antenna is directive to the west.

A full-wave antenna does not have its maximum directivity at right angles to the direction of the wire like a one-half wave antenna, but has two lobes in the form of an "X". These lobes are at an angle of 54 degrees to the direction in



Directional characteristics of full-wave antenna.

which the antenna points, as in Fig. 8.

Now if the direction of our antenna (which in this case was due east-and-west) is fixed so that the lobes are fixed on the great circle, then strong signals will be heard from the points shown. In our particular case U. S. East coast stations were actually discriminated against, while European, South African and Australian signals were excellent.

The Lead-in Connections

To transfer the signal from the tilted antenna to the receiver we have found that a single wire line is most effective when connected at the end closest to ground. Experience has shown that this lead should be brought away from the antenna at an angle of 90 degrees to the inclined plane and should run without a bend for at least one-quarter wavelength. The shortest possible line should be used. Equally effective as to reception, more effective as to directivity, but again requiring a tuned circuit in the transmission line, is the use of the zeppelin type twisted pair transmission line similar to the line so often used by transmitting amateurs. Fig. 9 shows how this is connected at both antenna and receiver.

Personally, we prefer this type of antenna construction to the semi-vertical antenna arrangement. Being non-directional in themselves, vertical antennas will not compare with horizontal or tilted antennas of equal length.

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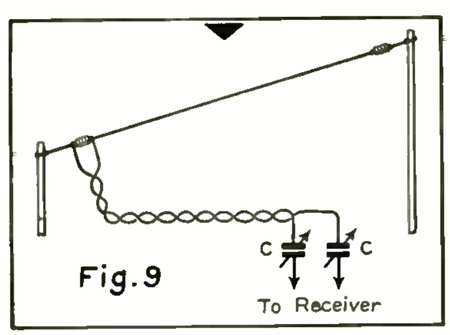
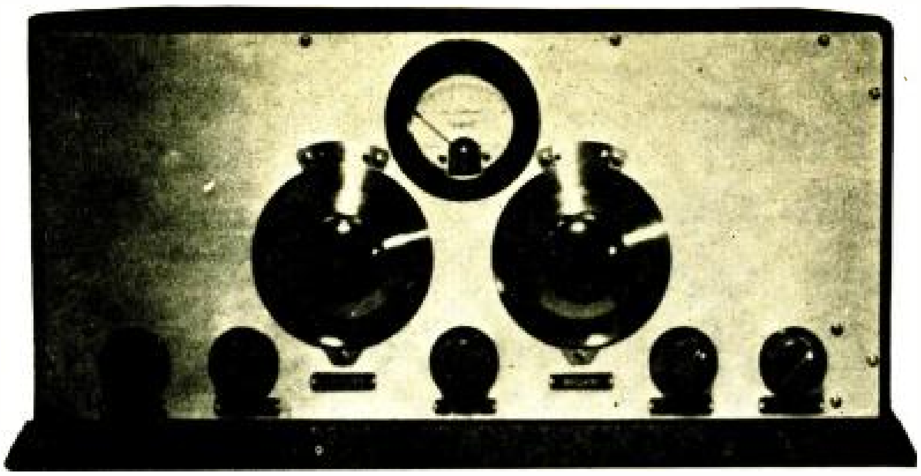


Connections of tuned transmission line to tilted antenna.



FRONT VIEW OF THE FIVE-METER SUPER DESCRIBED IN THIS ARTICLE.

A CONVENTIONAL FIVE-METER SUPERHETERODYNE

By C. O. Stimpson • W9TRD

THIS article is based on a year's experiments in developing a conventional type of superheterodyne receiver for use on frequencies above 56 megacycles. Instead of writing a plain "how to build it" story, we wish rather, to discuss the methods we used in overcoming the difficulties encountered in all work in the ultra-high frequencies. May we say at the beginning that, because of the complications involved at these frequencies, the less advanced experimenter will have greater success if he begins with something not quite so elaborate as the receiver described here.

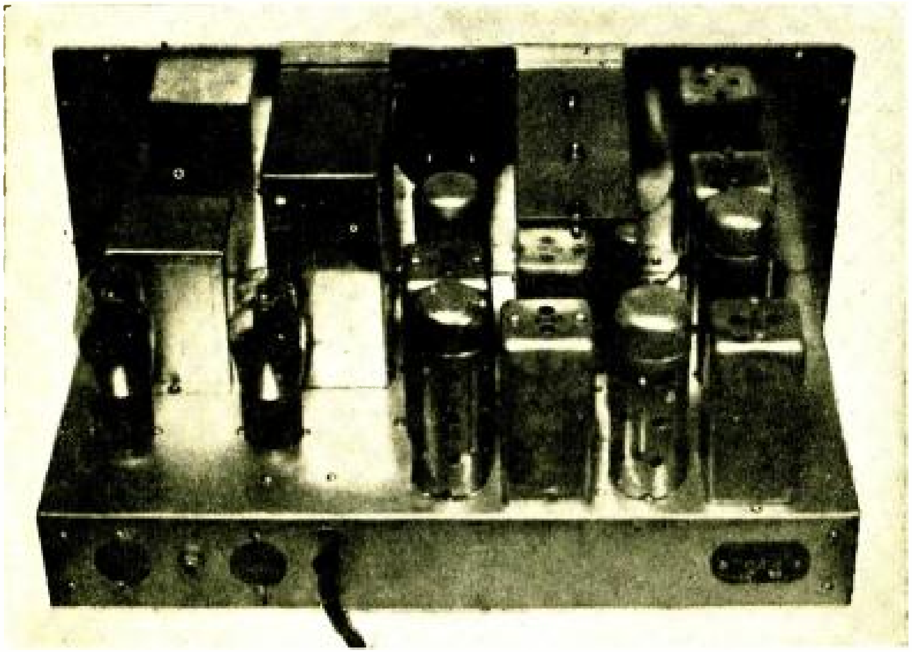
The purpose of these experiments was to determine what results might be had with a conventional type superheterodyne receiver constructed to operate at these frequencies. The fundamental principles are the same as those governing the operation of receivers built for the lower frequencies. However, certain departures were necessary to overcome the special conditions found at the ultra-high frequencies. It is to these departures that we shall direct most of our attention.

The Intermediate Frequency

Previous experience with supers on these frequencies brought out the following drawbacks: When using standard intermediate transformers, one of the first things we notice is that there are two dial settings on the oscillator for each signal received. This is because the comparatively low intermediate frequency used by these transformers has a ratio to the total tuning range of the receiver of less than 1 to 2. The cure for this is to choose a higher intermediate frequency. It is then impossible to find more than one setting where the difference between the frequency of the oscillator and that of the received signal equals the intermediate frequency.

Next, we are pretty sure to have image frequency interference. Since the selectivity of resonant circuits is a matter of a percentage of the resonant frequency, and not just so many cycles off to one side or the other, the input circuits at ultra-high frequencies are quite broad in their tuning and permit the entrance of unwanted signals whose frequencies happen to be the proper value to heterodyne with the oscillator and produce the frequency to which the i-f transformers are tuned. A resonant circuit may at broadcast frequencies admit a band only a few kilocycles wide, while at the ultra-high frequency end of the spectrum, the same type of circuit will admit a band many hundred kilocycles wide. Here again, a higher intermediate frequency will help.

A third source of trouble encountered with the standard intermediate transformers is something that should really be cleared up at the transmitting end. It is that the signals we wish to receive are not as stable as the signals for which these transformers were designed. These



Chassis view of the five-meter super showing placement of components.

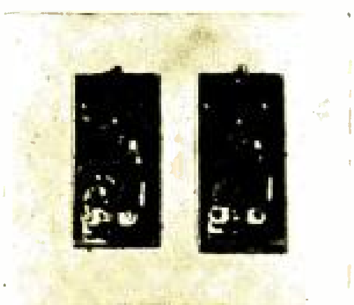
signals are subject to considerable frequency modulation and the sharply tuned transformers will permit only a small part of the signal to get through. Consequently, severe distortion results.

Those working with ultra-high frequency supers usually have to contend with a very weak signal at the input of the first detector. They generally try to compensate for this by increasing the gain of the intermediate-frequency amplifier. This is likely to produce an annoying amount of amplifier noise.

The Intermediate Transformers

With the above facts in mind, the logical sequence of our procedure was to choose a suitable frequency for our intermediate amplifier, to find i-f transformers which tuned broadly enough to permit reception of the poor quality signals which are in use now, and to obtain the maximum amount of signal possible at the grid of the first detector tube.

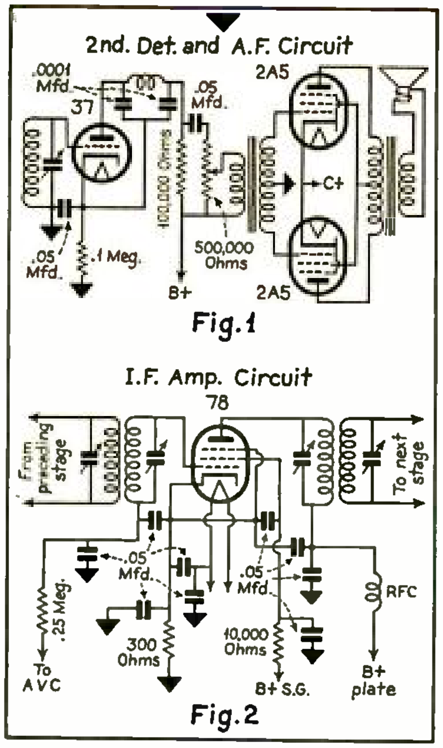
We wished to have this receiver tune from 56 to 60 megacycles, a range of four megacycles. Therefore, to prevent repeats, it was necessary to choose an i-f greater than two megacycles. We had on hand a set of transformers developed



The r-f and 1st detector units which employ acorn tubes.

by the Meissner Mfg. Co. for use in ultra-high frequency police work. These were tuned to three megacycles, which suited our purpose nicely. They were also designed to pass a band of frequencies 200 kc wide. This frequency tolerance will handle any frequency modulation encountered at the present time. The poor selectivity of these transformers was obtained by using small wire, severely overcoupling, and then giving the whole a generous application of coil dope. This did cause some sacrifice in gain, but two stages of i-f amplification gave all the gain we could use with a triode detector.

In our search for unknown facts, we must always start with things we do know, and try to relate them to the things we wish to study. So in our experiments, we started with the audio end and worked backwards through the second detector, intermediate amplifier, first detector, oscillator, and finally the radio-frequency amplifier, and so to the antenna. In our discussion of the various



Circuits of the i-f amplifier, 2nd detector and a-f stages.

features, we shall break the diagram up into separate units, and study them individually rather than refer to the complete diagram. We hope by this means to illustrate more clearly the functions of the individual units and avoid the confusion of having to locate these units on the completed diagram. In this connection it might be well to remind you that the most complicated devices are nothing more than a series of related simple ones, and that if we master the simple ones separately, we find that we understand the combination as a whole.

The Audio Circuit

In the audio end, which is shown in Fig. 1, there is nothing unusual, unless it is the way we have inserted the volume control in the plate circuit of the second detector. This coupling trick keeps the direct plate current out of the audio transformer, and permits positive control of volume without interfering too much with the load impedance of the detector plate circuit.

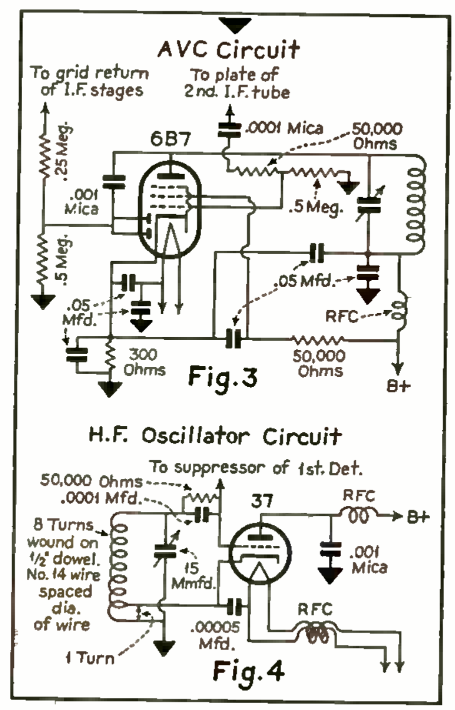
The intermediate frequency amplifier did take considerable time. You will notice in the complete diagram that we have two stages in the main amplifier and an additional stage to drive the avc diode. This makes three stages operating at 3 megacycles, with a fairly high over-all gain. It was necessary, therefore, in order to prevent oscillation, to carefully shield each stage and to insert filters in every lead entering it.

The I-F Circuit

Fig. 2 shows the electrical construction of one of the i-f stages. The resistances in the grid return and screen-grid circuits, and also the radio-frequency choke in the plate circuit, serve to isolate these components from the rest of the circuit, while the .05-mfd by-pass condensers connected direct to cathode furnish a short r-f path to the cathode. The cathode is, of course, the common return point to which all circuits in the stage are connected. This is true of both r-f and d-c circuits. The 300-ohm resistance in the cathode circuit has two functions. It serves to keep a definite minimum amount of C bias on the tube and, at the same time, helps to isolate the stage. You will also notice that the circuits are by-passed to ground. This was found necessary to prevent oscillation.

The AVC Circuit

The circuit of the 6B7 tube is shown in Fig. 3 with the screen-grid amplifier section used to drive the diode section which acts as an automatic volume control on the two i-f stages. The additional i-f stage to drive the avc diode furnishes plenty of action and, as the 6B7 tube is working with normal grid bias, the avc action is present on both weak and strong signals. This avc action, in connection with an 0-10 milliammeter installed in the cathode of the second i-f tube, makes a sensitive vacuum-tube voltmeter. The vacuum-tube voltmeter was extremely useful in lining up the r-f and i-f stages, as a greater deflection of the meter occurred when any adjustment produced an increase of amplification. Since the automatic volume control was set to respond to weak signals, one might think it would



Circuits of the automatic volume control and high-frequency oscillator.

limit the loudspeaker response too much. This did not prove to be the case. Any signal strong enough to activate the meter needle gave full speaker response. The usefulness of the vacuum-tube voltmeter did not end with the completion of the receiver. It has been found very handy for making comparative field-strength measurements of transmitters when they were being adjusted. When any change is made that varies the strength of the signal, it shows up immediately as a change in the meter deflection.

With the audio and intermediate frequency parts of the set constructed and working properly, we come to the main problem of the experiment. This is, of course, the ultra-high frequency part.

The logical way to attack the ultra-high frequency end of the receiver is, first, to get a suitable oscillator working, as it is the connecting link between the ultra-high and the intermediate frequency amplifier which we already have working. The next step is to develop the first detector or mixer stage, and finally, the radio-frequency input amplifier.

The Oscillator Circuit

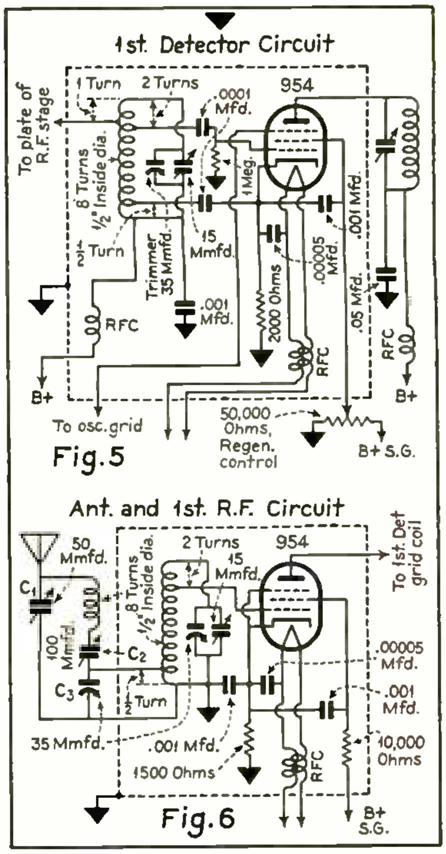
The work we did on the oscillator alone would make an interesting full-length article. However, we shall confine ourselves here to a description of our final choice for an oscillator arrangement. The circuit diagram of the oscillator is shown in Fig. 4. This may be thought of as a Hartley type oscillator with the plate end grounded and the cathode placed at r.f. potential by tapping it part way up on the coil. An oscillator of this type is quite stable, doesn't have tuning holes, and can be made to give a fairly uniform output over its whole tuning range. The harmful effects of the inter-electrode tube capacities are largely eliminated in this arrangement. The grid-to-cathode capacity is in series with the plate-to-cathode capacity, and these are shunted by both the grid-to-plate capacity and that of the main tuning condenser. The capacity of the main tuning condenser plus the grid-plate capacity is quite large in relation to the other capacities in the circuit and has, therefore, good control of the oscillator frequency. Neither the capacities between the tube elements nor that of the tuning condenser have much to do with the amount of regeneration in this circuit, hence the uniformity of output over the whole tuning range.

The only difference between this circuit and some you may have seen before is that we have isolated the filament by placing r-f chokes in its leads and tied the filament and cathode together with a small condenser. It was necessary to isolate the filament because of the capacity coupling between the filament and the cathode. This coupling would permit the filament either to bypass the cathode to ground or couple it to some chance external resonant circuit. The first would reduce regeneration and the latter would cause tuning holes. Insertion of the fixed condenser between the cathode and filament was necessary to stabilize the oscillation. Its presence definitely ties the two elements together and its comparatively large value may prevent a voltage phase shift between them. The r-f chokes in the filaments of the oscillator and two other ultra-high frequency tubes were made of No. 14 enameled wire close wound on a half-inch dowel pin.

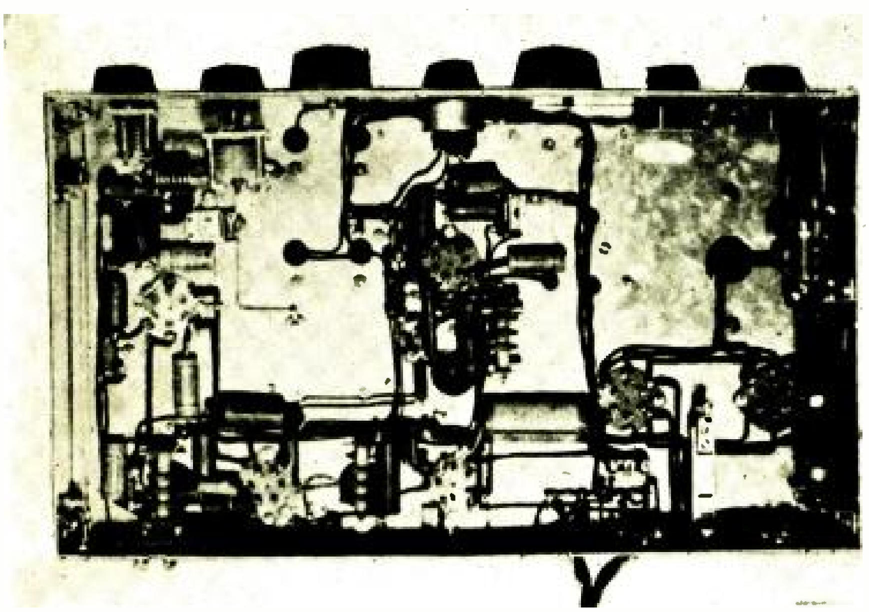
Regeneration

In oscillators of this type, the greatest amount of regeneration and hardest oscillation occur when the cathode tap is about one-third of the way up the coil. Unless we reduced the plate voltage, the increased r-f current generated with the cathode tap in this position would cause thermal expansion of the circuit elements and consequently a bad frequency drift. In addition to this, the cathode-to-ground capacity would become a large factor in the control of the oscillator frequency. Better frequency stability and sufficient output was had when we reduced the regeneration by placing the cathode tap only one turn up from the ground end of the coil.

When working at these frequencies it is, of course, necessary to keep all leads in the r-f part of the circuit as short as possible. The inductances should be made of bare wire, turns spaced the diameter of the wire, and the coil length about equal to its diameter. Nothing, except possibly mechanical strength, seems to be gained by using wire larger than No. 17. All shielding should be separated from both the ends and sides of the coil, a distance equal to not less than the diameter of the coil. All ground connections in a given circuit should be made at one place, preferably at the grounded terminal of the tuning condenser. The inductance should always be soldered directly to the terminals of the tuning condenser and the whole assembly mounted as close as possible to the socket terminals.



Circuits of the 1st detector and antenna-radio-frequency unit.



Under-chassis view of the completed job, showing placement of components and wiring distribution.

The path of the radio-frequency currents can be shortened as much as two inches by using midget, or "postage stamp" by-pass condensers. It is good practice also to use the smallest resistances which will safely carry the current load. In addition to allowing shorter leads, and taking up less space, the smaller resistors cause less stray capacity to ground than the larger ones.

The First Detector

The first detector circuit is shown in Fig. 5. The local oscillator signal is injected into the suppressor grid. Various ways of introducing this signal were tried and this was chosen because it is not affected by fairly large variations of the oscillator output. The suppressor is connected directly to the grid of the oscillator and gets its bias from the voltage drop in the oscillator gridleak. Since the oscillator bias increases and decreases with an increase or decrease of the oscillator output, it serves as an automatic sensitivity control in the suppressor of the first detector. This partially explains the tolerance which this method of signal injection has to wide variations of oscillator output. Regeneration is used in the first detector and gives a great increase in sensitivity. The regeneration was produced by tapping the cathode return lead one-half turn up from the ground end of the grid coil. The screen-grid voltage was varied to control the amount of regeneration. Since the tuned circuit in the grid of this stage acts also as the plate circuit, and carries the plate current of the preceding radio-frequency stage, it was necessary to insert blocking condensers in the cathode and grid leads. The grid return circuit is through a one-megohm resistor connected directly from grid to ground.

The input and output impedances of tubes are quite low at ultra-high frequencies, so it is necessary to tap the grid and plate leads down from the ends of the tuned coils in order to get a good energy transfer and prevent overloading the tuned circuits. Overloading of these circuits is evidenced by a loss of amplification and very broad tuning. The proper position of the taps for good impedance matches, was found experimentally by adjusting the tap and observing the sharpness of the tuning and the amount of gain. The amount of grid bias of the first detector was chosen by putting a variable resistance in the cathode circuit and adjusting the value of it until we had the maximum signal gain.

The R-F Circuits

Fig. 6 shows the antenna and ultra-high frequency r-f amplifier stage. This stage is practically a duplication of the first detector except for the grid bias and the fact that the suppressor is tied directly to the cathode. The grid circuit in this case carries no high voltage and therefore the .001-mfd blocking condensers in grid and cathode leads are not necessary, as they were in the first detector circuit. The 1500-ohm cathode biasing resistor was chosen by experiment the same as in the case of the first detector.

The antenna circuit used here is very unusual. It was developed to make use of the fact that a tuned antenna circuit greatly increases the amount of signal available at the grid of the first tube. This arrangement has three functions: it matches the input circuit to any antenna impedance, tunes the antenna, and couples it to the input circuit in such a way that this circuit is not pulled out of resonance with the first detector circuit with which it is ganged. The impedance of a given antenna is matched by setting the capacity of C-1 so that its reactance equals the impedance of the antenna. The antenna is then tuned to resonance with C-2. C-3 is adjusted until its reactance at the working frequency equals the impedance across the part of the r-f amplifier coil between the antenna tap and ground. This condition is reached by varying C-3 and then tuning with C-2 to see if it pulls the ganged circuit out of resonance. When a setting is found which does not react on the ganged circuit, the match is reached and need never be changed. The condenser C-3 is a small balancing type and is varied with a screwdriver.

[*Continued on page 534*]

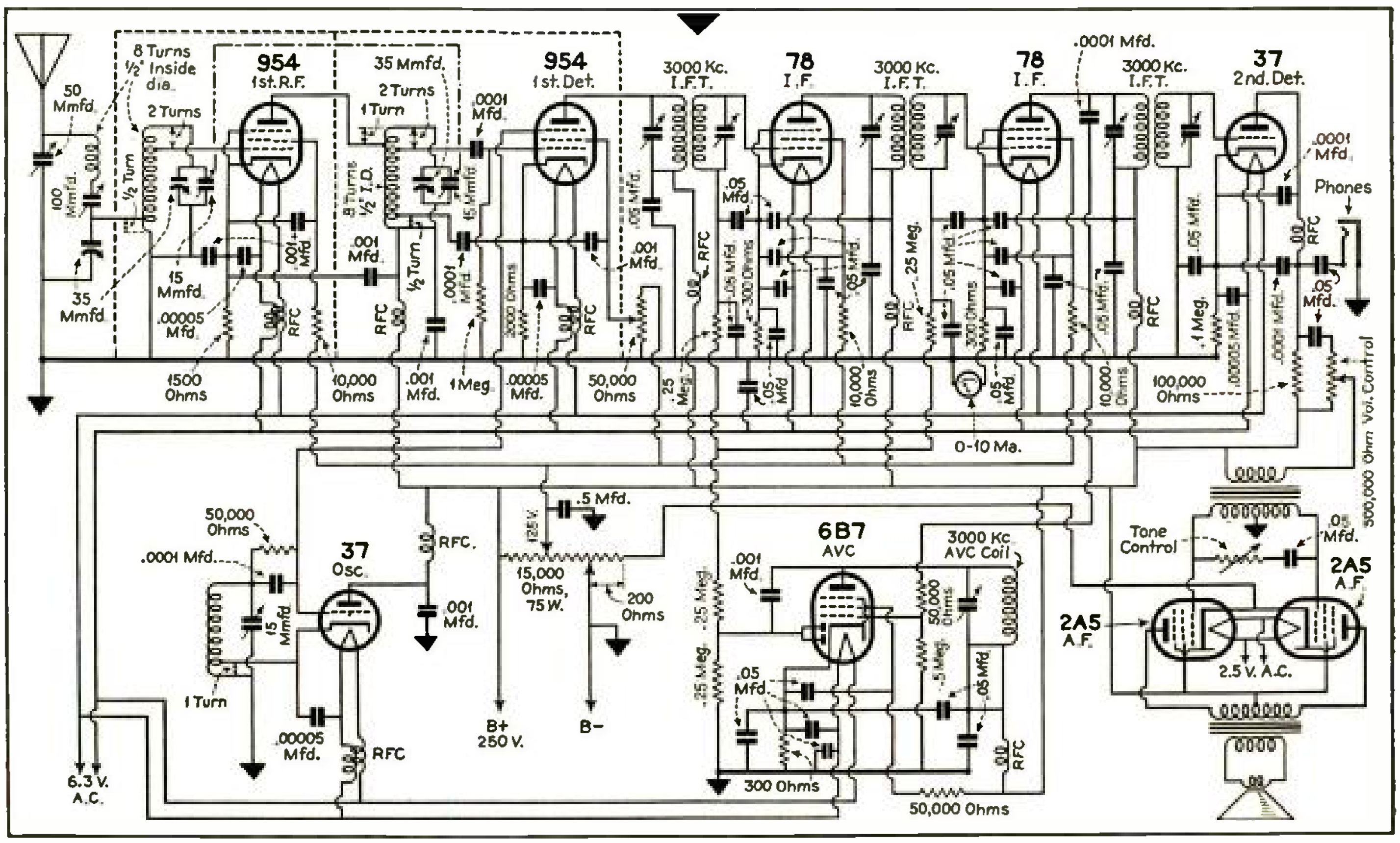


Fig. 7. Complete circuit diagram, with parts values, of the five-meter superheterodyne receiver.

Globe Girdling

By J. B. L. Hinds

the receiver and dx reception . . . italian stations . . . spanish reports ham fones . . . brazilian line-up . . . station schedules . . . spanish

MANY listeners still have the impression that the complete answer to dx reception rests in the type of receiver employed. The receiver is a highly important factor, but there are other factors equally as important.

Location has a bearing on reception. So has the antenna system. A good receiver is therefore handicapped if the location where it is used is a poor one for short-wave reception, or if the antenna system is inadequate.

But the most important factor is the human element. Real dx reception requires patience and preseverance, a knowledge of short-wave receiving conditions, and the application of a bit of horse sense in relation to the hours one should listen for desired stations.

The fact that John Jones picks up Australian stations with a "Super-Blooper" receiver by no means indicates that you can do likewise—unless, of course, you give thought to the other factors that contribute to the performance.

View of transmitter position at Boston's F. B. W1XAL. Note neon sign.

Station Data

Many changes are still under consideration as numerous stations are testing here and there. The following are reported in this issue:

NEW STATIONS

Kc	Meters	Call	Location
19620	15.29	VQG	Nairobi, Kenya, Africa
17620	17.03	IBC	San Paolo, Italy
16385	18.31	ITK	Mogdishu, Somaliland, Africa
15230	19.69	......	Prague, Czechoslovakia
14410	20.82	IBC	San Paolo, Italy
11955	25.09	IBC	San Paolo, Italy
11760	25.51	......	Prague, Czechoslovakia
11450	26.20	COCX	Havana, Cuba
11280	26.60	HIN	Ciudad Trujillo, R. D.
10480	28.63	ITK	Mogdishu, Somaliland, Africa
9660	31.06	PSJ	Rio de Janeiro, Brazil
9600	31.25	RAN	Moscow, U. S. S. R.
9540	31.45	VPD2	Suva, Fiji Islands
9350	32.09	HS8PJ	Bangkok, Siam
7890	38.02	IDU	Asmara, Eritrea, Africa
6325	47.43	HH3NW	Port-au-Prince, Haiti
6243	48.05	HIN	Ciudad Trujillo, R. D.
6115	49.06	......	Prague, Czechoslovakia
6050	49.59	GSA	Daventry, England (Reinstated)

STATION CHANGES

New Frequency	Call	Old Frequency
31600	W8XKA	55500
31600	W3XKA	55500
13075	VPD	13100
11680	K1O	11630
9660	CR6AA	7177
9500	PRF5	9501
8185	PSK	8190
7010	EA8AB	7245
6820	XGOX	9500
6730	HI3C	6105
6351	HRP1	6357
6420	HI1S*	6420
6010	VP3MR	7080
5880	YV8RB	5900

* Puerto Plata to Santiago de los Caballeros, R. D.

STATIONS DELETED

Kc	Meters	Call	Reason
7780	38.56	PSZ	Not in service
7282	41.20	HJ1ABD	Not in service
6425	46.69	W9XBS	Not in service
6420	46.72	W3XL	Not in service

NON-AUTHENTICATED STATIONS

Frequency	Call	Location
15795	XOJ	Shanghai, China
15600	HS8PJ	Bangkok, Siam
15000	SV1KS	Athens, Greece (Nov.)
14000	PZ1AA	Paramaribo, Dutch Guiana
11740	HP5L	David, Panama (Nov.)
11710	......	Stockholm, Sweden (Oct.)
10370	EAJ ?	Tenerife, Canary Islands
9590	VK6ME	Perth, W. Australia (May) (Aug.)
9540	CSW	Lisbon, Portugal (Oct.)
9540	CB954	Santiago, Chile
9527	FCR2	Saigon, Indo-China
9520	F3ICD	Saigon, Indo-China (July)
8710	KBD	Manila, P. I. (July)
7281	SM5SD	Stockholm, Sweden (Nov.)
7100	FO8AA	Papeete, Tahiti (Nov.)
7030	EA9AH	Spanish Morocco (Nov.)
6330	YV13RV	Valencia, Venezuela (Mar.)
6300	VP3BG	Georgetown, B. G. (Nov.)
6270	YV14RC	Caracas, Venezuela (Aug.)
6240	CO9RY	Matanzas, Cuba (Aug.)
6150	HJ4ABU	Pereira, Colombia
6130	KZEG	Manila, P. I. (Aug.)
6120	HP5Z	Panama City, Panama (July)
6075	HI3E	Puerto Plata, R. D. (Nov.)

Station Notes

The latest veri card from HVJ Vatican shows a reflection of one of the radio towers in the pool located inside the grounds of the Vatican.

HIN, Ciudad Trujillo, Dom. Rep., is already sending out their very colorful veri cards, and which they may well be proud of.

HJ1ABP, Cartagena, Colombia, has another scenic card done in red and white.

HI3E, Puerto Plata, Dominican Republic is a new short-wave station soon to be installed at Puerto Plata on 6075 kc with 400 watts power. Sr. Ignacio Agramonte is owner and address is Apartado No. 343.

A complete list of radiophone stations has been received from the Minister of Marine, Italy, and additions are included in the station list. Such stations in Italy proper (San Paola), Ethiopia (Addis Ababa), Eritrea (Asmara) and Somaliland (Mogdishu) are now shown. San Paola is a village surburban to Rome. It lies close to the southern line of the city, between the Tiber and the ancient Appian Way.

Prague, Czechoslovakia stations on 15230, 11760 and 6115 kc have been transferred to the station list from the non-authenticated block as they appear to be working on a tentative schedule. They are on 15230 and 11760 kc and alternating weekly on these frequencies and

Blue with red letters, the veri of COCQ. Havana, Cuba.

transmitting with a very consistent signal. Their veri card has a picture of Prague on one side and verification on the other. They are signed "Radiojournal." They are now broadcasting from studios in Prague instead of Podebrady. Announcements are made each 30 minutes in several languages, with English announcements last, usually by a woman. Their new address is Czechoslovakia Broadcasting Corporation. Prague, Czechoslovakia.

The writer recently enjoyed a visit with Mr. William de Leon, formerly the English announcer with station HI3C, La Romana, Dominican Republic, who is now in the United States. He came in to extend the good wishes of HI3C and to inform us that they had again changed their frequency from 6105 to 6730 kc, or 44.58 meters, and are now being heard with good signal strength.

During Mr. de Leon's stay in La Romana, HI3C was changed from a station built by Senor Roberto Palli Bernado, its owner, from odds and ends and employing but 7 watts power, to a station of 30 watts power with a new Lafayette transmitter. It is now being heard in many countries. The station is now known as "La Voz de la Feria." Their Spanish announcement is *"Esta es la Emisora HI3C La Voz de la Feria, La Romano, Republica Dominicana, en su frecuencia de 6730 kc, equivalente a 44.58 meters."* Announcements are also made in English and Italian. They have no special opening and closing selection at present.

La Romana is a small city of 11,000 people and noted for its exportation of cane sugar to the United States and Europe.

HIN, Ciudad Trujillo, is the new Dominican Republic station now broadcasting between 7 and 9 P.M. on 6243 kc, and on 11280 kc between 4:30 and 5:30 P.M. It is called La Voz del Partido Dominicano, "The Voice of the Dominican Political Party." The announcer of HIN is Sr. Vinicio Saladin, the son of our genial friend, Senor J. R. Saladin, the Director of Radio Communications in the Dominican Republic.

COCQ, Havana, Cuba, is shown in the station list correctly—9750 kc, as verification card shows them operating on that frequency with CMQ, 880 kc. Their card is done in red, white and blue. The address is Sr. Miguel Gabriel, Administrador Gerente. Calle 25. No. 445, Havana, Cuba.

Station Reports

XGOX, Nanking, China, has changed from 9500 to 6820 kc and is heard just above JVT, 6750 kc. It is said to maintain its regular schedule Monday to Saturday 6:30 to 8:30 A.M. and Sunday 6:30 to 9:30 A.M. E. S. Time. Frequent announcements are made in English by a female announcer who also reads the English news bulletin.

CQN, Macao, China, in station list as 9553 kc is reported as being on 9545—9520—9650 and 9677 kc. All reports seem to be in agreement, however, that the station is on the air Mondays and Fridays, from 7 to 8:30 A.M., E. S. Time.

CSW, Lisbon, Portugal, in non-authenticated list is reported as heard on Saturdays between 5 and 6 P.M. near 9549 kc, although announcing frequency as 9540 kc, 31.45 meters, which is the same frequency as DJN, Germany.

SV1KI, Athens, Greece, is said to be broadcasting daily from 3 to 7 P.M., E. S. Time, near 15000 kc.

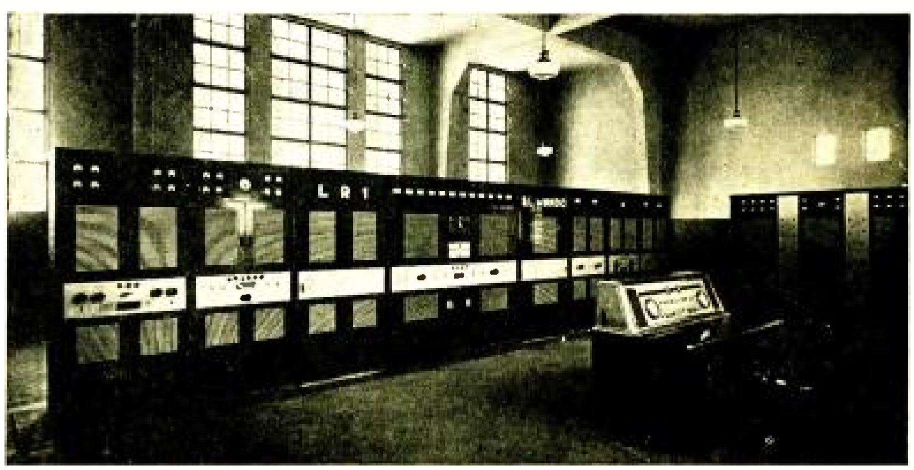
FO8AA, Papeete, Tahiti, is reported heard by Robert Behm, Philadelphia, on 7100 kc. It is said to broadcast Tuesday to Friday, 11 P.M. to midnight. Also reported by R. Simpson, Australia.

VPD2, Suva, Fiji Islands, is the call of a new station on the air and with the announced frequency of 9540 kc. It relays programs of ZJV, Suva. Lyle Nelson, Yamhill, Oregon, and J. Wendell Partner, Tacoma, Washington, report it on the air 5:30 to 8:00 A.M., E. S. Time. It commenced broadcasting on August 23rd. VPD, 13100 kc, still remains on the air although announcements indicate it on 13075 kc.

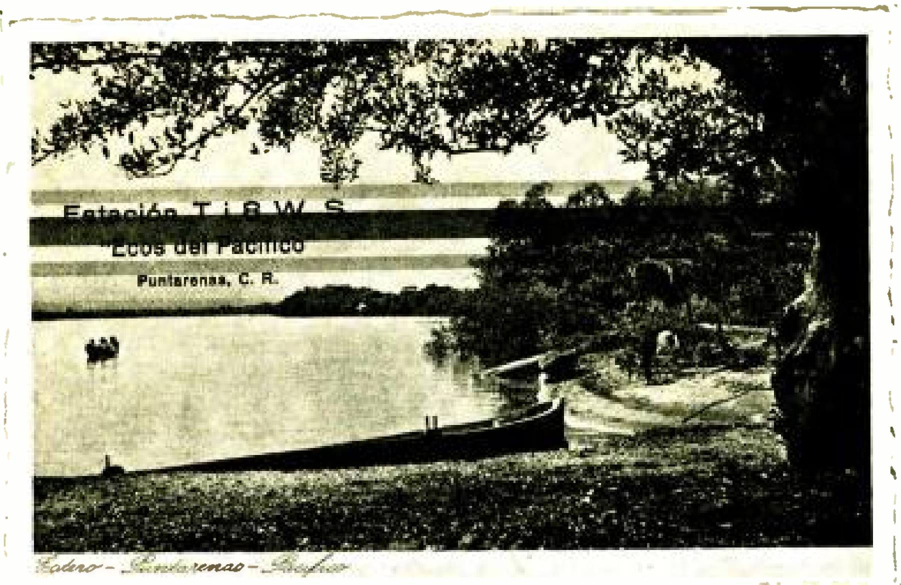
EA9AH, "Radio Tetuan," Spanish Morocco, is reported as being on approximately 7030 kc each day from 4 to 4:25 P.M. and is said to be one of the Rebel stations. Transmits news. Male announcer in Spanish, French, German and Italian. Lady anouncer in English following the opening Spanish announcement.

KAZ, 9990, kc, Manila, P. I.—Mr. R. Simpson, Concord West, N.S.W., Australia, reports receiving verification for reception on special broadcast and also of hearing KTR, Manila, on special test program on 10910 kc, although the only call given was KZRM. Mr. J. Wendell Partner, Tacoma, Washington, states that these test programs have been discontinued.

H. Van der Veen of the Java Wireless Stations is at present in the United States studying the methods of shortwave transmitting here. It is understood that his trip will take him around the world. He will visit Netherlands (Holland) before his return.



The 50-kilowatt transmitter at station LR1, Radio El Mundo.



Veri from TI8WS, Puntarenas, Costa Rica—"Ecos del Pacifico."

JVH, 14600 kc, is reported as getting stronger each night on Japanese overseas program between 12 and 1 A.M.

From advice direct from Tokyo, Japan intends to enlarge and extend their Overseas Service. Their new address is Overseas Section, Broadcasting Corporation of Japan, Atagoyama, Shiba-ku, Tokyo, Japan. They request that no reports be sent to the station call letters for Overseas broadcasts.

New veri cards with pictures are being issued.

Mr. H. L. West, Lakewood, Ohio, reports hearing Australia's Radio ship *Kanimbla* on 11710 kc. They are reported as being heard between 5 and 7 A.M., E. S. Time.

OER2, Vienna, Austria, 6072 kc, is reported as recently having increased its power.

New Zealand is reported soon to install a short-wave broadcasting station.

1UC, Addis Ababa, is reported as testing late afternoons.

VP3BG, Georgetown, British Guiana, is reported as changing from 7220 to 6300 kc. Reports welcomed.

LSX, Buenos Aires, Argentina, 10350 kc is reported as broadcasting special programs Wednesday evenings, 9 to 11:30 P.M.

TI8WS, Puntarenas, Costa Rica, advise that their official frequency is 7550 kc or 39.74 meters. They do at times change the frequency and pass to 40 meters, so as to talk with their friends of the air. Their musical broadcasts are on the first named frequency. They employ 120 watts power.

EAQ, Madrid, Spain, have been heard of late with special broadcasts on their assigned frequency of 19720 kc. Some reports indicate them, however, as high as 19784 kc.

Mr. Galen Balfe, Lowell, Mass., reports SM5SD, Stockholm, Sweden, on 7281 kc broadcasting Saturday mornings from 7 to 8 A.M. E. S. Time. Lennart C. Anderson, Denair, California, states call letters to be SMA and that power of station is 2 kw. Reports of reception would be appreciated.

Brazilian Stations

PRF5 9500 kc, Rio de Janeiro, Companhia Radio Internacional do Brazil, advise this station is only broadcasting at present from 4:45 to 5:45 P.M. the daily program assigned as "Hora do Brazil," except on Sunday and holidays. They also have furnished revised list of radiophone and radiotelegraph transmitters and frequencies and station lists have been corrected accordingly. It is noted that radiotelephone stations PSE, 14935 kc, PSH, 10220 kc, and PSK, 8185 kc, transmit musical programs at irregular times. For the information of those interested, the following transmitters are radiotelegraph: (Code) PSB, 19010 kc; PSC, 18640 kc; PSD, 15070 kc; PSG, 10760 kc; PSI, 10120 kc and PSL 7935 kc.

HJ1ABP, Cartagena, Colombia, advise they have not been off 9600 kc since installation, which disproves the reports that they were testing elsewhere. They are being heard nightly with fine volume and are transmitting excellent programs. Their closing march is Sousa's "Under the Double Eagle."

COCX, (11450 kc), Havana, Cuba, verifies reception reports but does not give the frequency on which transmitting. This station transmits simultaneously with CMX long wave (920 kc) from 8 A.M. to 1 A.M., E. S. Time. They open and close their programs with the Mexican selection "Pajarillo Barranqneno." Reports should be sent to Radiodefusora COCX, c/o Estacion Perifonica, CMX, Edificio "Calle"—Oficios by Obrapia, Havana, Cuba.

YNLF, Managua, Nicaragua, in late advice still say they are transmitting on 9595 kc. The writer has not heard them there during the past few weeks. Listeners will please report if heard.

The Chicago Short Wave Club reports improved reception from Europe between 4 P.M. and midnight, and from Australia and Japan between 4 and 7 A.M., E. S. Time.

PCJ, Eindhoven, Holland, latest schedule (E. S. Time) is as follows:

9590 kc	Sunday	2-3 P.M., Africa;
	Tuesday	1:30-3 P.M., Africa;
	Wednesday	7-10 P.M., America.
15220 kc	Tuesday	4:30-6 A.M., Australia and New Zealand.
	Wednesday	8-11 A.M., Asia.

EA8AB, Santa Cruz de Tenerife, Canary Islands, has changed frequency to 7010 kc and is now sending out programs of "Radio Club of Tenerife" on Mondays, Wednesdays, Fridays and Saturdays, 3:15 to 4:15 P.M. They open and close their programs with "Lady of Spain." Announcements in English on Saturdays only.

And a souvenir card from COCQ, showing the 4-kilowatt transmitter.

XEWI, Mexico D. F., have not as yet received authority to broadcast on 6015 kc and as a consequence are only transmitting on 11900 kc as last reported.

HP5L is the call of a new short-wave broadcasting station to be presently operated at David, in the Province of Chiriqui, Panama. It will operate with 200 watts power on 11740 kc or 25.55 meters and will be known as "Asiul Airam," which is the phrase "Maria Luisa" in reverse.

Mr. Leo Marchowsky is the manager of the company, which is known as Compania Chiricana de Radiodefusion y Television, S. A.

W9XF, Chicago, 6100 kc, announces regularly in eight languages namely: Russian, Spanish, Japanese, French, Swedish, Italian, German and English. They open and close all programs with "The Star Spangled Banner."

W2XE, 6120 kc, announces in five languages omitting the Russian, Japanese and Swedish, but uses the same opening and closing selection as W9XF.

In this respect the NBC and CBS seem to be quite chummy.

This card is a beauty. Call alone in red, background of island in blue, printing in black, leaves of palm tree in green and photo of General Trujillo in brown. Better try for one.

Nix on Queen Mary

GBTT—*Queen Mary,* through the International Marine Radio Company, Limited, Connaught House, 63 Aldwych, London, W.C.2, advise that they are very pleased to know that we heard them, but as they are licensed under the Wireless Telegraph Act of 1904 for commercial working only, secrecy must be observed regarding all transmissions in accordance with the Post Office (protection) Act of 1884 (Section 2) so they therefore regret that they are unable to confirm reports. This for the information of all listeners.

W9XBS, Chicago, Illinois, 6425 kc, and W3XL, Bound Brook, New Jersey, 6420 kc, have been deleted from the station list. The National Broadcasting Company advise they no longer operate on these frequencies experimentally although they may be used from time to time by the engineers for transmitting test signals, etc., yet they present no regular programs and operate on no regular frequencies. As a matter of information to those interested, W3XL has eight assigned frequencies including 17310 kc, mentioned by several as heard on test. W9XBS has upwards of 25 assigned frequencies.

Advance Transmission Data

In accordance with requests from listeners there is given below the addresses of such short-wave stations that send out detailed make-up of program material covering their time on the air:

British Broadcasting Corporation,
Broadcasting House, London, W 1,
England

German Short-Wave Station,
Broadcasting House,
Berlin, Germany

Station EAQ—P. O. Box 951,
Madrid, Spain

"Radio Caracas" YV2RC,
Apartado 2009,
Caracas, Venezuela, S. A.

Station 2RO,
Montello, 5,
Rome, Italy

Radio Coloniale (TPA2-3-4),
Boulevard Haussmann, 98,
Bis, Paris, France

Director, Bureau Central de Presse,
Belgrade Short-Wave Broadcasting Station,
Belgrade, Yugoslavia

Short-Wave Stations,
Radio Centre,
Solianka 12,
Moscow, U.S.S.R.

Estacion Difusora XEWI,
P. O. Box 2874,
Mexico, D. F.

Estacion COKG,
Apartado 137,
Santiago, Cuba

Spanish Pronunciations

In August "Globe Girdling" we printed the Spanish pronunciation of letters of the alphabet and of the simple numerals as shown in the Department of Commerce record book of May 15, 1935.

The Quixote Radio Club of Santa Barbara, California, are of the opinion that the Department of Commerce setup is a poor job, and with the permission of that Club we are listing their interpretation of the letters and numerals mentioned (with comments noted below). This is therefore our second lesson in Spanish.

We are indeed grateful to Mr. E. J. Shields, Editor QRC, for permission and the following lesson:

Letters

a	a
b	be
c	ce
ch	che
d	de
e	e
f	efe
g	ge
h	hache
i	i
j	jota
k	ka
l	ele
ll	elle
m	eme
n	ene
ñ	eñe
o	o
p	pe
q	cu
r	ere
rr	erre
s	ese
t	te
u	u
v	ve
x	ekis
y	ye
z	zeta

Numbers

1	u'no
2	dos
3	tres
4	cua'tro
5	cin'co
6	seis
7	sie'te
8	o'cho
9	nue've
10	diez
11	on'ce
12	do'ce
13	tre'ce
14	ca-tor'ce
15	quin'ce

Comment:—W is not a Spanish letter. In Mexico they call it "double U" while in Cuba it is "double V." They do not say "dubb'l" but "do'ble." In Mexico Y is called "y griega" (Greek I), but in Venezuela it is simply "ye" as in yet. "Ekis" may also be spelled "Equis," the pronunciation being exactly the same.

G before E or I is pronounced like the English H. In Spanish, H is always silent, the letter J having the sound of H. In America the letter Z has the hiss of soft S. Latin vowels are sounded as in the musical scale: do, re, mi, fa, sol, la, ti, do.

Sectional Reports

Referring to the sectional reports which were printed in the September number of "Globe Girdling," we have taken from the recent lists sent in by West Coast listeners such stations as have not been previously shown in September and October issues and are listing them below so that they may be added to the compilation already listed. We will continue in each subsequent

[*Continued on page 530*]

Channel Echoes

By Zeh Bouck

the cheerio program . . . diversified diversity . . . cq to old timers

THIS is the story of how a couple of breakfast plates were broken.

Of all the programs on the air we can think of only one of which much good can be said and nothing bad. The appeal of this program in its conception was limited —but almost universal in its realization. We refer to the Cheerio program that for the last decade has given millions in the eastern part of the country "a good start for the day," or, which is more vital perhaps, soft-pedaled an infinite number of bad starts. Having been back stage of broadcasting for even more years than Cheerio, we can say that this is one of the few broadcasts through the veins of which courses undiluted the blood of sincerity. The vitality of this program is evident in the manner in which it has survived the vicissitudes of broadcasting —the incursions of commercial time. Occasionally there has been talk of a sponsor. But we doubt if Cheerio will ever have a sponsor other than the ideals which have carried him on so nobly for ten years.

Of course, it is inevitable that now and then Cheerio loses a member of his audience. Which brings us to the breakfast plates. The occasion was my mother's birthday. She was sixty something or another. Not so young—and yet not too old. The scene was the kitchen on our farm, with breakfast in the making and Cheerio's Gay Nineties tramping in from the sun-porch. Said a friend to my mother, in a most kindly way—"Well, it won't be long now, Alice, before you're on Cheerio's program." That was how the dishes were broken—and my mother has not listened to the program since.

However, she may return to the fold. Here's hoping she does—say thirty years from now.

Every effort should be made to keep the Cheerio program on the air. "The Story of Cheerio" will shortly be published. The book can be obtained from Cheerio, care of NBC, Rockefeller Plaza, New York City. The price is two dollars, and the royalties will be devoted to the Cheerio Radio Fund which supplies radios to the invalid poor.

◆

ANENT DIVERSITY reception, C. M. Whelan, Denver, Colorado, writes: "O. M., you don't know nothin' yet! I've had diversity reception for years—up and down our block. Sparton to the right—Echophone to the left—blaring out KPOF (Pillar of Fire) hymns and shouting. Same radios running riot with Maw Perkins. Diversity reception from across the street plus diversity reception from the middle of the block!

It would seem that Mr. Whelan has diversity reception.

◆

WERE WE TO publish a list naming those who might properly be excluded from our Old Timers' contest this month, it would read like radio's social register and include David Sarnoff, General Harbord, Dr. Alfred N. Goldsmith, Bertha Brainard, Carl Dreher, Professor (Major) Armstrong, Milton J. Cross, Louis B. Reed. Keith McCleod and many others who looked upon this scene better than ten years ago. However, it's wide open and free-for-all, with a subscription to ALL-WAVE RADIO for the best identification of the accompanying photograph. Note the oscilloscope of the mirror type just under the RCA horn, the porcelain base switches and the loop pick-up for monitoring. Back in the early twenties all this was the proverbial "last word."

◆

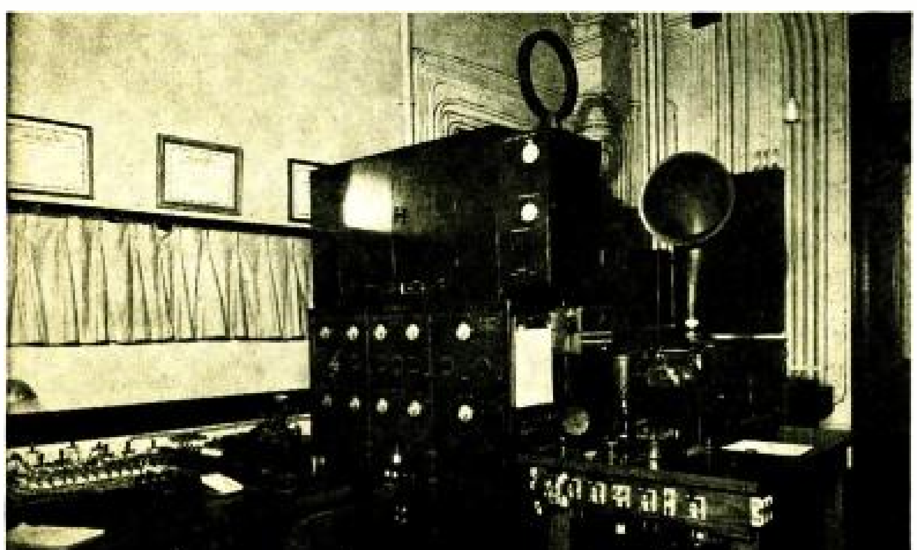
SHORT-WAVE LISTENERS who seek emancipated entertainment in the region of megacycles rather than verifications will welcome the new station at Prague, operating on 15.23 mc. If later programs come over with anything like the signal they're putting down in the experimental transmission at the time of writing, Czechoslovakia will be every bit as reliable as Germany and England.

◆

WITH THE EQUINOX on hand, the Australian stations are coming up in volume, and from about 5:00 A.M., Eastern Standard Time, put through a consistent signal until signing off—VK3ME at 7:00 and VK3LR a half-hour later. Ordinarily we should never have discovered this amelioration in reception from the antipodes. However, early this morning our dog evinced her desire for the wide open spaces. Choosing the lesser evil we let her out, and decided to stay up. We found the lower frequency Mel-

[Continued on page 531]

ANOTHER OLD TIMERS' TEASER



Pins, France. Delete 1ZS in Auckland, New Zealand, on 1420 kc. 4ZC on 1280 should be changed from Cromwell to Otago, New Zealand. According to a notice in the Newark News Radio Club bulletin the Cuban CMCQ, in Havana, has changed from 1420 to 1410 kc and has increased power to 320 watts.

World's Oldest Station?

Though KDKA is usually recognized as the pioneer station of the world, recent newspaper articles state that WWJ has risen to dispute the claim and has very good reason to do so. There is no doubt that KDKA was the first *regular* broadcasting station, being inaugurated on November 2, 1920, and broadcasting regularly since that day. WWJ actually did broadcast its first program a few month's before, on August 20, 1920, but did not carry on any regular schedule of broadcasts. And that is the way the contestants stand. It is hoped that we will not be accused of placing another iron into the fire—but we cannot help but let you know that authoritative information on hand shows that the University of Iowa station WSUI broadcast its first program in the year *1919* under the call 9YA, which was used until the call WSUI was assigned to the station when broadcasting stations were licensed.

World News Briefs

YUGOSLAVIA: The Ministry of Posts and Telegraphs has secured permission from the government to prepare a project for the erection of three new broadcasting stations at the following locations: Belgrade with 100,000 watts; Skoplje with 20,000 watts; and a relay station at Maribor with 3,000 watts. In addition to the above new stations the present station at Zagreb will be increased from 800 to 200,000 watts and the station at Ljubljana will be increased from 5,000 to 20,000 watts. The present station at Belgrade will be moved to Sarajevo, with, we hope, no dire consequences!

ARGENTINA: The City Hotel of Buenos Aires has four central receiving stations enabling 500 of its rooms to receive a choice of four different programs.

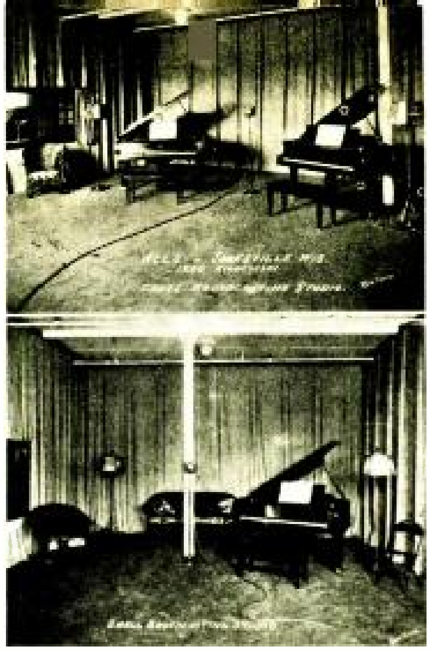


Photo-veri from WCLO, Janesville, Wis., showing the large and the small broadcasting studios.

BRAZIL: Brazilian stations are obliged to broadcast their call letters and the full name of the operating individual or association frequently or at the end of each program broadcast. The use of any other expression will not be allowed, especially any which might lead to the station being known by a sub-title or nick-name.

NEW ZEALAND: A bill has just been passed which permits a new class of station in this country known as the Class "C" Station. Stations in this class will be allowed to broadcast advertising matter heretofore excluded from all broadcasts by the now existent "A" and "B" Stations. No stations have yet been planned for this new class of operation which will be restricted to government-owned stations such as the present Class "A" Stations.

Kilocycling Around

That article on station calls and their meaning in the September issue reminded us of a little story. A few years back while listening to a DX program over WNBH we heard the announcer make the following remark in answer to a fan letter regarding the meaning of the call WNBH. He modestly informed the puzzled questioner that the station had been named after himself, the call letters meaning "Women Never Bother Him." . . . Station CKY is in a mess to say the least. They are assigned two frequencies, and still are not satisfied—but you can hardly blame them. The two frequencies happen to be 910 and 960 kc. On 910 we find the none-too-weak signals of XENT, and on 960 Doc Brinkley holds the fort with his XEAW. Can you blame CKY officials for finding it difficult to decide which of these two frequencies to adopt permanently? . . . From Lyle Nelson, in Yamhill, Oregon, we learn that station ZJV in the Fiji Islands, on 880 kc, is now operating. Night Owl Nelson also submits some information regarding Siamese stations which proved helpful in compiling the world station list in the October issue . . . Ray Geller, the Bronx Night Owl, tells of a little activity in upstate New York. WMBO is now carrying the programs of the NT (WINS) Network, and WFBL is seeking to further its activities by requesting a new station at Watertown, New York . . . Indirectly we learn that the Canadian DX Relay will continue to operate and will be guided by those two great guiders, Charles Hesterman and Randolph Hunt, both very well known in DX Circles. May you have all the luck in the world, fellows, and keep up the good work started by Fred Bisset, former editor of the CDXR. We may be wrong, but it's just one of our hunches that the session in the control room of CKTB at the last CDXR convention was a turning point in Fred's radio career and instilled into his heart a yearning to know more of the transmitting side of radio and eventually led to his forsaking the DX hobby to study for a commercial operator's license . . . The National Radio Club has completed arrangements for a weekly DX News broadcast over station WORK each Thursday at 8:45 P.M. Bob Weaver is in charge . . . And while on the subject of DX News broadcasts, let us not forget to mention the KDKA program every Friday at 11 P.M. conducted by Joe Stokes, one of the best radio DX commentators on the air. You can always depend on the KDKA broadcast for some real news each week during the DX season . . . WCAU has been granted permission to operate from 2 to 6 A.M. on frequencies of 860, 1020, and 1170 kc. in order to make a comparison of fading on three frequencies approximately 150-kc apart . . . KWJJ granted permission to resume operating until 6 A.M. *daily* . . . All time mentioned is Eastern Standard unless otherwise specified, and your letters regarding DX activities will be welcomed by the Chief Night Owl, Ray La Rocque at 135 Highland Street, Worcester, Mass.

CHAMPIONSHIP DX CONTEST PRIZES

Since the Championship DX Contest does not close until May 1, 1937, it has been deemed advisable to list only the approximate cash value of each of the eleven major prizes rather than the actual merchandise, as many changes in equipment may take place in the interval. This will insure our offering merchandise of the latest type and not receivers or radio components that may, in the meantime, have been superseded by apparatus of more modern design.

FIRST PRIZE	**RADIO RECEIVER**	**APPROXIMATE VALUE $150**
SECOND PRIZE	**RADIO RECEIVER**	**APPROXIMATE VALUE $100**
THIRD PRIZE	**RADIO RECEIVER**	**APPROXIMATE VALUE $50**
FOURTH PRIZE	**PRESELECTOR**	**APPROXIMATE VALUE $25**
FIFTH PRIZE	**LOUDSPEAKER**	**APPROXIMATE VALUE $10**
SIXTH PRIZE	**KIT OF TUBES**	**APPROXIMATE VALUE $7.50**
FIVE PRIZES (each)	**EQUIPMENT**	**APPROXIMATE VALUE $5.00**
TEN PRIZES (each)	**SUBSCRIPTION TO ALL-WAVE RADIO**	**VALUE $2.50**

In the event of ties duplicate prizes will be awarded.

"BARB" AND "ERNEST"—
THEY MODULATE

The First CQ

Dear Gerald:

From my standpoint your last letter cleared up a lot of points that I frankly had never paid any attention to before. The fact that by changing the number of turns in a coil you would change the resonant frequency was something that I had not realized before, but your very clear analogy with the slide trombone brought the whole thing home to me much more clearly.

I'm afraid I can't say the same for the boss. She sees the wheels but doesn't know what makes them go 'round. How's chances of chartering your time for a while, so as to pound a little of it into her noodle?

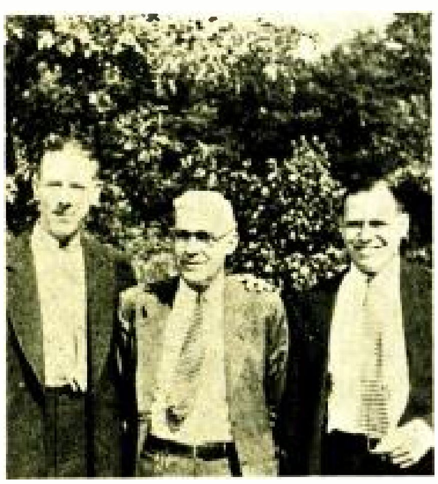
Of course, if I'd had the intelligence I was born with I would have realized that the coil is more or less of a choke, because I've used modifications of this a lot in my work. In signal practice it is customary to use coils to cut back a.c. and let d.c. through, which of course is exactly the same principle that you've described in your letter.

I want to tell you that the boss and I had one swell time last Sunday afternoon at Mr. Appel's station W2FDA, where we saw the wheels go 'round. I suppose I should feel very proud to know that I got an answer to my very first CQ, but to tell the Gospel truth, I was plumb scared to death. If I remember correctly W9FMU who was spending the afternoon with W9UHA in Chicago answered it, and I can assure you that, while I felt like a first-class jackass talking, I got the biggest thrill of my life out of it. Unfortunately, I got very badly bitten with the bug, and I am in deeper now than ever before.

Which reminds me, you haven't told me yet what receiver circuit I should build. We're getting to a point now with the code where we should be able to pass the test very shortly, and I'd like to have a c-w receiver if I should pass. I have an idea, too, that if Barb could help me build a receiver she might get a little more out of this technical stuff.

That's all this time. I'll leave the question to Barb. Please thank Mr. Appel for me for his kindness to both Barb and myself.

Ernest



Muhleman—Rowland—Appel. Photo taken by "W2ICU, under the span of his Johnson Q." Muhleman says he looks like Tilden in the photo—Appel says nuts. Which about covers it.

Scared But Game

Dear Gerald:

I guess it's a good thing you took us to see Mr. Appel's station for frankly I had begun to lose interest in radio, due to sheer fright over ever mastering the technical side of it. I got such a thrill out of seeing the real operation of a station that I guess it will have to be a case of "To Paris or bust." I suppose to your technical mind my absolute ignorance must seem impossible, but really, while enjoying your trombone illustration, it still leaves me much in the dark as to what's what in radio. Ernest insists that I must ask you technical questions as he has given me up as a bad job, but really I haven't enough sense to think of any. I'm like the man who was being chased by a mad bull and when told to say something to the bull could only say "morning, cow."

However, I could write on indefinitely about our visit to W2FDA. If all radio contacts would be as pleasant, I'm sure it would be well worth the effort involved to make the grade. If we ever do own a station, I shall always remember our first QSO.

I'm going away tomorrow for a week and am going to make another desperate effort to conquer the "darn thing"—my code is still lots better than Ernest's!

Please have patience.

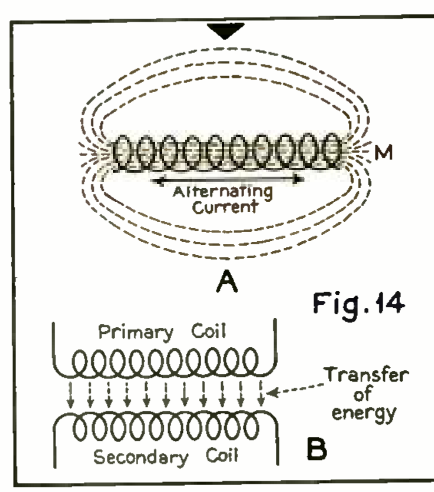
Barb

Barb practicing up at the mike at Appel's shack, preparatory to forming an XYL's knitting bee. Photo by Granger, the sap.

Gerald "Right Back"

Dear Barb and Ernest:

We *all* had a swell time that Sunday. I'll never forget Geo. working his lungs over-time trying to raise a station for your "edification" and getting nary a peep out of anyone—and then you sitting yourself down in front of the mike and raising W9UHA on your first CQ. Boy, have *you* a compelling voice! Maybe you were scared at that, but you certainly didn't sound it. Nor did Barb. I think both of you are going to take to the mike or the key like a duck takes to water.



The magnetic field around an energized coil, and illustrating the transfer of energy from primary to secondary coil of a transformer.

EMBRYO RADIO HAMS

A CARRIER

Ernest trying to slice a sideband with Appel's ACR-175. (It's a posed photo, folks—the signal is emerging from the HRO!)

By rights you shouldn't have rated an answer to your CQ. As I recall it, you said CQ just three times and then left the air, whereas the average Ham yells CQ until his breath gives out. Maybe you'll teach the gang something when you get on the air. If you've got a system for raising a station through bad QRM with only three little come-hither's, the Hams are going to beat a path to your door (and beat the life out of you for copping the DX).

Speaking of receivers—what you really want, and need, is a set with a beat-frequency oscillator with which you can properly receive code signals, and a set with sufficient band spread to make tuning easy in the crowded ham bands. I am designing a not-too-complicated set of this type right now, and you will have the pleasure (?) of building it. When you get through with the job, you'll know a lot more about radio than you do now! You're going to grab a lion by its tail and not be able to let go—but you'll end up by twisting said tail and making the lion behave. But you may sweat a bit first. In the end, the thing will work, and you'll be wiser for the experience.

I'm sorry, Barb, that you've had such a miserable time with the explanations of technical functions. However, I am sure you will be able to grasp the fundamentals more thoroughly after I have had the opportunity of completing the picture I set out to form. So far I have dealt with only fragments of the whole, and I don't wonder that you can't piece together the picture when many of the parts are missing. Just stick with it a while.

Now we had best get back to coils. So far nothing has been said about modern tuning circuits for the reason that tuning today is done with condensers, and as yet condensers have not been covered. We'll finish with the coils first.

Enter the Transformer

No doubt you've read or heard about transformers and wondered just what they are. Fundamentally a transformer is two or more coils placed in proximity to each other but not connected together by a wire conductor. They are used for various purposes, but the transformer action in most cases is principally the same.

A transformer is an interesting unit because the electrical energy flowing in one of the coils is made to appear in the other coil without any direct wire circuit between the two. Ordinarily the coil through which the current flows is referred to as the *primary coil* and the coil into which the current is induced is referred to as the *secondary coil.*

A transformer will not function on a direct current; therefore it may be considered as an alternating current device. It can be used only when the current flowing in the primary coil alters in value, or when the flow of the current is interrupted.

Why? Let's look at Fig. 14. "A" shows a single coil through which is flowing an alternating current. This current develops sort of an electrical halo, M, around the coil, as shown by the dotted lines. We call it a *magnetic field.* As the alternating current increases and decreases its rate of flow through the coil, the magnetic field "breathes." As the current in the coil rises, the field expands; as the current falls, the field contracts, and, as the current alters its direction of flow the magnetic field changes its direction of movement through the center or core of the coil.

The magnetic field is actually electrical energy extending out into the space around the coil. If another coil is placed close to the first coil, as shown at "B," it will pick up energy from the magnetic field even though there is no direct connection between the two coils.

The transfer of energy from the primary coil, P, to the secondary coil, S, Fig. 15, takes place by ***induction.*** As the magnetic field, M, is spreading out from the primary coil as the current flow increases, it envelops or "cuts" the turns of wire of the secondary coil, as shown at "C" and thereby induces a current in them. As the magnetic field contracts, it again cuts the turns of the secondary coil, as shown at "D," and again imparts some of its energy. In other words, as long as the magnetic field is in motion, it will induce a current in the secondary coil, just as wind in motion will blow your hat off!

Now, why won't the transformer shown in Fig. 15 operate on a direct current? Observe, please, that were a direct current to be passed through the primary coil, the magnetic field would ex-

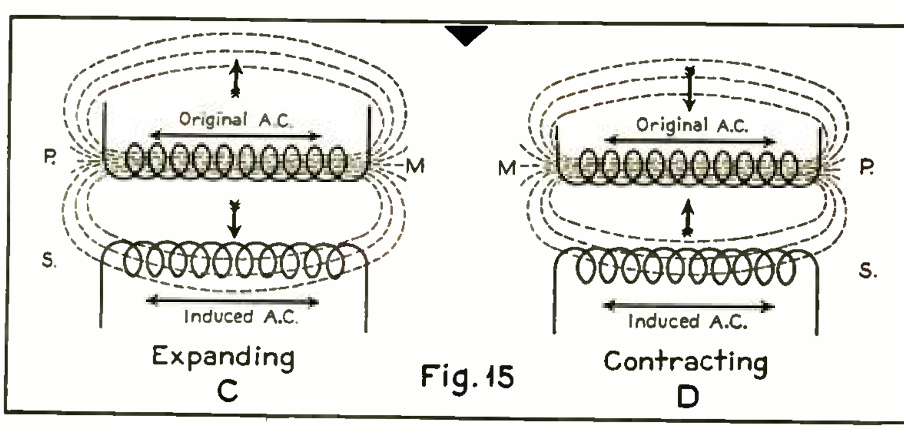
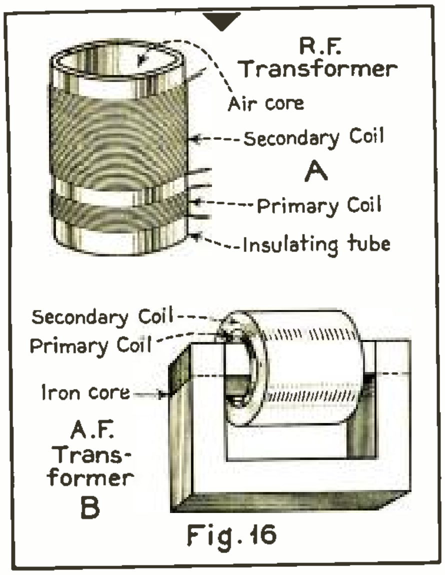


Fig. 15

Illustrating the manner in which the magnetic field expands and contracts, and in so doing induces a current in the secondary coil.



Physical appearance of a typical radio-frequency transformer and an audio-frequency transformer.

pand and then *stay put*, because a direct current does not vary. Consequently the field would cut the turns of the secondary coil only once and thereafter remain motionless. A momentary current would be induced in the secondary during this period of the field expansion, but no further transfer of energy from primary to secondary coil would take place. It's simple when you consider that motionless air won't blow your hat off, but if the air is in motion your hat will be "gone with the wind." Or isn't it simple?

Uses for Transformers

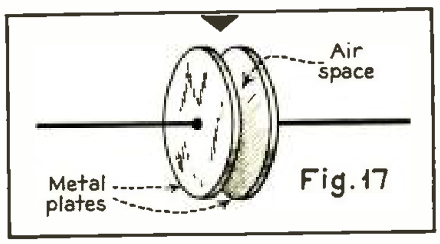
Transformers are used in radio receivers and transmitters to couple one circuit with another, and to build up or reduce voltages. Those used in high-frequency circuits are known as *radio-frequency transformers*, and usually consist of two separate coils of wire wound one above the other on an insulating tube, as shown at "A" in Fig. 16. Since such a transformer is surrounded by air, it is said to have an *air core*.

Transformers used in low-frequency circuits are known as *audio-frequency transformers*. These also consist of two coils of wire wound close together, but in this case the coils are wound on an iron core which serves to provide greater coil inductance and a far better "conductor" for the magnetic field than plain air, as shown as "B" in Fig. 16.

Transformers used to supply energy to a transmitter or receiver are known as *power transformers*. These units also have iron cores. One type is used to step down the voltage from the house line to light the filaments of the vacuum tubes, and the other type is used to step up the voltage from the same source to supply plate power for the tubes.

The action of a step-up or step-down transformer is not difficult to understand. It's merely a matter of arithmetic. If there are twice as many turns of wire in the secondary winding as there are in the primary, the voltage induced in the secondary by the magnetic field will be twice the voltage in the primary. Conversely, if there are only one-half the number of turns in the secondary coil as in the primary coil, the voltage developed in the secondary will be only one-half that of the primary. For instance, if a given step-up transformer has a secondary winding with three times the number of turns as the primary, and the primary is connected to a 110-volt a-c line, the secondary voltage will be 660. If the secondary had but one-third the number of turns as the primary, the voltage would be approximately 36.5 volts.

The type of power transformer used in a radio receiver has a single primary coil which connects to the 110-volt line, and as many as three secondary coils, each having a different number of turns. The single primary winding energizes all three of the secondary windings. One secondary has a large number of turns of wire and supplies 300 volts or so to



A simple condenser, composed of two metal plates separated by an air space.

the high-voltage rectifier tube. Another secondary winding has a small number of turns and supplies 5 volts or so to the the filament of the high-voltage rectifier tube. The third secondary winding also has a small number of turns and supplies 2.5 or 6.3 volts to the filaments of the receiver vacuum tubes, depending upon which type of tube is used.

The type of power transformer used in a radio transmitter is similar to the type used in a receiver, except higher voltages are developed and the filament windings which energize the tube filaments are usually separate units.

That will hold us on coils for the time being. Now let's take a look at condensers.

The Condenser

A condenser is fundamentally a storage tank, and every condenser has a definite storage capacity. In this respect it is like a water tank which has a valve that opens when the tank is completely full and permits all the water to flow out through a pipe. The difference is that a condenser, like a coil, is fundamentally an alternating-current operated device, and therefore, since an alternating current reverses direction periodically, the condenser is first charged to full capacity and thence discharged in one direction, and then charged and discharged in the opposite direction.

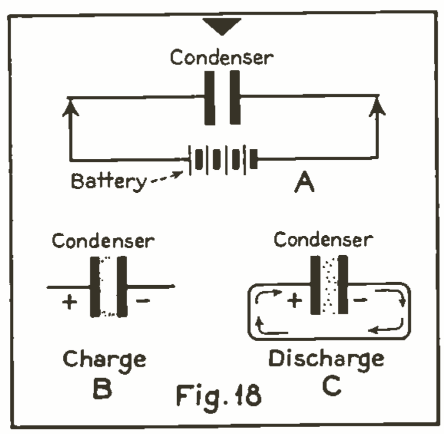
A simple condenser is composed of two metal plates separated by some form of insulation, such as paper, mica or just plain air, as shown in Fig. 17. Like the primary and secondary coils of a transformer, there is no direct connection between the plates. And, just as a direct current flowing in the primary winding of a transformer cannot be induced into the secondary winding, neither can a direct current impressed on one plate of a condenser be transfered to the other plate. To put it plainly, a direct current cannot flow through a condenser.

But an alternating current can. The ease with which such a current can pass through a condenser is dependent upon the frequency of the current and the capacity of the condenser.

Let's follow the action of a condenser. We will suppose first that the condenser is not connected in a radio circuit. If we attach it momentarily to a source of d-c voltage such as the battery shown at "A" in Fig. 18, one plate of the condenser will become positively charged and the other plate will become negatively charged, as shown at "B." If the condenser is then disconnected from the source of voltage it will contain a charge of electricity equal to its storage capacity —and in this respect will be like a tank holding water. If the two plates of the condenser are then connected together by a conductor the condenser will discharge and there will be a flow of current in the connecting wire, as shown at "C."

Since a direct current is a steady source of power, it is evident that the condenser can be charged but once, since the voltage remains constant. However, an alternating current voltage swings from a positive peak, through zero, and then to a negative peak, with the result

[*Continued on page 533*]



Illustrating the manner in which a condenser is charged and discharged.

The Ham Bands

By George B. Hart

W8GCR

potted hams . . . time-delay plate current turner-oner . . . curing key clicks . . . central division convention . . . doping tank condensers

WE have been more or less disgusted at times ourself when we tuned in on certain amateur phone conversations, but when we begin to read items in the press concerning certain unsavory conditions we begin to boil and wish for the "Old Man" and "Rettysnitch." A "Young Squirt" ourself when the Old Man was in his prime, we cannot help but notice an increase in the sort of thing that proved so distasteful to the writer of the following paragraph culled from the weekly pages of *Radio Dial:*

"Even though you don't understand their lingo, one of the interesting things about dialing the amateur phone bands of an all-wave set is the wide variety of fellows you find chattering into 'ham' microphones. Some are just technicians, concerned only with the why and how of QSO, QSA and QRM. Others are such likeable, friendly chaps that they make you wish for a transmitter of your own to get better acquainted with them. And every now and then you run across still another kind you'd just as soon miss. I heard a specimen last week on the 20-meter band. He wouldn't have been pleasant if he'd been *sober* (the italics are ours)! Like the rest of the world, it takes all kinds to make up the amateur radio fraternity, but somehow it made me less anxious to know those other fellows."

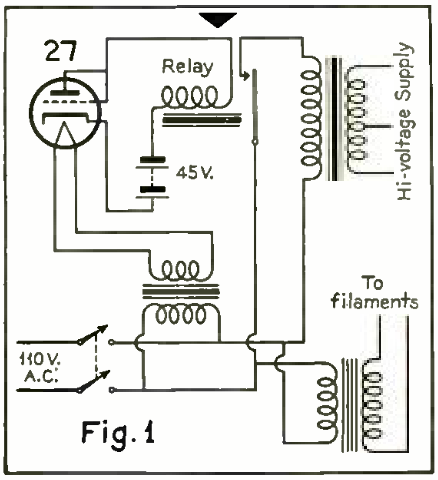
If that is a good way to get increased privileges or increased frequency allotment, then we are crazy as hell. Advertising of that kind does not make for increased public good-will. Personally we wish the late Old Man could cut loose and give "kitty" a chance to scratch the bands clean of that type of licensed operator, whom we refrain from calling "Ham." After all, a Ham is a *gentleman.*

✦

WE WONDER if W8MOL would mind sending us a copy of "Amateur Radio News." We heard about it on the air and it must be good.

✦

THEY ALL loose their minds sooner or later. W8NCV kept hearing c.w. signals after he turned off his receiver. In vain he tried to copy the poor sending until suddenly the canary stopped for another breath. Yep. It actually happened!



Time-delay circuit for handling plate and filament power switching.

✦

WE DON'T suppose there is a single member of the gang who hasn't at one time or another wished for a simple, yet effective, method of turning the plate current on without having to wait for the filaments to heat. Included in our new rig is a simple time-delay device that permits the use of a single switch to operate both filament and plate supplies.

The time-delay circuit shown in Fig. 1, makes use of a 27 tube and any inexpensive relay that will handle the current to the primary of the high-voltage transformer. After the switch in the 110-volt, a-c line is closed the filaments light immediately, but due to the fact that the cathode of the slow-heating 27 must be heated before sufficient current passes in its plate circuit to close the relay contacts, about 30 seconds pass before the plate transformer is energized. The high-voltage transformer remains applied as long as the filaments are lighted.

We tied the grid and plate of the 27 together because the emission current is greater than the plate current with normal grid bias and, as a result, a less sensitive relay is required than would be the case if the grid were brought back to the cathode.

RIGS GET BIGGER and better every year. And workmanship improves. Ray E. Krueger, W8HES, Niles, Michigan, has a layout which, to us, is a perfect example of modern design and construction. Judge for yourself from the accompanying photo.

Features of the transmitter are: Aluminum units for r-f stages, A-cut xtal control, separate Thordarson matched power supplies for each stage, separate bias supplies, complete overload relay protection, and separate meters for each stage. The input is one kilowatt on the 160, 80, 40, and 20 meter bands.

Though only c.w. is now used, phone is to be added later—plate modulating the 1-kw stage.

The design of the 1-kw final may be of interest to any one planning to build such a stage in a relay rack. The 150T's are mounted on a conventional "panel-chassis unit." The split stator grid cir-

[*Continued on page 534*]

THE ONE-KW RIG AT W8HES.

Backwash

Receiver Reviews

Editor, ALL-WAVE RADIO:

You fellows have something in that magazine. Keep up the good work. I have all the issues but August, and one thing that impressed me was a spirit of independence which seems to prevail. In your radio reviews you give what seems to be a rather unbiased analysis of the receivers. Your public is going to love that. At least they should.

I recall reading in one issue a letter from a reader commenting rather caustically on your receiver reviews, charging that they are much too general. They are, I think. But this reader, and I believe you recall the letter, swung too far in the opposite direction. What is needed is a happy medium between that reader's super-scientific report and your fairly general one. It all takes time, I know. At least it's a long step in the right direction and is immeasurably better than the idiotic practice one well-known radio publication is addicted to—having the reviews written by the manufacturer thus insuring an accurate and unbiased report!

Your reviews of ham stations are good. Hope that you'll continue them. "Beat Note" and "Roses and Razzberries" are perfect. I'd like to write a column like that myself. Bet I could do it too.

The rest of the magazine is good. But remember once you take that chip off your shoulder and play up to a gang of advertisers you lose that spirit of unbiased independence. And when you lose that you drop out of the select circle which you rule practically alone in the radio field and drop down to join a lot of has-beens.

WILLIAM A. BACH,
PHILADELPHIA, PA.

(Thanks. We're having a swell time attempting to put out a swell magazine. Anything less would be boring. As to writing "a column like that," we bet you could. Why not try?—Ed.)

Index and Binders

Editor, ALL-WAVE RADIO:

I think that your magazine is the best all-around radio magazine on the market. However, I think that the value of ALL-WAVE RADIO to its readers would be greatly increased if an itemized index were issued for the magazine, say every six months. If an inexpensive binder were issued for ALL-WAVE RADIO they would be much easier to file and articles easier to find; therefore more increased value. I wonder what the rest of your readers think?

E. MACK FRIEDL,
PORT ARTHUR, TEXAS

(A complete index will appear in the January issue—out December 10th. We would be pleased to have binders made up if there is a sufficient demand for them. It is necessary to order these in quantity.—Ed.)

Almost Poetic

Editor, ALL-WAVE RADIO:

I am a subscriber to your AWR for the simple reason the first issue I got hold of was in a second-hand magazine store. It was the December 1935 issue. I at once went to a stand and purchased the May 1936 issue.

Now at this point things happen fast:—
No. 1—I subscribe;
No. 2—First sub. mag. received;
No. 3—I become more fond of the paper;
No. 4—Conclusion: Best darn mag I've ever had.

Your departments are swell; "Backwash", "Channel Echoes", Editorials, Ham Bands are all pips. The style of writing; that is, the language, is real—not the "Now mind Teacher, Johnny" type. (I hope you get me right.)

Now I'm off on No. 5 as follows: Please send me the six back issues to complete my set of AWR, the intimate, and talkative mag. of my heart.

L. F. SCHNEIDER,
WEST ALLIS, WISC.

(We get what you mean—and thanks. Now we're shooting for bigger and better issues. Watch us burn up the insulation.—Ed.)

This and That

Editor, ALL-WAVE RADIO:

The arrival of the September AWR reminds me of a few gossipy bits I've been wishing to send on to you. (Not to draw a reply, of course: if I see any improvement in the paper, I shall know you will have read this!)

By the way, KLZ has gone to 5000 watts. 400' pole: nice reception in new location.

AWR is good: I've dropped everything else. September is good; the Listener is not forgotten. And for goodness sake, you wish us to go oscilloscope at $85.00 per!

Wish your logs had been printed, for one month at least, as a supplement to be handy around the radio. That chap you lambasted for suggesting *Liberty's* make-up had a good idea. It would be nice for technical or build-up directions to be available for ripping from paper for separate filing. Or are we supposed to keep AWR intact?

Just made two nice improvements to my Taco No. 20 antenna:

(1) Moved it until more properly NW/SE. Believe me when I say a directional aerial is DIRECTIONAL, I *mean* it! No fooling about that. Results show.

(2) At Taco's suggestion rebuilt this aerial into X-antenna, 26' legs separated on outer end 6'. Aerial now close to 40' high. Results: Excellent; increase in signal and tonal qualities in receiver. Initial results show wisdom of extra wire. No QRM.

Note: Liquid solder excellent for line splices and plastic roofing cement good for repairing stript lines.

Neighbors across the alley just bought 8-K RCA-Victor. Only 2 gang condenser? Indifferent results, possibly due to poor job on aerial his service man did. Neighbor must now rebuild his own aerial. Serviceman in too much of a hurry; jammed receiver coupler on wrong posts of a 3-post assembly.

What about the ethics of hams? Are those chaps always on the 20-m. band merely enthusiasts or air-hogs? Particularly that DDS out in La. Three or four I recognize on the air constantly might be a menace to others' use of the band.

Been told of a wonderful aerial to be sealed in a piece of sewer tile and buried deep. Also of a wonderful baffle for Midwest; Celotex with 4" thickness, 36" square.

Had a poor summer! Mountain static in gobs: QRM from electric fan down the street. But yet s-w signals came through that QRM.

Zeh Bouck ought not to reply to every postal I send him. And he might append one-sentence replies to his present Queries column.

I like C. F. Mullen on Cabinets. He might continue sometime with some hints on improving existing cabinets, such as

[*Continued on page 535*]

↑

RCVE

SEND

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AUTOMATIC SWITCHING OF XMTING ANTENNA TO RECEIVER

Automatic antenna switching relay made from a Bunnell Telegraph Sounder.

HOW TO CONSTRUCT A RELAY FOR THIS PURPOSE

By FRANK L. McKENNA • W2GNT

MANY amateurs do not realize the benefits accruing from the use of a really good tuned receiving antenna on the high-frequency ham bands, such as 20 meters. A gain equivalent to the addition of an extra r-f stage on the receiver can be realized, without the increase in tube noise such an addition entails. A tuned antenna will increase the pickup of any signal on the band to which it is tuned, without increasing the outside noise pickup. The balanced feeders used with the tuned antenna will in themselves pick up very little noise. This permits the further advantage of locating the antenna away from the local noise source.

Advantage of Tuned Antenna

The advantage of a tuned receiving antenna was brought to my attention on a recent visit to a local amateur. This amateur is using a Johnson Q antenna on 20 meters. The Johnson Q uses an efficient quarter-wave matching stub between the antenna proper and the feeder line. The feeder line is an untuned, balanced line of about 400 ohms impedance. Any feeder line should be close spaced and of low impedance (below about 500 ohms) for minimum noise pickup when receiving. A twisted pair feeder line (such as EO1 type cable) of around 70 ohms impedance is also satisfactory.

This amateur uses a double pole, double throw relay to automatically switch the Johnson Q antenna from the receiver to the transmitter, and vice-versa, when the transmitter "off-and-on" switch is operated. Another hand-operated double pole, double throw switch on the wall above the receiver connects the receiver to the regular untuned antenna and ground for purposes of comparison with the Q transmitting antenna.

Tests were made on reception from European fone and c-w stations. These amateurs were received R7 to R9 on the tuned transmitting antenna, while switching over to the regular untuned antenna dropped them to an R4 to R5 level. Subsequent observations at my own and other amateur stations seem to indicate that there is an average difference of three R's in level between signals received on the untuned antenna and on the tuned transmitting antenna. The difference in reception between the two types of antenna, of course, varies at different stations, the untuned antenna occasionally giving better signals than the tuned antenna—probably due to directional characteristics of the two antennas being checked.

The benefits of having the tuned antenna out in the clear, away from the house, coupled with the use of the balanced feeder line, were also vividly demonstrated to me by this local ham, when using the vacuum cleaner for a test. This particular vacuum cleaner had always killed reception before the Johnson Q was used for receiving as well as transmitting. But with the receiver switched over to the transmitting antenna this racket dropped to a very low level and interfered with the reception of only the weakest signals—and the transmitting antenna was located only a few feet from the house. But even this was sufficient to place the antenna about 40 or 50 feet from the vacuum cleaner itself. Placing the antenna farther away from the noise source should reduce the noise even more than this.

Commercially-built antenna relays are rather expensive at the present, but a very satisfactory one can be built from an old telegraph sounder, and fortunately there are plenty of these floating around amateur shacks.

Construction of Relay

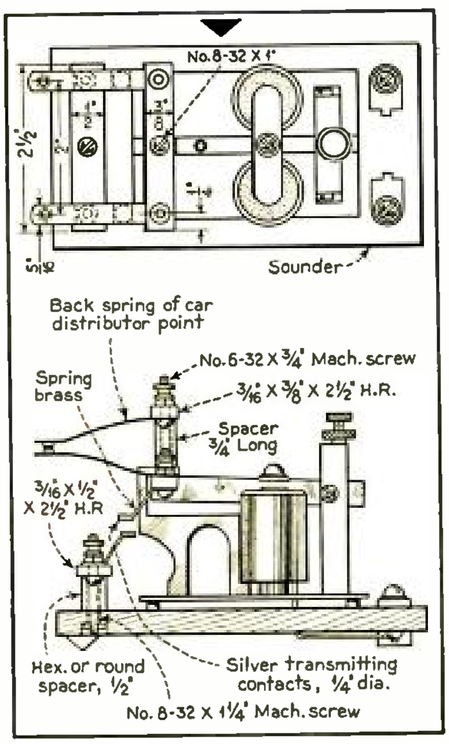
First make the three hard rubber strips to dimensions shown in list of materials or drawing, and ¼" from the end of each drill a hole to pass a 6/32 machine screw. In the center of one of the two ⅜"-wide rubber strips drill a hole to pass an 8/32 machine screw. In the second ⅜"-wide strip of hard rubber drill a hole to pass a 6/32 machine screw, flat head, and countersink the hole so that the head will fit flush with, or below, the surface of the hard rubber strip when it is attached to the rocker arm of the telegraph sounder. Take out the rocker arm and carefully notch the end so that the rubber strip is flush with the top of the arm.

Use a hacksaw to rough out the notch and finish with a file. Fit the ⅜"-wide strip with the countersunk hole in the notch and see whether it fits flush with the top of the rocker arm by sighting across it to see if it lies parallel to the rocker arm pivot bar. Next scribe through the countersunk hole onto the rocker arm for the location of the hole to be drilled and tapped for the 6/32 flat head machine screw that holds the strip to the arm. After tapping, fasten the strip to the arm, again checking whether the strip is parallel to the pivot bar. In tapping use a little oil on the tap to prevent its binding and snapping off in the metal. Use a No. 36 drill.

Assemble the sounder and remove the upper and lower stop adjustment screws. These will not be used in the construction of the relay. In place of the upper stop adjustment screw fasten the remaining ⅜"-wide strip with the hole for the 8/32 machine screw in the center with an 8/32 x 1" machine screw with a ¾" spacer inserted between the strip and the sounder. Assemble the ½"-wide strip to the wooden base of the sounder in much the same manner, using a ½" spacer and an 8/32 machine screw 1½" long. This is assembled in the countersunk screw hole used for attaching the sounder to table, desk, or shelf.

The Relay Contacts

Next make the four silver contacts for the transmitting position of the relay. Very good contacts have been made from a Canadian 5-cent piece by smoothing one surface with a file and quartering with a hack saw. Scribe a ¼" circle on each piece. This may be done easily by using a template consisting of a piece of metal with a ¼" hole drilled in it. Hold the metal firmly on the pieces of silver and scribe the ¼" circles through the hole drilled in the template. The excess silver may be quickly removed with a file. This method is preferable to describing the circles with a pair of dividers as the dividers usually leave a small indentation on the surface of the contact, thereby marring the contact surface which might induce arcing. These contacts should pass from two to four amperes, according to commercial ratings of contacts this size. Scrape the backs of the contacts with a knife to clean the surfaces and tin with solder, leaving enough excess solder to facilitate the sweating of the contacts to the spring arms.



Details of the construction of the automatic antenna switching relay.

Next make the four spring arms. These are made out of strips of spring brass 1/32" thick, ¼" or 5/16" wide, and ¼" long. Make the first bend ¼" from the end and the second bend ½" from the opposite end. In the end bent at ½", cut a slot to pass a 6/32 machine screw. This will facilitate the adjustment of the transmitting contacts. Next tin the ¼" ends with solder, again leaving some excess solder for sweating on the contacts.

The contacts may now be sweated on by placing the contacts in their proper places and holding the soldering iron under the brass arm until the solder flows and the contacts settle into place.

The receiving contacts are obtained from discarded automobile distributor points which may be had for the asking from the local garage mechanic. As there is no effective current through the contacts on the receiving position, these steel arms with brass contacts will serve very nicely. They are removed from the distributor points by filing the head off one rivet. Shape as shown in the drawing.

In assembling the contact arms, start from the bottom and work up. Adjust all contacts so that they meet flush and simultaneously. Also adjust them so that there is just the slightest tension on the arms when the contacts are in position.

The transmitting contacts may be made perfectly flush by reheating the solder while holding the relay in transmitting position. When the solder melts the contacts, due to the pressure on them, will settle in a perfectly flush position.

The relay is then ready for operation.

Installation of Relay

All telegraph sounders have d.c. magnets of low ohmage, usually around 20 ohms. The easiest way to obtain the voltage to operate the relay is to put the relay coil in series with the negative B lead on one of the power supplies in the transmitter, or else in the center-tap lead of one of the transmitter stages. A current of around 50 to 150 mils or so through the relay coil is sufficient to close the contact arm when the transmitter is turned on. The particular transmitter layout used will dictate the correct placement of the relay in the transmitter circuits. The B voltage of the receiver power supply might be used, with a resistor of suitable ohmage in series with the relay coil to cut down the current drawn by the coil. The plate control switch of the transmitter could be made double pole and the extra section used to apply the voltage to the relay, in this instance.

A discrepancy between the photo and the construction layout will be noticed. The relay was constructed with the contact arms turning in, as shown in the photo. However, it would be better to construct the arms parallel, and this construction is shown in the layout. The feeder line from the relay to the transmitter should retain the same size wire and spacing as the line to the antenna.

Coupling to Receiver

Coupling to the receiver should be experimented with until the best signal strength from *foreign* signals is obtained. For best results the feeder line to the receiver should be matched in with the same care as to the transmitter. The method used here is to mount a piece of tubing of small diameter near the relay. Two coils, of a few turns each, determined by experiment, should be wound on this form and doped up so that the distance between them may be varied. One coil connects to the receiver contacts on the relay, the other to the antenna coil of the receiver. A twisted pair may be run from this coil to the receiver, and the coil turns and coupling varied for best results.

The relay may be used with any type of antenna and feedline, but best results are obtained when the feedline is untuned, either of open line construction, as in the Johnson Q, or else a twisted pair, such as the EO1 cable. Remember that it is important to properly match the feedline to the receiver, or else the antenna will not work as a tuned antenna in the receiving position.

Materials

1 Bunnell Telegraph Sounder
4 Back springs of worn distributor points
2 Strips of hard rubber, size 3/16" x ⅜" x 2½"
1 Strip of hard rubber, size: 3/16" x ½" x 2½"
6 6/32 x ¾" machine screws and nuts, brass
6 Knurled machine screw nuts, 6/32, brass
1 8/32 x 1" machine screw, brass
1 8/32 x 1½" machines screw, brass
4 ¼" dia. silver contacts made from foreign coin
4 Strips of spring brass 1/32" thick x ¼" wide x 1¼" long
1 6/32 x ⅜" flat head machine screw
1 Nickeled brass spacer, ¾"
1 Nickeled brass spacer, ½"

Tuning Indicator Circuits

FOR THE 6E5 AND 6G5 ELECTRON-RAY TUBES

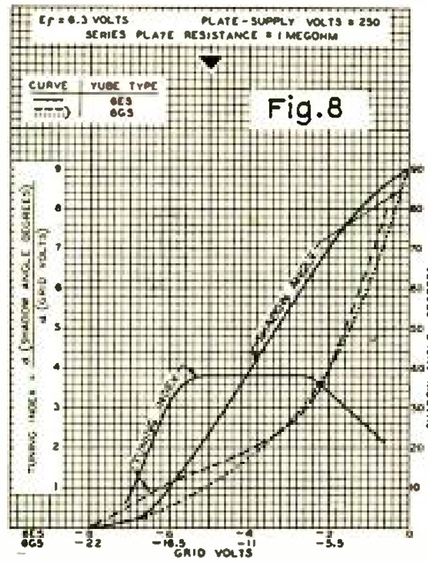
Developed in RCA Radiotron Laboratories

THE 6E5 and 6G5 are electron-ray tubes intended for use as tuning indicators in radio receivers. Both tube types have the same external appearance and base-pin connections, but their cut-off voltages are different. This article discusses the characteristics of several practical tuning-indicator circuits that employ these tube types.

Fig. 1 shows the variations in plate current, target current, and shadow angle vs. d-c grid voltage for the 6E5. Fig. 2 shows these relations for the 6G5. Both tube types have brilliant flourescent areas when they are operated from either 100- or 250-volt power-supply sources. For 250-volt operation, the 6E5 cuts off at -8 volts and the 6G5 cuts of at -22 volts; for 100-volt operation, the 6E5 cuts off at -3.3 volts and the 6G5 cuts off at -8 volts. A 1-megohm resistor should be connected in the plate circuit of either tube type for 250-volt operation; a 0.5-megohm resistor should be used in this position when the plate-supply voltage is 100 volts.

250-Volt Operation

Fig. 3 is a typical tuning-indicator circuit for either the 6E5 or the 6G5. Because the avc circuit is not delayed, the grid of the tuning-indicator tube can be connected to the avc filter, as shown. The 6E5 should be used in this circuit when the maximum avc voltage is approximately 8 volts; the 6G5 should be used when the maximum avc voltage is approximately 22 volts. However, the



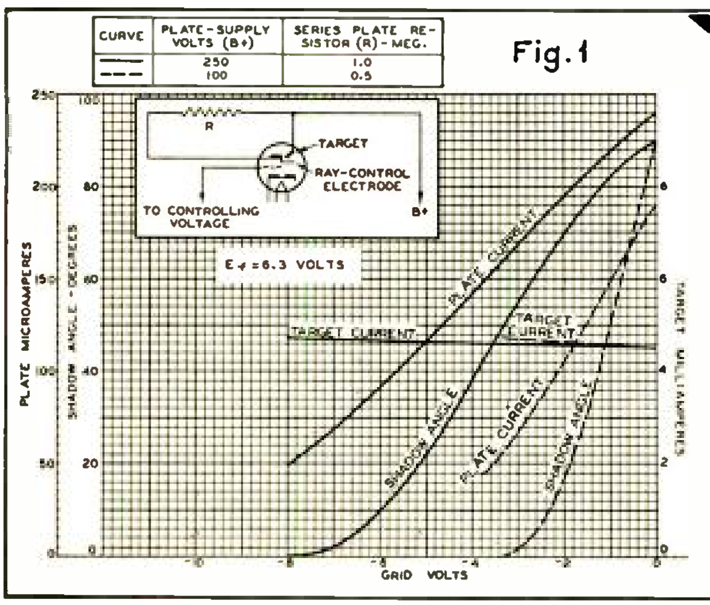
Shadow-angle change for the 6G5 and 6E5.

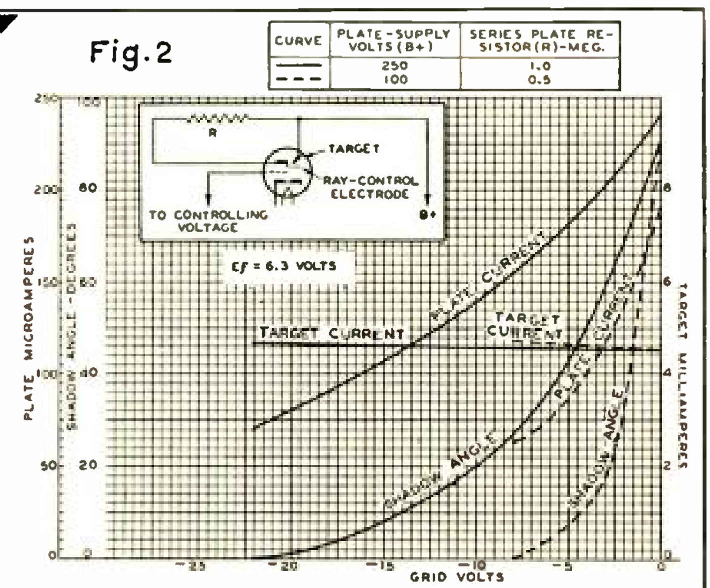
fluorescent area of either tube type overlaps when the avc voltage exceeds the cut-off voltage of the tube. In the event that overlapping occurs, a resistor (R_3) may be connected as shown in order to reduce the maximum avc voltage to the cut-off voltage of the tube. The value of R_3 is easily determined: a strong signal is applied and R_3 is adjusted until the shadow angle is nearly zero. If the required value of R_3 is low enough to reduce the avc voltage appreciably, it is desirable to obtain the d-c controlling voltage for the 6E5 or 6G5 from the audio-diode circuit. Because the audio-diode circuit must be tapped in order that the controlling voltage will equal the cut-off voltage of the tube, a separate a-f filter is required for the tuning-indicator tube. Two electrically equivalent circuits of this type are shown in Fig. 4 a and b. Either the 6E5 or 6G5 may be used with these circuits when the maximum diode-circuit voltage exceeds 22 volts; the 6E5 should be used when the maximum diode-circuit voltage is less than 22 volts.

When the avc system is delayed the tuning-indicator tube should be actuated through its own filter by the audio-diode circuit. If the 6E5 or 6G5 is actuated by the avc voltage in a delayed avc system the indicator tube will not operate until the carrier voltage at the diode exceeds the delay voltage. The circuit of a typical delayed avc system with connections for the tuning-indicator tube is shown in Fig. 5. In the event that overlapping occurs with this circuit a resistor (R_3) may be connected as shown in order to reduce the controlling voltage to the cut-off voltage of the tube. Resistor (R_3) does not reduce the avc voltage in this circuit.

Combined Rectifier-Indicator

The 6E5 or 6G5 can be used as a combination second-detector and tuning-indi-





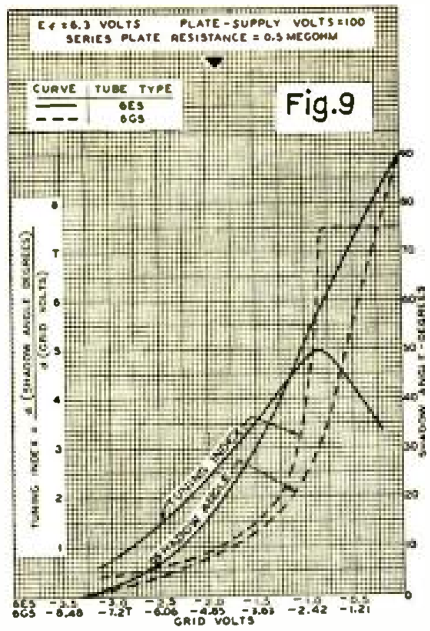
Variations in plate current, target current, and shadow angle vs. d-c grid voltage for the 6E5 and 6G5 tubes.

cator tube when it is connected as shown in Fig. 6. The usual values of grid resistor and condenser are used; the audio voltage is obtained from the grid resistor, as shown. The plate and target circuit is filtered for audio-frequencies in order to prevent the pattern from fluctuating at an audio-frequency rate. When this circuit is used, the 6E5 or 6G5 should be placed close to the last i-f transformer. With the recommended plate-target resistance, the no-signal shadow angle is less than 90 degrees, because the initial plate-target voltage is adjusted to a low value for good sensitivity. The sensitivity is high for weak signals and decreases with increasing signal strength. An important feature of this circuit is that the edges of the fluorescent area do not overlap, regardless of signal strength, because the d-c plate current remains constant over a wide range of signal voltages.

Fig. 7 is a circuit for obtaining high sensitivity on weak signals. The volume control is part of the diode load; the audio signal and the controlling voltage for the 6E5 or 6G5 are obtained from the arm of the volume control. Resistor (R_5) and condenser (C_4) constitute the audio filter for the 6E5 or 6G5. Resistor (R_8) is used to obtain an indication on the 6E5 or 6G5 when the volume control is in the zero-output position. The value of R_8 is determined by setting the volume control for normal audio output with a strong signal applied and then adjusting R_8 until the shadow angle is very nearly zero. Thus, for strong signals, the controlling voltage is limited by the setting of the volume control. For weak signals, the volume-control setting is advanced; consequently, the audio output and the controlling voltage of the 6E5 or 6G5 are increased. When the audio amplification of the receiver is low, resistor (R_9) may be added in order to prevent overlapping at advanced settings of the volume control. The value of R_9 is determined by trial.

Shadow-Angle Change

As mentioned previously, either the 6E5 or 6G5 may be used as a tuning indicator when the maximum controlling voltage exceeds 22 volts. Under this condition, it is necessary to tap the diode load at the proper point for each tube type in order to prevent overlapping. When this is done, the ratio of the controlling voltage applied to the 6G5 to that applied to the 6E5 is 22/8. Thus, the 6G5 is always actuated by more controlling voltage than the 6E5 for the same total diode-circuit voltage. Because of this voltage difference, the shadow-angle change is greater for the 6G5 than for the 6E5, as shown in Fig. 8. In this figure, one ordinate is used for both tube types; the abscissas are in the ratio of 22/8. For example, if the maximum diode-circuit



Variation of shadow angle and tuning index vs. controlling voltage for 6E5 and 6G5 with 100-volt supply.

voltage is 30 volts, a 6E5 would be tapped at the 8-volt point and a 6G5 would be tapped at the 22-volt point. When the total diode-circuit voltage is reduced to 7.5 volts, a 6E5 would be controlled by 8/30 x 7.5 = 2 volts and the shadow-angle change would be 20 degrees; the 6G5 would be controlled by 22/30 x 7.5 = 5.5 volts and the shadow-angle change would be approximately 52 degrees.

The total change in shadow-angle from the zero-signal angle is not the only measure of the sensitivity of these tube types. In actual operation, the tuning dial is rocked about the resonant frequency. For this reason, the rate of change of shadow angle (tuning index) at any point on the shadow-angle curve is a good indication of the facility with which a receiver can be tuned to the carrier frequency from a nearby frequency. Fig. 8 shows the rate of change of shadow angle vs. controlling voltage for both tube types. From these curves, it is seen that the change in shadow angle for small changes in controlling voltage is greater for the 6E5 than for the 6G5 over the major portion of the operating range. Thus, the tuning index of the 6E5 is greater than that of the 6G5 over a wide range of controlling voltages.

100-Volt Operation

Fig. 9 shows the variation of shadow angle and tuning index vs. controlling voltage for both tube types when the B-supply voltage is 100 volts. One ordinate is used for corresponding curves and the abscissas are in the ratio of 8/3.3, the respective cut-off voltages of the 6G5 and 6E5. These curves show that the total change in shadow angle from the zero-signal angle is greater for the 6G5 than for the 6E5; however, the tuning index is greater for the 6E5 than for the 6G5 over the major portion of the operating range. When the maximum diode-circuit voltage is less than 8 volts, the 6E5 should be used; either tube type may be employed when the maximum

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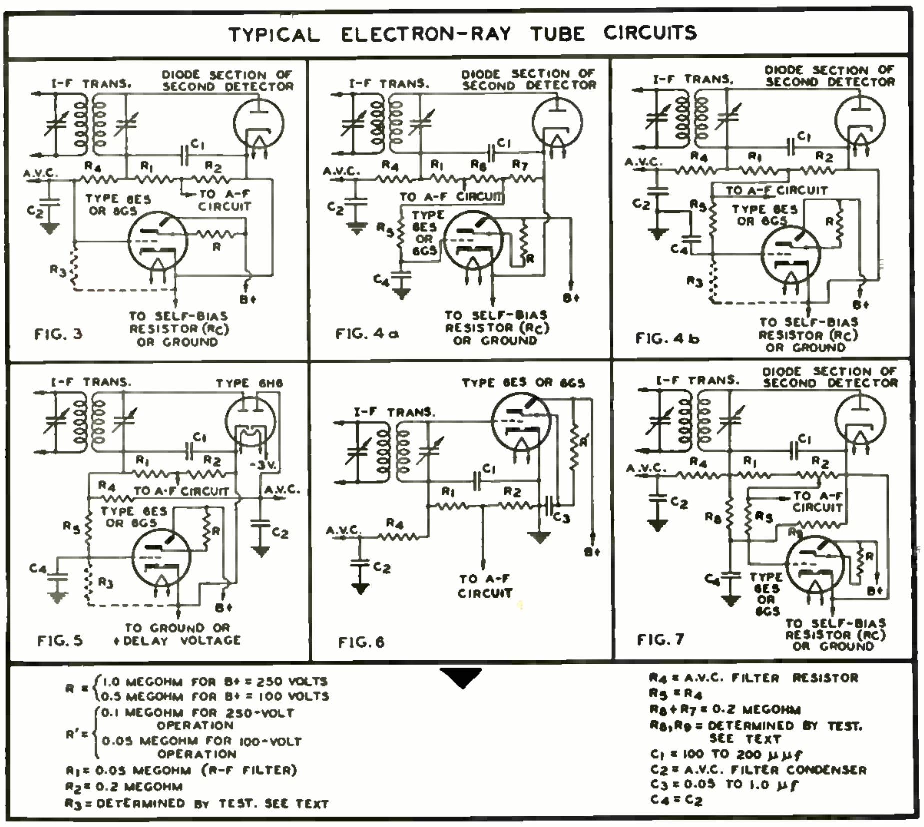


Various tuning-indicator circuits for the 6E5 and 6G5 electron-ray tubes, with parts values.

Queries

ohm's law in tube circuits . . . when to call in a service man

THE primary purpose of the Queries Dept. is to solve the technical and semi-technical problems of our readers who feel they require such assistance. However, questions, so long as they are related to radio, need not be of a technical nature. Every question will be answered personally — by mail. A self-addressed and stamped envelope should be included. Rather than publish the answers to many questions each month—in a necessarily abbreviated form—we shall select only one or two of general interest which will be elaborated upon and answered in detail. These questions will be numbered, an index will be published periodically, and, in time your files of this department should prove a valuable reference work.

Question Number 17

"This is no doubt a question dealing with the elemental workings of Ohm's Law—but one which puzzles me nevertheless. Take for instance the circuit of the noise silencer adapter on page 107 of AWR for March (though any other tube circuit would do). The screen voltage dropping resistor, R-1, has a value of 50,000 ohms. This resistor drops the screen voltage to the 6L7 and 6J7 tubes to a value of about 100 volts presumably. According to the RCA Metal Tube Manual, the operating current of these two screens would be about 6 milliamperes. In that case it appears to me that the IR drop across R-1 would be 50,000 x .006 or 300 volts.

"Please set me straight on this point or recommend some book or paper which covers the subject of voltage-dropping resistors and voltage dividers."

R. A. H., Rochester, N. Y.

Answer:

Ohm's Law was described in detail in an article by A. A. Berard, appearing in the August issue of ALL-WAVE RADIO. Restated briefly, $I = E/R$, $R = E/I$ and $E = IR$—that is, the current equals the voltage divided by the resistance, resistance equals voltage divided by the current and the voltage equals the current multiplied by the resistance, when the units are in volts, amperes and ohms. This law, as Berard put it, has not been repealed. It is universal in its application and holds for vacuum tube circuits as well as for ordinary resistors.

R. A. H.'s figures are correct—only his premise is wrong. The screen grids will be operated at a voltage lower than one hundred; the screen current will therefore be less than 6 milliamperes and the voltage drop across R-1 less than 300 volts.

As R. A. H. suggests, any other tube circuit will do—so let us take a more simple arrangement, such as Fig. 1 which shows a 112-A tube with a 100,000-ohm resistor in the plate circuit. Operating at 180 volts, with a normal grid bias, this tube draws 8 milliamperes of plate current. This would indicate a voltage drop across the plate resistor of 800 volts, which would leave the tube with minus 620 plate volts! This, of course, is ridiculous. What actually happens is that a balance is achieved in the circuit. Due to the high resistance, the voltage applied to the plate of the tube is much below 180 volts. At a lower plate voltage the tube naturally draws less current, the value of which is such that the drop across the resistor is less than 180 volts.

Let us investigate the matter from the point-of-view of Ohm's Law. Assuming a plate resistance for the tube of 5000 ohms, we have a total resistance of 105,000 ohms—across which 180 volts is applied. According to Ohm's Law this will result in a current of .001715 ampere, or 1.715 milliamperes. (In actual measurements we'd round this off to 1.7 m.a., but for the sake of the arithmetical demonstration we must carry it out another two decimal points.) The drop across the resistor will therefore be .001715 x 100,000 or 171.5 volts. Subtracting from 180, this leaves 8.5 volts across the tube. With the data on hand, we can check this in three ways with Ohm's Law the better to demonstrate the inter-relation of the factors.

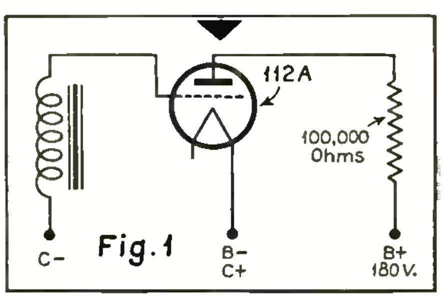


Diagram used to illustrate Ohm's Law in tube circuits.

Check 1: The voltage across the tube divided by the current should equal the resistance of the tube—8.5/.001715 = 5000 ohms. *Check 2:* The resistance of the tube times the current should equal the voltage across it—5000 x .001715 = 8.5. *Check 3:* The voltage across the tube divided by the resistance of the tube should give the current flowing through the tube—8.5/5000 = .001715.

While the above figures are quite accurate and suitable for the purpose of the explanation given, they do not present true operating conditions because it has been assumed that the resistance of a vacuum tube is similar to the resistance of a 5000-ohm resistor of perfect characteristics. Such is far from being the case. The resistance of a vacuum tube is not constant, and changes with different plate and grid voltages. Thus, in the example just discussed, a change in the plate voltage caused by the drop across the plate circuit resistor would alter the resistance of the tube with a resulting differential action that is rather complicated. Also, operating with a resistive load of 100,000 ohms value, a much lower grid bias would be applied which would again change the plate resistance.

However, the main thought is that Ohm's Law still applies, and the voltage drop must be considered as across the entire resistance—tube resistance and plate resistance—the tube receiving a portion of this voltage in the ratio of its resistance to the total resistance.

Question Number 18:

"I have a Westinghouse Model 601. I should like to know the year in which this set was manufactured. I obtained this set from a New York firm about four months ago. It employs an Eveready Air Cell for the A supply—dry batteries for the rest. After a month and half of operation, during which time it was possible to receive only local stations, the volume began to die down, a tube burned out which was replaced by a local serviceman, and after

[Continued on page 533]

RADIO PROVING POST

THE PILOT MODEL 293

Six Metal Tubes 16 to 550 Meters

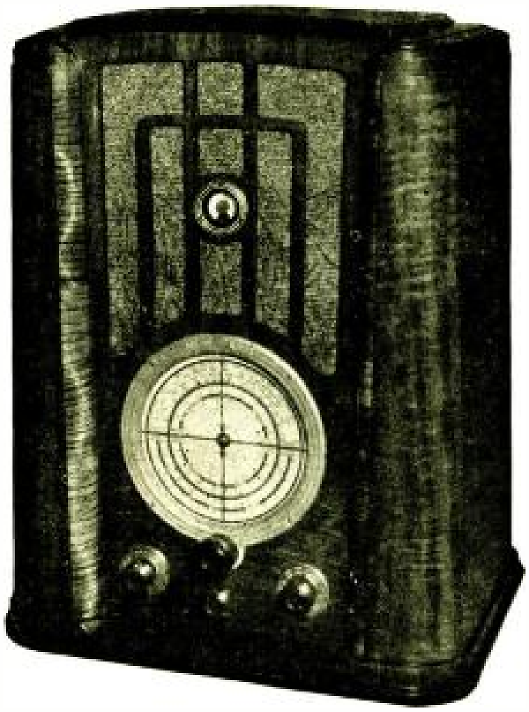


Fig. 1. The Pilot Model 293 All-Wave Receiver with electron-ray tuning indicator.

WE obtained a Pilot Model 293 all-wave receiver for test this month with the express purpose in mind of determining what degree of results could be expected from a set in the low price range as compared with the more expensive eight to ten tube table model receivers.

Curve of Merit

The results we obtained are interesting because they indicate, at least generally, that if both price and the number of tubes are plotted against overall performance, the curve does not rise as abruptly as one might suspect. It is true, of course, that if certain factors such as quality or frequency response and power output are permitted to be the determining points, the curve of merit rises rapidly with an increase in the price of a receiver and the number of tubes it employs. The curve of merit relating solely to sensitivity and selectivity is less abrupt in its rise, but here again price and the number of tubes show their effect.

The interesting point, however, is that a low-priced receiver with not less than six tubes has an *overall* performance as related to price that comes close to the peak in a curve of merit based on the factors previously outlined. The curve drops off above and below this price-performance inter-relation.

The Pilot Model 293 receiver, shown in Fig. 1. hits this point in the overall merit curve. The set uses six work-producing tubes (seven if the 6G5 electron-ray tuning indicator is included.) Six is a happy number in relation to the design of a superheterodyne receiver, for with six tubes all vital circuit functions can be taken care of. If the number is reduced to five, some function of the receiver is bound to suffer.

Suppose we refer to the circuit diagram of the Pilot Model 293, shown in Fig. 2. A 6K7 tube is used as a radio-frequency amplifier or, as it is often called, a pre-selector. This is followed by a 6A8 which serves as the mixer or first detector and oscillator. A second 6K7 is employed as the intermediate-frequency amplifier, and this is followed by a 6Q7 which serves as the second detector, automatic volume control and intermediate audio amplifier. The audio amplifier section of this tube feeds directly the 6F6 pentode power output tube coupled to the loudspeaker. Then, of course, the 5W4 tube supplies the plate voltage for the tubes and the excitation for the field of the dynamic speaker.

Tubes vs. Performance

Now let us see why none of these tubes can be safely dispensed with, and again why the six tubes used are adequate to meet standard reception requirements. It is obvious that the 5W4 high-voltage rectifier tube cannot be eliminated as its use is necessary for supplying voltage for the operation of the receiver. It is also obvious that the 6F6 couldn't be left out as it is necessary for developing power for driving the loudspeaker. Likewise, neither of these functions could be taken care of satisfactorily by some dual-purpose tube.

What of the 6Q7? This is a dual-purpose tube to begin with, and it could not exceed its present triple function. Much of the same thing applies to the 6A8—it is a dual-purpose tube operating as mixer and oscillator.

The only remaining possibilities are the two 6K7 tubes. The 6K7 pre-selector stage could be eliminated, but not without reducing sensitivity and—what is decidedly more important—the degree of input selectivity necessary in a superheterodyne receiver to prevent image and second channel interferenc. If this tube were eliminated, receiver performance would take a perceptable drop.

There is left now only the 6K7 intermediate-frequency amplifier stage. If the second detector tube were a straight pentode—in which case it would be most difficult to obtain proper automatic volume control action—there would be the remote possibility of developing fair gain or amplification by the use of regeneration in this stage, but the arrangement would be a makeshift one to say the least. Yet it is the intermediate-frequency amplifier in a superheterodyne receiver that must be relied upon to provide the majority of the gain and selectivity. It is reasonable to assume, therefore, that the 6K7 intermediate amplifier could not be safely dispensed with.

In other words, less than six tubes in a super will not suffice if satisfactory sensitivity and selectivity are to be obtained, to say nothing of reception free from artificial image and second channel interference. This does not take into account the fact that the mixer could be made regenerative to advantage, but the proper control of regeneration is beyond any but the experienced operator, and would not do in a stock receiver.

On the other hand, six tubes meet very nicely the major requirements imposed by a receiver employing a superheterodyne circuit. No portion of the circuit is left at a disadvantage. Moreover, if the output power stage is ignored, the addition of one or two more tubes will not increase performance with the price increase in the same relative proportion. It is at the six-tube point that the curve of merit as plotted against price ceases to rise abruptly.

But how much can be expected from a receiver such as the Pilot Model 293? Let's first see what this set has to offer.

Receiver Details

As can be seen from Fig. 1, the airplane dial is larger than usual for this type of receiver. It is, in fact 5½ inches across. The lower and inner portions of the face are divided up into the three bands covered by the set, the calibrations in each band being in both frequency and wave-length. The outer surface of the upper half of the dial contains the call letters of the principal broadcast-band stations in the United States with a red line under each indicating the approximate position for the pointer. There are 68 stations so logged and any one of this number can be tuned to without the bother of having to consult frequency tables. The broadcast-band frequency and wavelength calibrations are also on the upper half of the dial, directly beneath the log of call letters.

The lower half of the dial face is occupied by the calibrations for the two short-wave bands covered by the receiver. Aside from the scale notations in both frequency in megacycles and wavelength in meters, the 16, 19, 25, 31 and 49 meter broadcast bands are spotted for quick reference. Moreover, the locations of the principal short-wave broadcast stations—such as London, Berlin, Paris, Moscow, etc.—are printed in red right on the dial face directly above the markers spotting the various bands.

The dial has no band-spread pointer, but the tuning knob which actuates the tuning pointer, and which is directly below the dial, has two speed ratios. When the knob is pushed in, the pointer travels fast; when the knob is pulled out, the pointer travels slow. When in the slow-motion position, the knob requires seven complete revolutions for the pointer to traverse the same distance that requires but one revolution of the knob when in the fast-motion position.

The receiver has a frequency coverage from 18,800 to 545 kc, or 16 to 550 meters. The band-selector switch below and to the right of the tuning knob has three positions as follows: 545 to 1700 kc, 2000 to 6000 kc, and 6000 to 18,800 kc. The setting of this switch automatically lights up the proper band scale on the face of the dial.

The volume control is below and to the left of the tuning knob. The combination power switch and tone control is located directly below the tuning knob. The complete tonal range of the receiver is obtained when the control is turned full to the right.

Receiver Controls

The electron-ray tuning indicator is mounted directly in the center of the loudspeaker grille so that it is normally at eye level. Aside from its utility as an indicator of resonance when a station is properly tuned in, it permits silent tuning in the broadcast band. It is only necessary to turn down the volume control and tune for maximum indicator deflection on the desired station. The vol-

[*Continued on page 524*]

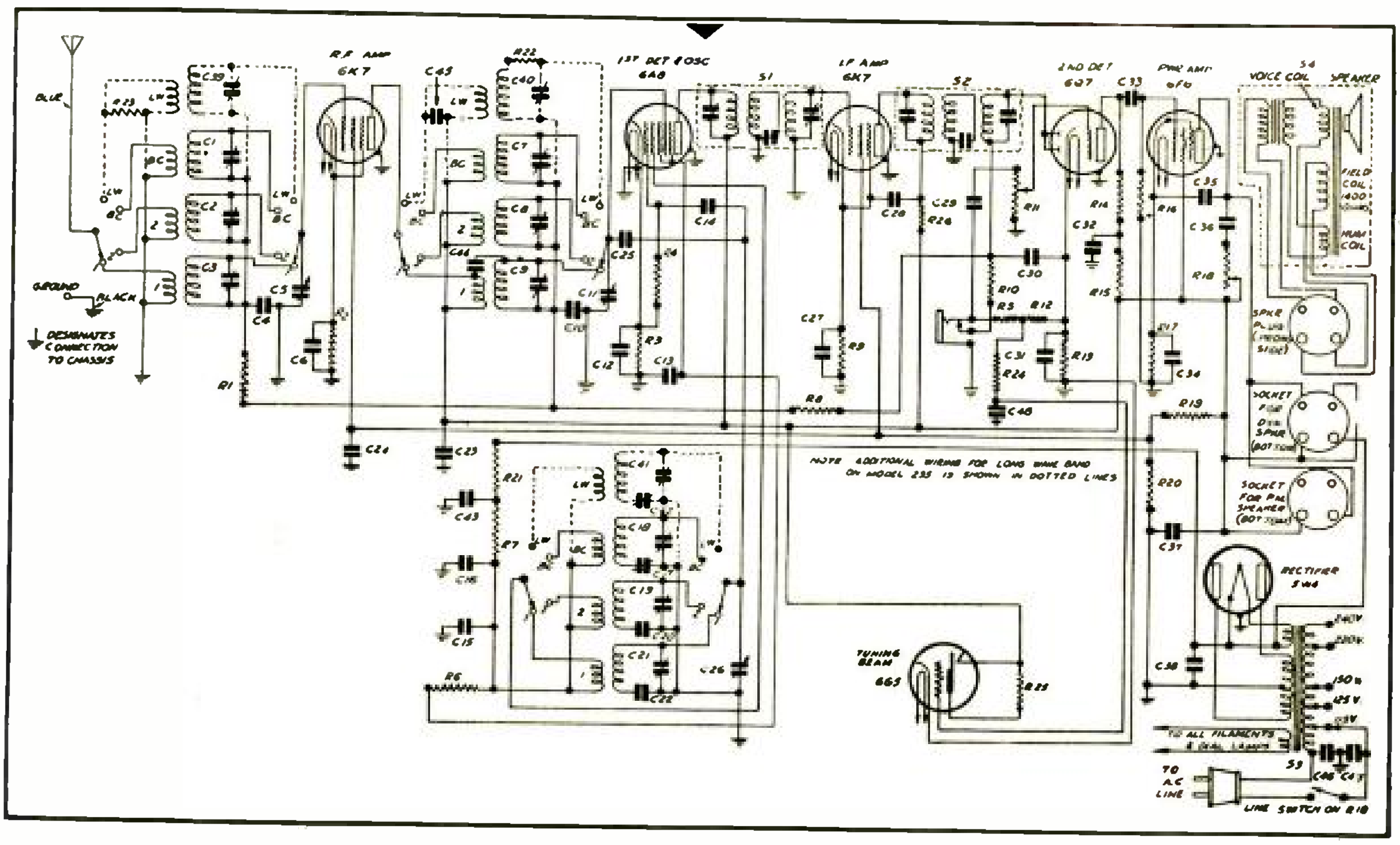


Fig. 2. Circuit of Pilot Model 293. Note that provisions are made for the use of a phonograph pickup and an additional p-m speaker.

SHORT-WAVE STATION LIST

BROADCAST STATIONS INDICATED BY DOTS • PHONE (P) • EXPERIMENTAL (E) • HOURS IN E.S.T.

KC	Meters	Call	Location	Time
55500	5.41	W1XKA	● Boston, Mass.	Sunday 7-11 A.M., 4 P.M.-12 A.M. Daily 11 A.M.-9 P.M.
31600	9.4	W8XKA	● Pittsburgh, Pa.	3-11 P.M. daily
31600	9.4	W3XKA	● Philadelphia, Pa.	Weekdays 11 A.M.-11 P.M. Sundays 9 A.M.-11 P.M.
31600	9.4	W8XWJ	● Detroit, Mich.	Sunday 2:30-7:30 P.M. Daily 6:15 A.M.-12:30 P.M., 2-5 P.M., 7-10 P.M.
24380	12.3	CRCX	● Bowmanville, Ont.	Experimental
21540	13.92	W8XK	● Pittsburgh, Pa.	7 A.M.-9 A.M. daily
21520	13.94	W2XE	● Wayne, N. J.	7:30 A.M.-1 P.M. daily
21500	13.95	NAA	Washington, D. C.	(E) Time signals
21470	13.97	GSH	● Daventry, England	6-8:45 A.M., 9 A.M.-11:30 A.M. daily.
21420	14.01	WKK	Lawrenceville, N. J.	(P) Phones LSN - PSA daytime; HJY - OCI-OCJ irregular
21160	14.19	LSL	Buenos Aires, Arg.	(P) Phones GAA mornings; DFB-DHO-PSE-EHY irreg.
21140	14.19	KBI	Manila, P. I.	(P) Tests and relays P.M. irregular
21080	14.23	PSA	Rio de Janeiro, Brazil	(P) Phones WKK-WLK daytime
21060	14.25	KWN	Dixon, Calif.	(P) Phones afternoon irregular
21020	14.29	LSN	Buenos Aires, Arg.	(P) Phones WKK-WLK daily; EHY, FTM irregular
20860	14.38	EHY	Madrid, Spain	(P) Phones LSM-PPU-LSY mornings
20860	14.38	EDM	Madrid, Spain	(P) Phones LSM-PPU-LSY mornings
20835	14.40	PFF	Kootwijk, Holland	(P) Phones Java days
20830	14.40	PFF	Kootwijk, Holland	(P) Phones Java days
20825	14.41	PFF	Kootwijk, Holland	(P) Phones Java days
20820	14.41	KSS	Bolinas, Calif.	(P) Phones Far East A.M.
20380	14.72	GAA	Rugby, England	(P) Phones LSL mornings; LSY-LSM-PPU irregular
20040	14.97	OPL	Leopoldville, Belgian Congo, Africa	(P) Tests with ORG mornings and noon
20020	14.99	DHO	Nauen, Germany	(P) Phones PPU-LSM-PSA-LSL-YVR A.M.
19987	15.01	CFA	Drummondville, Que.	(P) Phones north America irregular
19980	15.02	KAX	Manila, P. I.	(P) Phones KWU evenings; DFC-JVE A.M.; early A.M.
19820	15.14	WKN	Lawrenceville, N. J.	(P) Phones GAU A.M.
19720	15.21	EAQ	Madrid, Spain	(P) Relays & tests A.M.
19680	15.24	CEC	Santiago, Chile	(P) Phones OCI - HJY afternoons
19620	15.29	VQG	Nairobi, Kenya, Africa	(P) Phones GAD 7-8 A.M.
19600	15.31	LSF	Buenos Aires, Arg.	(P) Phones and tests irregularly
19530	15.36	EDR2	Madrid, Spain	(P) Phones LSM-PPU-YVR mornings
19530	15.36	EDX	Madrid, Spain	(P) Phones LSM-PPU-YVR mornings
19520	15.37	IRW	Rome, Italy	(P) Phones LSM-PPU-mornings. Broadcasts irregularly
19500	15.40	LSQ	Buenos Aires, Arg.	(P) Phones daytime irregularly
19355	15.50	FTM	St. Assisse, France	(P) Phones LSM-PPU-YVR mornings
19345	15.52	PMA	Bandoeng, Java	(P) Phones PCK-PDK early mornings
19270	15.57	PPU	Rio de Janeiro, Brazil	(P) Phones DFB-EHY-FTM mornings
19235	15.60	DFA	Nauen, Germany	(P) Phones HSP-KAX early mornings
19220	15.61	WKF	Lawrenceville, N. J.	(P) Phones GAS-GAU mornings
19200	15.62	ORG	Brussels, Belgium	(P) Phones OPL A.M.
19160	15.66	GAP	Rugby, England	(P) Phones Australia A.M.
19140	15.68	LSM	Buenos Aires, Arg.	(P) Phones DFB-FTM-GAA-GAB A.M.
18970	15.81	GAQ	Rugby, England	(P) Phones ZSS A.M.
18960	15.82	WOD	Rocky Point, N. Y.	(E) Tests LSY irreg.
18920	15.85	WQE	Rocky Point, N. Y.	(E) Programs, irreg.
18910	15.86	JVA	Nazaki, Japan	(P) Phones and tests irregularly with Europe
18890	15.88	ZSS	Klipheuvel, So. Africa	(P) Phones GAQ-GAU mornings
18830	15.93	PLE	Bandoeng, Java	(P) Phones PCV mornings early; KWU evenings
18680	16.06	OCI	Lima, Peru	(P) Phones CEC-HJY days; WKK-WOP noon
18620	16.11	GAU	Rugby, England	(P) Phones VWY-ZSS early A.M.; Lawrenceville, daytime
18545	16.18	PCM	Kootwijk, Holland	(P) Relays and phones Java early A.M.
18540	16.19	PCM	Kootwijk, Holland	(P) Relays and phones Java early A.M.
18535	16.20	PCM	Kootwijk, Holland	(P) Relays and phones Java early A.M.
18480	16.23	HBH	Geneva, Switzerland	(E) Relays to N. Y. mornings irreg.
18450	16.26	HBF	Geneva, Switzerland	(E) Commercial; irreg.
18440	16.25	HJY	Bogota, Colombia	(P) Phones CEC - OCI noon; music irreg.
18410	16.29	PCK	Kootwijk, Holland	(P) Phones PLE - PMC early A.M.
18405	16.30	PCK	Kootwijk, Holland	(P) Phones PLE - PMC early A.M.
18400	16.31	PCK	Kootwijk, Holland	(P) Phones PLE - PMC early A.M.
18388	16.31	FZS	Saigon, Indo-China	(P) Phones FTK early mornings
18340	16.36	WLA	Lawrenceville, N. J.	(P) Phones GAS A.M.
18310	16.38	GAS	Rugby, England	(P) Phones WLA-WMN mornings
18295	16.39	YVR	Maracay, Venezuela	(P) Phones DFB-EHY FTM mornings
18270	16.42	IUD	● Addis Ababa, Ethiopia	Irregular
18250	16.43	FTO	St. Assise, France	(P) LSM-LSY A.M.
18220	16.46	KUS	Manila, P. I.	(P) Phones Bolinas nights
18200	16.48	GAW	Rugby, England	(P) Relays and phones N. Y. irreg.
18190	16.49	JVB	Nazaki, Japan	(P) Phones Java early mornings, U. S. evenings
18180	16.51	CGA	Drummondville, Que.	(P) Phones GBB A.M.
18135	16.54	PMC	Bandoeng, Java	(P) Phones PCK - PCV early A.M.
18115	16.56	LSY3	Buenos Aires, Arg.	(E) Phones DFB-FTM-GAA-PPU A.M.; evening broadcasts occasionally
18075	16.59	PCV	Kootwijk, Holland	(P) Phones PLE early mornings
18070	16.60	PCV	Kootwijk, Holland	(P) Phones PLE early mornings
18065	16.61	PCV	Kootwijk, Holland	(P) Phones PLE early mornings
18060	16.61	KUN	Bolinas, Calif.	(P) Phones Manila afternoons and nights
18040	16.63	GAB	Rugby, England	(P) Phones LSM noon
18020	16.65	KQJ	Bolinas, Calif.	(P) Phones afternoons; irregular
17980	16.69	KQZ	Bolinas, Calif.	(E) Tests and relays to LSY irreg.
17940	16.72	WQB	Rocky Point, N. Y.	(E) Tests with LSY A.M.
17920	16.74	WQF	Rocky Point, N. Y.	(P) Phones Ethiopia irregular
17900	16.76	WLL	Rocky Point, N. Y.	(E) Relays to Geneva and Germany, A.M.
17850	16.81	LSN	Buenos Aires, Arg.	(P) Phones S. A. irreg.
17790	16.86	GSG	● Daventry, England	Daily 6-8:45 A.M., 9 A.M.-12 noon; 3:40-5:45 P.M.
17780	16.87	W3XAL	● Bound Brook, N. J.	9 A.M.-5 P.M. daily
17780	16.87	W9XAA	● Chicago, Ill.	Irreg. before 8 A.M., 4-6 P.M. or special
17775	16.88	PHI	● Huizen, Holland	Sunday 7:30-9:30 A.M., 1-2 P.M.; Mon., Thu., Fri., Sat., 7:30-9:30 A.M.
17760	16.89	DJE	● Zeesen, Germany	12:05-5:15 A.M.; 5:55-11 A.M. daily
17750	16.91	IAC	Pisa, Italy	(P) Phones and tests to ships A.M.
17740	16.91	HSP	Bangkok, Siam	(P) Phones DFA-DGH-KAY early A.M.
17710	16.94	CJA-3	Drummondville, Que.	(P) Phones Australia and Far East early A.M.
17699	16.95	IAC	Pisa, Italy	(P) Phones and tests to ships A.M.
17620	17.03	IBC	San Paolo, Italy	(P) Irregular
17545	17.10	VWY	Poona, India	(P) Phones GAU-GBC-GBU mornings
17520	17.12	DFB	Nauen, Germany	(P) Phones PPU-YVR-KAY mornings
17480	17.16	VWY	Poona, India	(P) Phones GAU-GBC-GBU daytime
17260	17.37	CMA5	Havana, Cuba	(P) Phones and tests evenings
17260	17.37	DAN	Nordenland, Germany	(P) Phones ships A.M.
17120	17.52	WOO	Ocean Gate, N. J.	(P) Phones ships daytime
17120	17.52	WOY	Lawrenceville, N. J.	(P) Phones England irregularly
17080	17.56	GBC	Rugby, England	(P) Phones ships daytime
16910	17.74	JZD	Nazaki, Japan	(P) Phones ships irreg.
16385	18.31	ITK	Mogdishu, Somaliland, Africa	(P) Irregular

KC	Meters	Call	Location	Time
16305	18.39	PCL	Kootwijk, Holland	(P) Special relays and phones irreg.
16300	18.44	WLK	Lawrenceville, N. J.	(P) Phones England irreg.
16250	18.46	FZR	Saigon, Indo-China	(P) Phones FTA-FTK early A.M.
16240	18.47	KTO	Manila, P. I.	(P) Phones JVE-KWU evenings
16140	18.59	GBA	Rugby, England	(P) Phones Argentina & Brazil irreg.
16117	18.62	IRY	Rome, Italy	(P) Phones IDU - ITK A.M.
16050	18.69	JVC	Nazaki, Japan	(P) Phones Hong Kong early A.M.
16030	18.71	KKP	Kahuku, Hawaii	(P) KWU A.M. & P.M. Tests JVF - KTO - PLE mornings
15930	18.83	FYC	Pontoise, France	(P) Phones 9:00 A.M. and irreg.
15880	18.89	FTK	St. Assise, France	(P)FZR-FZS-LSM-PPU-YVR mornings
15860	18.90	JVD	Nazaki, Japan	(P) Phones Shanghai early A.M.; U. S. eves.
15860	18.90	CEC	Santiago, Chile	(P) Phones OCJ A.M.
15810	19.02	LSL	Buenos Aires, Arg.	(P) GAA, A.M.; GCA, PSE, PSF, P.M.
15760	19.04	JYT	Kemikawa-Cho, Japan	(E) Tests KKW-KWE KWU evenings
15740	19.06	JIA	Chureki, Japan	(P) Nazaki early A.M.
15700	19.11	WJS	Hicksville, L. I., N. Y.	(P) Phones Ethiopia irregular
15670	19.15	WAE	Brentwood, N. Y.	(E) Tests afternoons
15660	19.16	JVE	Nazaki, Japan	(P) Phones PLE early A.M.; KTO eves.
15625	19.20	OCJ	Lima, Peru	(P) Phones CEC days
15620	19.21	JVF	Nazaki, Japan	(P) Phones KWO-KWU after 4 P.M.
15595	19.24	DFR	Nauen, Germany	(E) Tests and relays mornings irreg.
15505	19.36	CMA-3	Havana, Cuba	(P) Phones and tests irregularly
15490	19.37	KEM	Bolinas, Calif.	(P) Phones Java and China; irregular
15475	19.39	KKL	Bolinas, Calif.	(P) Phones Manila and Japan; irregular
15460	19.41	KKR	Bolinas, Calif.	(P) Phones Manila and Japan; irregular
15450	19.42	IUG	Addis Ababa, Ethiopia	(P) Phones irregular
15430	19.44	KWE	Bolinas, Calif.	(P) Tests JYK - JYT - PLE evenings
15415	19.46	KWO	Dixon, Calif.	(P) Phones JVF evenings
15370	19.52	HAS3	● Budapest, Hungary	Sunday 9-10 A.M.
15360	19.53	DJT	● Zeesen, Germany	Irregular
15355	19.54	KWU	Dixon, Calif.	(P) Phones Japan, Manila and Java evenings
15340	19.56	DJR	● Zeesen, Germany	8-10 A.M. daily
15330	19.56	W2XAD	● Schenectady, N. Y.	10 A.M.-3:45 P.M. daily
15310	19.60	GSP	● Daventry, England	6-8 P.M. daily
15305	19.60	CP7	La Paz, Bolivia	(E) Relays CP4; tests daytimes
15280	19.63	LRU	● Buenos Aires, Arg.	7 A.M.-3:45 P.M. daily
15280	19.63	DJQ	● Zeesen, Germany	7:15-11 A.M., 4:45-10:45 P.M. daily
15270	19.64	W2XE	● Wayne, N. J.	1-6 P.M. daily
15252	19.67	RIM	Tashkent, USSR.	(P) Phones RKI early mornings
15243	19.68	TPA2	● Pontoise, France	1-1:55 A.M., 4:55-10 A.M. daily
15230	19.69	—	● Prague, Czechoslovakia	4 A.M.-3:45 P.M. daily
15220	19.71	PCJ	● Eindhoven, Holland	Sunday 6:30-7:30 A.M.; Tues., 4-6 A.M.; Wed., 7-11 A.M.
15210	19.72	W8XK	● Pittsburgh, Pa.	9 A.M.-7 P.M. daily
15200	19.74	DJB	● Zeesen, Germany	12:05-5:15 A.M., 5:55 A.M.-11 A.M., 4:45-10:45 P.M. daily. Sundays 11:10 A.M.-12:10 P.M.
15183	19.76	RV96	● Moscow, USSR.	1:30-2 P.M. Sunday
15180	19.76	GSO	● Daventry, England	12:15-3:40 P.M. daily
15145	19.81	RKI	● Moscow, USSR.	Phones RIM early A.M.
15140	19.82	GSF	● Daventry, England	9 A.M.-12 noon, 3:40-5:45 P.M., 9-11 P.M. daily
15121	19.84	HVJ	● Vatican City, Vatican	10:30-10:45 A.M. weekdays
15110	19.85	DJL	● Zeesen, Germany	12-2 A.M., 8-10 A.M., 11:35 A.M.-4:30 P.M. daily. Sunday 6-8 A.M.
15055	19.92	WNC	Hialeah, Fla.	(P) Phones daytime
15040	19.95	HIR	Ciudad Trujillo, R. D.	(P) Phones WNC days
14985	20.02	YSL	San Salvador, Salvador	(P) Phones days irreg.
14980	20.03	KAY	Manila, P. I.	(P) Phones DFC-DFD GCJ early A.M.; KWU evenings
14970	20.04	LZA	● Sofia, Bulgaria	Weekdays 5-6:30 A.M., 12-2:45 P.M. Sundays 12 A.M.-4:30 P.M.
14940	20.06	HJB	Bogota, Colombia	(P) Phones WNC-PPU-YVQ days
14935	20.07	PSE	Rio de Janeiro, Brazil	(P) Phones LSL-WLK day irreg.; EDM-EHY 8 A.M. Broadcasts irreg.
14920	20.11	KQH	Kahuku, Hawaii	(P) Tests irregularly
14910	20.12	JVG	Nazaki, Japan	(P) Phones Formosa and broadcasts 1-2:30 A.M. irreg.
14845	20.19	OCJ2	Lima, Peru	(P) Phones HJY and others daytime
14800	20.27	WOV	Rocky Point, N. Y.	(E) Tests Europe irreg.
14790	20.28	RIZ	Irkutsk, USSR.	(P) Calls RKI 9:30 A.M.
14770	20.31	WEB	Rocky Point, N. Y.	(E) Tests with Europe; irregular
14730	20.37	IQA	Rome, Italy	(P) Phones Japan and Egypt; sends music at times
14690	20.42	PSF	Rio de Janeiro, Brazil	(P) Phones LSL-WLK-WOK daytime
14653	20.47	GBL	Rugby, England	(P) Phones Nazaki early A.M.
14620	20.52	EHY	Madrid, Spain	(P) Phones LSM mornings irreg.
14620	20.52	EDM	Madrid, Spain	(P) Phones PPU-PSA-PSE mornings
14600	20.55	JVH	Nazaki, Japan	(E) Phones DFB-GTJ-PCJ - FYB early mornings. B.C. music 12-1 A.M. daily & eves. 5-9 P.M.
14590	20.56	WMN	Lawrenceville, N. J.	(P) Phones England days
14535	20.64	HBJ	Geneva, Switzerland	(E) Relays to Riverhead daytime
14530	20.65	LSN	Buenos Aires, Arg.	(P) Phones PSF-WLK-WOK irreg.
14485	20.71	TIR	Cartago, Costa Rica	(P) Phones WNC days
14485	20.71	TIU	Cartago, Costa Rica	(P) Phones WNC days
14485	20.71	YNA	Managua, Nicaragua	(P) Phones WNC days
14485	20.71	HPF	Panama City, Panama	(P) Phones daytime
14485	20.71	HRM	Tela, Honduras	(P) Phones WNC days
14485	20.71	TGF	Guatemala City, Guatemala	(P) Phones WNC days
14480	20.72	PLX	Bandoeng, Java	(P) Phones Europe irreg.
14470	20.73	WMF	Lawrenceville, N. J.	(P) Phones England daytime
14460	20.75	DZH	● Zeesen, Germany	Irregular
14440	20.78	GBW	Rugby, England	(P) Phones Lawrenceville daytime
14410	20.82	IBC	San Paolo, Italy	(P) Irregular
14410	20.80	DIP	Zeesen, Germany	(S) Experimental; irreg.
14250	21.00	W10XDA	Schooner Morrissey	(P) Irregular
14236	21.07	HB9B	● Basle, Switzerland	Monday, Thursday, Friday 4-6 P.M.
14100	21.25	HJ5ABE	● Cali, Colombia	11:00 A.M.-12 noon daily. Sun. 6:00-10:30 P.M.
13990	21.44	GBA2	Rugby, England	(P) Phones Argentina & Brazil irreg.
13900	21.58	WQP	Rocky Point, N. Y.	(E) Test daytime
13820	21.70	SUZ	Cairo, Egypt	(P) Phones DFC-DGU-GBB daytime
13780	21.77	KKW	Bolinas, Calif.	(P) Special relays; tests afternoon and evening
13745	21.83	CGA-2	Drummondville, Que.	(P) Phones Europe irreg.
13738	21.82	RIS	Tiflis, USSR.	(P) Tests with Moscow irregular
13720	21.87	KLL	Bolinas, Calif.	(P) Special relays; tests afternoon and evening
13690	21.91	KKZ	Bolinas, Calif.	(P) Tests Japan and Java early A.M.; days Honolulu
13667	21.98	HJY	Bogota, Colombia	(P) Phones CEC afternoons
13635	22.00	SPW	● Warsaw, Poland	11:30 A.M.-12:30 P.M., Mon., Wed., Fri.
13610	22.04	JYK	Kemikawa-Cho, Japan	(E) Tests irregular A.M.
13595	22.07	GBB2	Rugby, England	(P) Phones Canada days
13585	22.08	GBB	Rughy, England	(P) Phones CGA3-SUV-SUZ daytime
13560	22.12	JVI	Nazaki, Japan	(P) Phones Manchukuo irregularly
13465	22.28	WKC	Rocky Point, N. Y.	(E) Tests and relays irregular
13435	22.33	WKD	Rocky Point, N. Y.	(E) Tests and relays irregular
13415	22.36	GCJ	Rugby, England	(P) Tests with JVH afternoons
13410	22.37	YSJ	San Salvador, Salvador	(P) Phones WNC days
13390	22.40	WMA	Lawrenceville, N. J.	(P) Phones GAS - GBS - GBU-GBW daily
13380	22.42	IDU	Asmara, Eritrea, Africa	(P) Phones Italy early A.M. and sends music
13345	22.48	YVQ	Maracay, Venezuela	(P) Phones WNC-HJB days
13285	22.58	CGA3	Drummondville, Que.	(P) Phones England days
13240	22.66	KBJ	Manila, P. I.	(P) Phones nights and early A.M.
13220	22.70	IRJ	Rome, Italy	(P) Phones Japan 5-8 A.M., and works Cairo days
13180	22.76	DGG	Nauen, Germany	(P) Relays to Riverhead days
13075	22.94	VPD	● Suva, Fiji Islands	Weekdays 12:30-1:30 A.M.
13020	23.04	JZE	Nazaki, Japan	(P) Phones ships irreg.
13000	23.08	FYC	Paris, France	(P) Phones CNR A.M.
12985	23.11	DFC	Nauen, Germany	(P) Phones KAY-SUV-SUZ early A.M.
12865	23.32	IAC	Pisa, Italy	(P) Phones ships irreg.
12860	23.33	RKR	Novosibirsk, USSR.	(P) Daily, 7 A.M.
12840	23.36	WOO	Ocean Gate, N. J.	(P) Phones ships days
12830	23.37	HJC	Barranquilla, Colombia	(P) Phones HJB-HPF-WNC days
12830	23.38	HJA-3	Barranquilla, Colombia	(P) Phones HJB-HPF-WNC days

KC	Meters	Call	Location	Time
12830	23.38	CNR	● Rabat, Morocco	(P) Phones FYB-TYB-FTA near 4 P.M.
12830	23.38	CNR	Rabat, Morocco	Special broadcasts irreg.
12795	23.45	IAC	Pisa, Italy	(P) Phones ships and tests Tripoli, irreg.
12780	23.47	GBC	Rugby, England	(P) Phones VWY early A.M.
12394	24.21	DAN	Nordenland, Germany	(P) Phones ships irreg. mornings
12300	24.39	PLM	Bandoeng, Java	(P) Phones 2ME near 6:30 A.M.
12295	24.40	ZLU	Wellington, N. Z.	(P) Phones ZLJ early A.M.
12290	24.41	GBU	Rugby, England	(P) Phones Lawrenceville days
12280	24.43	KUV	Manila, P. I.	(P) Phones early A. M.
12250	24.49	TYB	Paris, France	(P) Phones JVH - XGR and ships irreg.
12235	24.52	TFJ	Reykjavik, Iceland	(P) Phones England days
12235	24.52	TFJ	● Reykjavik, Iceland	English broadcast each Sun., 1:40-2:30 P.M.
12220	24.55	FLJ	Paris, France	(P) Phones ships irreg.
12215	24.56	TYA	Paris, France	(P) Algeria days
12150	24.69	GBS	Rugby, England	(P) Phones Lawrenceville days
12130	24.73	DZE	● Zeesen, Germany	Irregular
12100	24.79	CJA	Drummondville, Que.	(P) Tests VIY early A. M. and evenings
12060	24.88	PDV	Kootwijk, Holland	(P) PLE - PLV - PMC early mornings
12055	24.89	PDV	Kootwijk, Holland	(P) PLE - PLV - PMC early mornings
12050	24.90	PDV	Kootwijk, Holland	(P) PLE - PLV - PMC early mornings
12020	24.95	VIY	Rockbank, Australia	(P) Tests CJA6 early A.M. and evenings
12000	25.00	RNE	● Moscow, USSR.	Sundays 6-7 A.M., 10-11 A.M., 4-5 P.M.; Mon. 4-5 P.M.; Wed., 6-7 A.M., 4-5 P.M.; Friday 4-5 P.M.
11991	25.02	FZS	Saigon, Indo-China	(P) Phones FTA - FTK early A.M.
11955	25.09	IBC	San Paolo, Italy	(P) Irregular
11955	25.09	IUC	● Addis Ababa, Ethiopia	Sunday 4:30-4:50 P.M.
11950	25.11	KKQ	Bolinas, Calif.	(P) Relays programs to Hawaii eve.
11940	25.13	FTA	St. Assise, France	(P) Phones FZS - FZR early A.M.
11935	25.14	YNA	Managua, Nicaragua	(P) Cent. and S. A. stations, days
11900	25.21	XEWI	● Mexico City, Mexico	Sun., 1-2:15 P.M.; Tues. and Thurs., 7:30-8:45 P.M., 10:30 P.M.-12 A.M.; Mon., Wed., 3-4 P.M.; Fri., 3-4 P.M., 9 P.M.-12 A.M.; Sat., 9-10 P.M.
11885	25.24	TPA3	● Pontoise, France	1-4 A.M., 11:15 A.M.-5 P.M. daily
11870	25.26	W8XK	● Pittsburgh, Pa.	7-9 P.M. daily
11860	25.30	YDB	● Soerabaia, Java	7:30 P.M.-2 A.M. daily
11855	25.31	DJP	● Zeesen, Germany	Irregular
11830	25.36	W2XE	● Wayne, N. J.	6-10 P.M. daily
11830	25.36	W9XAA	● Chicago, Ill.	Daily 8:30 A.M.-5 P.M.
11810	25.40	2RO4	● Rome, Italy	5:43 A.M.-9:30 A.M., 10:30 - 11:30 A.M., 11:40 A.M. - 6 P.M. daily. Mon., Wed., Fri., Am. Hour, 6-7:30 P.M. Tues., Thurs., Sat., Spanish, 6-7:45 P.M.
11800	25.40	HJ4ABA	● Medellin, Colombia	11:30 A.M.-1 P.M., 6:30-10:30 P.M.
11795	25.43	DJQ	● Zeesen, Germany	Irregular
11790	25.43	W1XAL	● Boston, Mass.	5 P.M. News Items—Mon. to Fri. inc.
11770	25.49	DJD	● Zeesen, Germany	11:35 A.M.-4:30 P.M., 4:50-10:45 P.M.
11760	25.51	——	● Prague, Czechoslovakia	4 A.M.-3:45 P.M. daily
11750	25.53	GSD	● Daventry, England	1:15-3:15 A.M., 12:15-3:25 P.M., 6-8 P.M. daily
11720	25.60	CJRX	● Winnipeg, Manitoba	Week Days' 6 P.M.-12 A.M. Sundays 5-10 P.M.
11720	25.60	TPA4	● Pontoise, France	5:15 P.M.-12 A.M. daily
11680	25.68	KIO	Kahuku, Hawaii	(P) Phones Far East early A.M.
11670	25.62	PPQ	Rio de Janeiro, Brazil	(P) Phones WCG-WET-LSX evenings
11660	25.73	JVL	Nazaki, Japan	(P) Phones Taiwan eve. Broadcasts irreg. 1-2:30 A.M.
11570	25.93	HH2T	● Port-au-Prince, Haiti	Sp'l programs irreg.
11560	25.95	CMB	Havana, Cuba	(P) Phones New York irreg.
11538	26.00	XGR	Shanghai, China	(P) Tests irregularly
11500	26.09	XAM	Merida, Mexico	(P) Phones XDF-XDM-XDR irreg.
11495	26.10	VIZ3	Rockbank, Australia	(P) Tests CJA4 early A.M.
11450	26.20	COCX	● Havana, Cuba	8 A.M.-1 A.M. daily
11413	26.28	CJA4	Drummondville, Que.	(P) Phones VIZ3 early A.M.
11402	26.31	HBO	Geneva, Switzerland	(E) Broadcasts Sundays 11:30 P.M.; commercial, irreg.
11280	26.60	HIN	● Ciudad Trujillo, R. D.	Daily 11:40 A.M.-1:40 P.M., 4:30-6 P.M., 7:10-9:10 P.M.
11275	26.61	XAM	Merida, Mexico	(P) Phones XDR-XDM irregular
11050	27.15	ZLT	Wellington, N. Z.	(P) Phones VLZ early mornings
11000	27.27	PLP	Bandoeng, Java	(P) Phones early A.M.; broadcasts 5:30-11 A.M. week days; Sun., 5:30-10:30 A.M.
11000	27.26	XBJQ	● Mexico D. F., Mexico	8:15-10:30 P.M. irreg.
10975	27.35	OCI	Lima, Peru	(P) Phones CEC - HJY days
10975	27.35	OCP	Lima, Peru	(P) Phones HKB early evenings
10955	27.38	HS8PJ	● Bangkok, Siam	Mondays 8-10 A.M.
10940	27.43	TTH	St. Assise, France	(P) Phones So. America irreg.
10910	27.50	KTR	Manila, P. I.	(P) Phones DFC early A.M. irreg.
10850	27.63	DFL	Nauen, Germany	(P) Relays programs afternoons irreg.
10840	27.68	KWV	Dixon, Calif.	(P) Phones Japan, Manila, Hawaii, A.M.
10795	27.79	GCL	Rughy, England	(P) Phones Japan days
10790	27.80	YNA	Managua, Nicaragua	(P) Phones So. America days, irreg.
10770	27.86	GBP	Rugby, England	(P) JYS and XGR irreg.; Phones VLK early A.M. & P.M.
10740	27.93	JVM	● Nazaki, Japan	4-7:30 A.M. daily and 5-9 P.M. irreg.
10675	28.10	WNB	Lawrenceville, N. J.	(P) Phones ZFB daytime
10670	28.12	CEC	Santiago, Chile	(P) Phones HJY - OCI daytime
10670	28.12	CEC	● Santiago, Chile	Daily ex. Sat. and Sun., 7-7:20 P.M. (see CED, 10230 KC.)
10660	28.14	JVN	Nazaki, Japan	(P) Phones JIB early A.M.; Relays JOAK irreg.
10660	28.14	JVN	● Nazaki, Japan	4-7:30 A.M. irreg.; Mon. & Thurs. 4-5 P.M.; 12-1 A.M. daily
10620	28.25	WEF	Rocky Point, N. Y.	(E) Relays program service irregularly
10620	28.25	EHX	Madrid, Spain	(P) Phones CEC and EHZ afternoons
10610	28.28	WEA	Rocky Point, N. Y.	(E) Tests Europe irreg.
10550	28.44	WOK	Lawrenceville, N. J.	(P) Phones LSN - PSF - PSH-PSK nights
10530	28.49	JIB	Tawian, Japan	(P) Phones JVL - JVN early mornings to 8 A.M.; sp'l be's 3-4 A.M. Sun.
10520	28.52	VK2ME	Sydney, Australia	(P) Phones GBP - HVJ early A.M.
10520	28.52	VLK	Sydney, Australia	(P) Phones GBP - HVJ early A.M.
10520	28.52	CFA-4	Drummondville, Que.	(P) Phones N. Am. days
10480	28.63	ITK	Mogdishu, Somaliland, Africa	(P) Irregular
10440	28.74	DGH	Nauen, Germany	(P) Phones HSG - HSJ - HSP early A.M.
10430	28.76	YBG	Medan, Sumatra	(P) Phones PLV - PLP early A.M.
10420	28.79	XGW	Shanghai, China	(P) Tests GBP - KAY early A.M. Musical tests 10:45 A.M.-3 P.M.
10420	28.79	PDK	Kootwijk, Holland	(P) Phones PLV A.M., and special programs irreg.
10415	28.80	PDK	Kootwijk, Holland	(P) Phones PLV A.M., and special programs irreg.
10410	28.82	PDK	Kootwijk, Holland	(P) Phones PLV A.M., and special programs irreg.
10410	28.82	KES	Bolinas, Calif.	(P) Phones S. A. and Far East irreg.
10400	28.85	KEZ	Bolinas, Calif.	(P) Phones Hawaii and Far East irreg.
10390	28.87	KER	Bolinas, Calif.	(P) Phones Far East, early evening
10380	28.90	WCG	Rocky Point, N. Y.	(E) Programs, irreg.
10375	28.92	JVO	Nazaki, Japan	(P) Manchuria and Dairen early A.M.
10370	28.93	EHZ	Tenerife, Canary Islands	(P) Phones EDN 3:30-6 A.M.
10350	28.98	LSX	● Buenos Aires, Arg.	Near 10 P.M. irregular; 6-7:15 P.M. daily
10335	29.03	ZFD	Hamilton, Bermuda	(P) Phones afternoons
10330	29.04	ORK	● Brussels, Belgium	1:30-3 P.M. daily
10310	29.10	PPM	Rio de Janeiro, Brazil	(P) Tests New York and B.A. evenings
10300	29.13	LSQ	Buenos Aires, Arg.	(P) Phones GCA - HJY - PSH afternoons
10300	29.13	LSL	Buenos Aires, Arg.	(P) Phones GCA - HJY - PSH afternoons. Broadcasts irreg.
10290	29.15	DZC	● Zeesen, Germany	Used irregularly
10290	29.15	HPC	Panama City, Panama	(P) Phones C. A. and S. Am. daytime
10260	29.24	PMN	Bandoeng, Java	(P) Tests VLJ early A.M.; broadcasts 5:30-11 A.M. week days; 5:30-10:30 A.M. Sundays

KC	Meters	Call	Location	Time
10250	29.27	LSK3	Buenos Aires, Arg.	(P) Afternoons
10230	29.33	CED	● Antofagasta, Chile	Retransmits programs of CEC, 10670 KC., daily ex. Sat. and Sun., 7-7:20 P.M.
10220	29.35	PSH	Rio de Janeiro, Brazil	(P) Phones LSL-WOK evenings; broadcasts irreg.
10169	29.50	HSG	Bangkok, Siam	(P) Phones DGH early A.M.
10160	29.53	RIO	Bakou, USSR.	(P) Phones RIR-RNE irreg. A.M.; News irreg. 11 P.M.-3 A.M.
10140	29.59	OPM	Leopoldville, Belg-Congo	(P) Calls 5 A.M. daily, Phones ORK afternoons
10080	29.76	RIR	Tiflis, USSR.	(P) Phones RIM-RKI 7-11 A.M.
10070	29.79	EDN	Madrid, Spain	(P) Phones YVR afternoons
10055	29.84	ZFB	Hamilton, Bermuda	(P) Phones WNB days
10055	29.84	SUV	Cairo, Egypt	(P) Phones DFC-DGU-GCA-GCB days
10042	29.87	DZB	● Zeesen, Germany	Irregular
10040	29.88	HJA3	Barranquilla, Colombia	(P) Tests early evenings, irreg.
9990	30.03	KAZ	Manila, P. I.	(P) Phones JVQ-KWX-PLV early A.M.
9966	30.08	IRS	Rome, Italy	(P) Tests irregularly
9950	30.13	GBU	Rugby, England	(P) Phones WNA evenings
9930	30.21	HKB	Bogota, Colombia	(P) Phones CEC - OCP-PSH - PSK afternoons
9930	30.21	HJY	Bogota, Colombia	(P) Phones LSQ afternoons
9890	30.33	LSN3	Buenos Aires, Arg.	(P) Phones WOK-WLK; broadcasts evenings irregular
9870	30.40	WON	Lawrenceville, N. J.	(P) Phones and tests; England irreg.
9870	30.40	JYS	● Kemikawa-Cho, Japan	4-7 A.M. irregular
9860	30.43	EAQ	● Madrid, Spain	Saturday 1-3 P.M.; daily 5:15 to 9:30 P.M.
9840	30.47	JYS	Kemikawa-Cho, Japan	(E) Tests irregular
9830	30.50	IRM	Rome, Italy	(P) Phones JVP - JZT - LSX-WEL A.M.
9810	30.58	DFE	Nauen, Germany	(P) Relays and tests afternoons irreg.
9800	30.59	GCW	Rugby, England	(P) Phones Lawrenceville eve. and nights
9800	30.59	LSI	Buenos Aires, Arg.	(P) Relays very irreg.
9760	30.74	VLJ	Sydney, Australia	(P) Phones PLV- ZLT early A.M.
9760	30.74	VLZ	Sydney, Australia	(P) Phones PLV- ZLT early A.M.
9750	30.77	COCQ	● Havana, Cuba	8 A.M.-12 mid. daily
9750	30.77	WOF	Lawrenceville, N. J.	(P) Phones GCU irreg.
9710	30.88	GCA	Rugby, England	(P) Phones LSL afternoons
9700	30.93	LQA	Buenos Aires, Arg.	(P) Tests and relays early evenings
9675	31.00	DZA	● Zeesen, Germany	Irregular
9670	31.02	TI4NRH	● Heredia, Costa Rica	Daily 9-10 P.M., 11:30 P.M.-12 A.M.; Sat. night to 2 A.M. Sun.
9660	31.06	CR6AA	● Lobito, West Africa	3:45-5:30 P.M. Wed. & Sat.
9660	31.06	LRX	● Buenos Aires, Arg.	8-9 P.M. daily, experimentally
9660	31.06	PSJ	Rio de Janeiro, Brazil	(P) Irreg., Argentina
9650	31.09	CT1AA	● Lisbon, Portugal	Tus., Thurs., Sat., 4-7 P.M.
9635	31.13	2RO3	● Rome, Italy	Not in use. See 11810 K.C.
9630	31.15	CFA5	Drummondville, Que.	(P) Phones No. America days
9620	31.17	DGU	Nauen, Germany	(P) Phones SUV A.M. Relays irreg.
9620	31.17	FZR	Saigon, Indo-China	(P) Phones Paris early A.M.
9610	31.22	YDB	● Soerabaia, Java	Weekdays 5:30-11 A.M., 6-7:30 P.M., 10:30 P.M.-2 A.M. Sundays, 5:30-10:30 A.M., 7:30 P.M.-2 A.M.
9600	31.25	RAN	● Moscow, USSR.	English 7-7:30 P.M.; German 7:30-8 P.M. daily
9600	31.25	HJ1ABP	● Cartagena, Colombia	Daily 6-11 P.M.
9600	31.25	CB960	● Santiago, Chile	Daily 10:30 A.M.-12 noon; 6-8:30 P.M.
9595	31.27	HBL	● Geneva, Switzerland	Saturday 5:30-6:15 P.M. First Monday each month 6-7 P.M.
9595	31.27	HH3W	● Port-au-Prince, Haiti	1-2 P.M., 7-8:30 P.M.; ex. Sunday
9595	31.27	YNLF	● Managua, Nicaragua	8-9 A.M., 1-3 P.M., 6:30-10:30 P.M. daily
9590	31.28	W3XAU	● Philadelphia, Pa.	12-8 P.M. daily
9590	31.28	VK2ME	● Sydney, Australia	Sunday 12:30-2:30 A.M., 4:30-8:30 A.M., 9:30-11:30 A.M.
9590	31.28	HP5J	● Panama City, Panama	Week days 12-1:30 P.M., 6:30-10:30 P.M. Sundays 10:30 A.M.-1:30 P.M., 7-10:30 P.M.
9590	31.28	PCJ	● Eindhoven, Holland	Sun. 2-3 P.M.; Tues., 1:30-3 P.M.; Wed., 7-10 P.M.
9580	31.31	GSC	● Daventry, England	6-8 P.M., 9-11 P.M. daily
9580	31.31	VK3LR	● Melbourne, Australia	Week days 3:30-8:30 A.M.; Friday also 10 P.M.-2 A.M. Sunday, 3:30-7:30 A.M.
9575	31.33	HJ2ABC	● Cucuta, Colombia	11 A.M.-12 noon; 6:30-9 P.M. daily
9570	31.33	W1XK	● Boston, Mass.	Week days 6 A.M.-12 midnight; Sunday 7 A.M.-12 midnight
9565	31.36	VUY VUB	● Bombay, India	11:30 A.M.-12:30 P.M., Wed. & Sat.; Sunday, 7:30-8:30 A.M.
9560	31.38	DJA	● Zeesen, Germany	12:05-5:15 A.M., 4:50-10:45 P.M. daily
9553	31.40	CQN	● Macao, China	Mon. & Fri. 7-8:30 A.M.
9545	31.44	HH2R	● Port-au-Prince, Haiti	Special programs irreg.
9540	31.45	DJN	● Zeesen, Germany	12:05-5:15 A.M., 4:50-10:45 P.M. daily
9540	31.45	VPD2	● Suva, Fiji Islands	5:30-8 A.M. daily
9530	31.48	W2XAF	● Schenectady, N. Y.	4 P.M.-12 A.M. daily
9520	31.51	XEME	● Merida, Yucatan, Mex.	10 A.M.-3:30 P.M., 5:30-11 P.M.
9515	31.53	LKJ1	● Jeloy, Norway	5-8 A.M., 11 A.M.-6 P.M. daily
9510	31.55	GSB	● Daventry, England	1:15-3:15 A.M., 12:15-5:45 P.M. daily
9510	31.55	VK3ME	● Melbourne, Australia	Mon., Sat. 4-7 A.M.
9510	31.55	HJU	● Buenaventura, Colombia	12-2 P.M., 8-11 P.M., Mon., Wed., Fri.
9505	31.56	XEFT	● Vera Cruz, Mexico	Same as 6120 KC.
9500	31.56	PRF5	● Rio de Janeiro, Brazil	4:45-5:45 P.M. ex. Sun.
9500	31.58	XGOX	● Nanking, China	Week days 6:30-8:40 A.M.; Sundays, 7:30-9:30 A.M.
9500	31.58	HI5E	● Ciudad Trujillo, R. D.	6:40-8:40 A.M., 10:40 A.M.-2:40 P.M., 4:40-8:40 P.M.
9500	31.58	HJ1ABE	● Cartagena, Colombia	7-8 A.M., 12-2 P.M., 6-10:30 P.M. daily
9490	31.61	KEI	Bolinas, Calif.	(P) Phones Indo-China and China A.M.
9480	31.65	PLW	Bandoeng, Java	(P) Phones Australia early A.M.
9480	31.65	KET	Bolinas, Calif.	(P) Phones WEL evenings & nights
9470	31.68	WET	Rocky Point, N. Y.	(E) Tests LSX-PPM-ZFD evenings
9460	31.71	ICK	Tripoli, Africa	(P) Phones Italy A.M.
9450	31.75	TGWA	● Guatemala City, Guate.	Daily ex. Sun. 12-2 P.M., 8-9 P.M., 10 P.M.-12 A.M.; Sun., 12 noon-2 P.M.; 12 A.M.-6 A.M.
9430	31.80	YVR	Maracay, Venezuela	(P) Tests mornings
9428	31.81	COCH	● Havana, Cuba	Week days 7 A.M.-12 night. Sun., 8-9 A.M., 11:30 A.M.-1:30 P.M., 6-9 P.M.
9415	31.86	PLV	Bandoeng, Java	(P) Phones PCV-PCK-PDK-VLZ-KWX-KWV early A.M.
9400	31.92	XDR	Mexico City, Mexico	(P) Phones XAM irreg., days
9385	31.97	PGC	Kootwijk, Holland	(P) Phones East Indies nights
9375	32.00	PGC	Kootwijk, Holland	(P) Phones East Indies nights
9370	32.02	PGC	Kootwijk, Holland	(P) Phones East Indies nights
9350	32.09	HS8PJ	● Bangkok, Siam	Thurs., 8-10 A.M.
9330	32.15	CGA4	Drummondville, Que.	(P) Phones GCB-GDB-GBB afternoons
9280	32.33	GCB	Rugby, England	(P) Phones Canada afternoons
9240	32.47	PDP	Kootwijk, Holland	(P) Phones East Indies nights
9235	32.49	PDP	Kootwijk, Holland	(P) Phones East Indies nights
9180	32.68	ZSR	Klipheuvel, S. Africa	(P) Phones Rugby afternoons seasonally
9170	32.72	WNA	Lawrenceville, N. J.	(P) Phones GBS-GCU-GCS afternoons
9147	32.79	YVR	Maracay, Venezuela	(P) Phones EHY afternoons
9125	32.88	HAT4	● Budapest, Hungary	6:00-7:00 P.M. Sundays
9110	32.93	KUW	Manila, P. I.	(P) Tests and phones early A.M.
9091	33.00	CGA-5	Drummondville, Que.	(P) Phones Europe days
9020	33.26	GCS	Rugby, England	(P) Phones Lawrenceville afternoons
9010	33.30	KEJ	Bolinas, Calif.	(P) Relays programs to Hawaii eve.
8975	33.42	CJA5	Drummondville, Que.	(P) Phones Australia nights, early A.M.
8975	33.43	VWY	Poona, India	(P) Phones GBC - GBU mornings
8950	33.52	WEL	Rocky Point, N. Y.	(E) Tests with Europe irreg.
8950	33.52	W2XBJ	Rocky Point, N. Y.	(E) Tests irregularly
8930	33.59	WEC	Rocky Point, N. Y.	(P) Phones Ethiopia irregular
8900	33.71	ZLS	Wellington, N. Z.	(P) Phones VLZ early mornings
8830	33.98	LSD	Buenos Aires, Arg.	(P) Relays to New York early evenings
8790	34.13	HKV	Bogota, Colombia	(E) Tests early evenings and nights
8790	34.13	TIR	Cartago, Costa Rica	(P) Phones Cent. America daytime
8790	34.13	HKV	● Bogota, Colombia	5:00-11:00 P.M. irregular

KC	Meters	Call	Location	Time
8775	34.19	HCJB	● Quito, Ecuador	Sunday, 4-10:45 P.M.; Tues. to Sat., inc., 7-10 P.M. or later
8775	34.19	PNI	Makasser, D. E. I.	(P) Phones PLV early mornings
8760	34.35	GCQ	Rugby, England	(P) Phones ZSR afternoons
8750	34.29	ZBW	● Hong Kong, China	1:30-3:15 A.M., 6 A.M.-12 noon
8740	34.35	WXV	Fairbanks, Alaska	(P) Phones WXH nights
8730	34.36	GCI	Rugby, England	(P) Phones VWY afternoons
8680	34.56	GBC	Rugby, England	(P) Phones ships and New York daily
8665	34.62	CO9JQ	● Camaguey, Cuba	7:45-9:00 P.M. weekdays. Sundays irreg.
8650	34.68	WVD	Seattle, Wash.	(P) Tests irregularly
8630	34.76	CMA	Havana, Cuba	(P) Phones New York irreg.
8590	34.92	YNVA	● Managua, Nicaragua	1-2:30 P.M., 7:30-10 P.M. daily
8560	35.05	WOO	Ocean Gate, N. J.	(P) Phones ships days
8515	35.23	IAC	Pisa, Italy	(P) Phones and tests irreg.
8500	35.29	JZF	Nazaki, Japan	(P) Phones ships irreg.
8470	35.39	DAN	Nordenland, Germany	(P) Phones ships irreg.
8404	35.70	HC2CW	● Guayaquil, Ecuador	Week days 11:15 A.M.-12:15 P.M., 7:15-10:30 P.M. Sundays, 3:30-5 P.M.
8185	36.65	PSK	Rio de Janeiro, Brazil	(P) Phones LSL-WOK evenings. Broadcasts irreg.
8155	36.79	PGB	Kootwijk, Holland	(P) Phones Java irreg.
8140	36.86	LSC	Buenos Aires, Arg.	(P) Tests evenings and nights irreg.
8120	36.95	KTP	Manila, P. I.	(P) Phones KWX-KWV-PLV-JVQ A.M.
8110	37.00	ZP10	● Asuncion, Paraguay	8:00-10:00 P.M.
8075	37.15	WEZ	Rocky Point, N. Y.	(E) Program service P.M.; irregular
8035	37.33	CNR	Rabat, Morocco	(P) Phones France nights
8035	37.33	CNR	● Rabat, Morocco	Special broadcasts irreg.
7970	37.64	XGL	Shanghai, China	(P) Tests early mornings
7968	37.65	HSJ	Bangkok, Siam	(P) Tests early A.M.
7960	37.69	VLZ	Sydney, Australia	(P) Phones ZLT early A.M.
7920	37.88	GCP	Rugby, England	(P) Phones VLK irreg.
7900	37.97	LSL	Buenos Aires, Arg.	(P) Phones PSK-PSH evenings
7890	38.02	IDU	Asmara, Eritrea, Africa	(P) Irregular
7890	38.02	CJA-2	Drummondville, Que.	(P) Phones Australia nights
7880	38.05	JYR	Kemikawa-Cho, Japan	(E) Tests and relays irregularly
7860	38.17	SUX	Cairo, Egypt	(P) Phones GCB afternoons
7855	38.19	LQP	Buenos Aires, Arg.	(P) Tests evening irreg.
7854	38.19	HC2JSB	● Guayaquil, Ecuador	9 A.M.-1:30 P.M., 6-11:15 P.M.
7840	38.27	PGA	Kootwijk, Holland	(P) Phones Java irreg.
7835	38.29	PGA	Kootwijk, Holland	(P) Phones Java irreg.
7830	38.31	PGA	Kootwijk, Holland	(P) Phones Java irreg.
7797	38.47	HBP	● Geneva, Switzerland	5:30-6:15 P.M. Saturdays. First Mon. each month, 6-7 P.M.
7790	38.49	YNA	Managua, Nicaragua	(P) Phones Cent. & So. America daytime
7770	38.61	PDM	Kootwijk, Holland	(P) Special relays to E. Indies
7765	38.63	PDM	Kootwijk, Holland	(P) Special relays to Dutch Indies
7760	38.66	PDM	Kootwijk, Holland	(P) Special relays to E. Indies
7740	38.76	CEC	Santiago, Chile	(P) Phones evenings to 8:30 P.M.
7735	38.78	PDL	Kootwijk, Holland	(P) Special relays to E. Indies
7730	38.81	PDL	Kootwijk, Holland	(P) Special relays to E. Indies
7715	38.39	KEE	Bolinas, Calif.	(P) Relays programs to Hawaii seasonally
7669	39.11	TGF	Guatemala City, Guate.	(P) Phones TIU-HPF daytime
7626	39.31	RIM	Tashkent, USSR.	(P) Phones RKI early mornings
7620	39.37	IUB	● Addis Ababa, Ethiopia	Irregular
7610	39.42	KWX	Dixon, Calif.	(P) Phones KKH nights; KAZ-KTP-PLV-JVT-JVM A.M.
7565	39.66	KWY	Dixon, Calif.	(P) Phones Shanghai early mornings
7550	39.74	TI8WS	● Puntarenas, Costa Rica	Sun., 4-5 P.M. Week days, 5-7 P.M., 8:30-10 P.M.
7520	39.89	KKH	Kahuku, Hawaii	(P) KEE-KEJ evenings, KWX-KWV nights
7518	39.90	RKI	Moscow, USSR.	(P) Phones RIM early mornings
7510	39.95	JVP	● Nazaki, Japan	(P) Tests Point Reyes early A.M.; broadcasts Mon., Thurs., 2-3, 4-5 P.M.
7500	40.00	CFA-6	Drummondville, Que.	(P) Phones N. America days
7470	40.16	JVQ	Nazaki, Japan	(P) Relays and phones early A.M.; broadcasts Mon., Thurs., 2-3, 4-5 P.M.
7470	40.16	HJP	Bogota, Colombia	(P) Phones HJA3-YVQ early evenings
7445	40.30	HBQ	Geneva, Switzerland	(E) Relays special B.C. evenings irreg.
7430	40.38	ZLR	Wellington, N. Z.	(P) Phones VLJ early mornings
7400	40.45	WEM	Rocky Point, N. Y.	(E) Special relays evenings
7390	40.60	ZLT-2	Wellington, N. Z.	(P) Phones Sydney 3-7 A.M.
7385	40.62	OEK	Wein, Austria	(P) Tests early evenings very irreg.
7380	40.65	XECR	● Mexico City, Mexico	Sundays 7-8 P.M.; occasionally later
7370	40.71	KEQ	Kahuku, Hawaii	(P) Relays programs evenings
7345	40.84	GDL	Rugby, England	(P) Phones Japan irreg. A.M.
7220	41.55	VP3BG	● Georgetown, Br. Guiana	6-8:45 P.M. daily
7118	42.13	HB9B	● Basle, Switzerland	Mon., Thurs., Fri., 4-6 P.M.
7100	42.25	HKE	● Bogota, Colombia	Monday 6-7 P.M.; Tues. and Friday 8-9 P.M.
7080	42.37	PI1J	● Dordrecht, Holland	Sat., 10:10-11:10 A.M.
7074	42.48	HJ1ABK	● Barranquilla, Colombia	3-6 P.M. Sunday
7010	42.80	EA8AB	● Santa Cruz de Tenerife, Canary Islands	Mon., Wed., Fri., Sat., 3:15-4:15 P.M.
7000	42.86	PZH	● Paramaribo, D. Guiana	S. A. Sun., 9:45-11:45 A.M.; Mon. and Fri., 5:45-9:45 P.M.; Tues. and Thurs., 2:45-4:45 P.M., 8:45-10:45 P.M.; Wed., 3:45-4:45, 5:45-9:45 P.M.; Sat., 2:45-4:45 P.M.
6990	42.92	JVS	Nazaki, Japan	(P) Phones China mornings early
6950	43.17	WKP	Rocky Point, N. Y.	(E) Relays programs evenings
6950	43.17	GBY	Rugby, England	(P) Phones U.S.A. irreg.
6922	43.34	IUF	Addis Ababa, Ethiopia	(E) Irregular
6905	43.45	GDS	Rugby, England	(P) Phones WOA-WNA-WCN evenings
6900	43.48	HI2D	● Ciudad Trujillo, R. D.	Daily 6:40-8:40 A.M., 10:40 A.M.-2:40 P.M., 4:40-8:40 P.M.
6895	43.51	HCETC	● Quito, Ecuador	8:15-10:30 P.M. ex. Sun.
6890	43.54	KEB	Bolinas, Calif.	(P) Tests KAZ - PLV early A.M.
6880	43.60	CGA-7	Drummondville, Que.	(P) Phones Europe days
6860	43.73	KEL	Bolinas, Calif.	(P) Tests KAZ - PLV early A.M.
6845	43.83	KEN	Bolinas, Calif.	(P) Used irregularly
6830	43.92	CFA	Drummondville, Que.	(P) Phones N. America nights
6820	43.99	XGOX	● Nanking, China	Week days 6:30-8:30 A.M. Sundays, 7:30-9:30 A.M.
6800	44.12	HI7P	● Ciudad Trujillo, R. D.	Daily 6:40-8:40 A.M., 10:40 A.M.-2:40 P.M., 4:40-8:40 P.M.
6796	44.14	HIH	● San Pedro de Macoris, R. D.	Sunday, 3-4 A.M., 12:30-3 P.M., 4-5 P.M.; week days 12:15-2 P.M., 7-8:30 P.M.
6795	44.15	GAB	Rugby, England	(P) Phones Canada irreg.
6760	44.38	CJA-6	Drummondville, Que.	(P) Phones Australia early A.M.
6755	44.41	WOA	Lawrenceville, N. J.	(P) Phones GDW-GDS-GCS evenings
6750	44.44	JVT	Nazaki, Japan	(P) Phones JOAK irregular; Phones Point Reyes at times
6750	44.44	JVT	● Nazaki, Japan	1:45-2:15 A.M., 4-7:45 A.M., 5-5:20 P.M., 7-7:15 P.M., 9:45 P.M.-11:45 P.M.
6730	44.58	HI3C	● La Romana, R. D.	Week days 12:10-2:10 P.M., 6:10-7:40 P.M. Sun., 12:10-2:40 P.M.
6725	44.60	WQO	Rocky Point, N. Y.	(E) Tests evenings irreg.
6720	44.64	YVQ	Maracay, Venezuela	(P) Phones and relays N. Y. evenings
6720	44.64	YVQ	● Maracay, Venezuela	8-9 P.M. Saturdays
6718	44.66	KBK	Manila, P. I.	(P) Phones A.M. seasonally
6710	44.71	TIEP	● San Jose, Costa Rica	7:00-10:30 P.M. daily
6690	44.84	CGA-6	Drummondville, Que.	(P) Phones Europe irregularly
6680	44.91	DGK	Nauen, Germany	(P) Relays to Riverhead evenings irreg.
6650	45.11	GBY	Rugby, England	(P) Phones U.S.A. irreg.
6650	45.11	IAC	Pisa, Italy	(P) Phones ships irreg.
6635	45.00	HC2RL	● Guayaquil, Ecuador	5:45-7:45 P.M. Sunday, 9:15-11:15 P.M. Tues.
6630	45.25	HIT	● Ciudad Trujillo, R. D.	12:10-1:40 P.M., 5:40-8:40 P.M. ex. Sun. Sat., DX 10:40 P.M.-12:40 A.M.
6618	45.33	Prado	● Riobamba, Ecuador	Thursday 9-11 P.M.
6555	45.75	HI4D	● Ciudad Trujillo, R. D.	12:15-2:00 P.M., 5:00-8:00 P.M. except Sun.
6550	45.81	TIRCC	● San Jose, Costa Rica	Daily 12-2 P.M. 6-7 P.M. Thurs. Extra 7-10 or 11 P.M. Sunday 11 A.M.-1 P.M., 8-10 P.M.
6545	45.84	YV11RB	● Ciudad Bolivar, Venez.	7-10 P.M. daily; 3-6 P.M. Sun.
6520	46.01	YV6RV	● Valencia, Venezuela	10:30 A.M.-1:30 P.M., 4:30-9:30 P.M. daily

KC	Meters	Call	Location	Time
6500	46.15	HIL	●Ciudad Trujillo, R. D.	12-2 P.M., 6-8 P.M.
6480	46.30	HI8A	●Ciudad Trujillo, R. D.	Daily ex. Sunday 8:40-10:40 A.M., 2:40-4:40 P.M.
6451	46.50	HJ4ABC	●Ibague, Colombia	7-10 P.M. ex. Sunday
6450	46.51	HI4V	●Ciudad Trujillo, R. D.	11:40 A.M.-1:40 P.M., 5:10-6:40 P.M. daily
6447	46.51	HJ1ABB	●Barranquilla, Colombia	11:45 A.M.-1:00 P.M., 5:30-10:00 P.M. daily
6420	46.72	HI1S	●Santiago de los Caballeros, R. D.	11:40 A.M.-1:40 P.M., 5:40-7:40 P.M.
6415	46.77	HJA3	Barranquilla, Colombia	(P) Phones HJA2 evenings
6410	46.80	TIPG	●San Jose, Costa Rica	7:30-9:30 A.M., 12-2 P.M., 6-11:30 P.M. daily
6400	46.88	YV9RC	●Caracas, Venezuela	7-11 P.M. irreg.
6375	47.10	YV4RC	●Caracas, Venezuela	5:30-9:30 P.M. ex. Sun.
6351	47.24	HRP1	●San Pedro de Sula, Honduras	12-2 P.M., 7:45-10 P.M. daily
6330	47.39	JZG	●Nazaki, Japan	5-7 A.M. irregular
6325	47.43	HH3NW	●Port-au-Prince, Haiti	1-2 P.M., 7-8:30 P.M. ex. Sunday
6316	47.50	HIZ	●Ciudad Trujillo, R. D.	Daily 11:30 A.M.-2:45 P.M., 5:30 P.M.-9 P.M. Sat. to 10 & 11 P.M.
6300	47.62	YV12RM	●Maracay, Venezuela	6:30-9:30 P.M. ex. Sun.
6280	47.69	CO9WR	●Sancti-Spiritus, Cuba	9-10 A.M., 12-1 P.M., 4-6 P.M., 9-11 P.M. daily
6280	47.77	HIG	●Ciudad Trujillo, R. D.	7:10-8:40 A.M., 12:40-2:10 P.M., 8:10-9:40 P.M.
6275	47.81	HJ1ABH	●Cienaga, Colombia	Broadcasts and phones, irregular evenings
6243	48.05	HIN	●Ciudad Trujillo, R. D.	(See 11280 KC.) 11:40 A.M.-1:40 P.M., 7:10-9:10 P.M. daily
6240	48.08	HI8Q	●Ciudad Trujillo, R. D.	Daily 10:40 A.M.-1:40 P.M., 4:40-8:40 P.M.
6235	48.11	OCM	Lima, Peru	(P) Phones afternoons
6235	48.11	HRD	●La Ceiba, Honduras	8-11 P.M., Sundays 4-6 P.M.
6230	48.15	HJ4ABJ	●Ibague, Colombia	8-11 P.M.
6230	48.15	OAX4G	●Lima, Peru	7-11 P.M. daily
6190	48.47	HI1A	●Santiago de Caballeros, R. D.	Daily 11:40 A.M.-1:40 P.M., 7:40-9:40 P.M.
6182	48.53	XEXA	●Mexico City, Mex.	8-11:30 A.M., 3-5 P.M., 7-11 P.M. ex. Sunday
6170	48.62	HJ3ABF	●Bogota, Colombia	11 A.M.-2 P.M. 6-11 P.M.
6150	48.78	HJ5ABC	●Cali, Colombia	11 A.M.-12 noon, 7-10 P.M. Mon. to Fri., Sunday 12-2 P.M.
6150	48.78	HJ2ABA	●Tunja, Colombia	1:00-2:00 P.M. & 7:00-10:00 P.M.
6150	48.78	CJRO	●Winnipeg, Manitoba	Week days 6 P.M.-12 A.M., Sundays 5-10 P.M.
6150	48.78	GBT	Rugby, England	(P) Phones U.S.A. days
6150	48.78	HI5N	●Santiago de los Caballeros, R. D.	Daily 6:40-8:40 A.M., 10:40 A.M.-2:40 P.M., 4:40-8:40 P.M.
6150	48.78	YV3RC	●Caracas, Venezuela	10:30 A.M.-1:30 P.M., 3:30-9:30 P.M. daily
6150	48.78	CB615	●Santiago, Chile	4-7 P.M. daily
6150	48.78	COKG	●Santiago, Cuba	Daily 8 A.M.-11 P.M.
6140	48.86	W8XK	●Pittsburgh, Pa.	9 P.M.-1 A.M. daily
6137	48.88	CR7AA	●Lourenco Marques, Africa	12:45-3 P.M. daily; 8-10:30 A.M. Sundays
6131	48.93	HIX	●Ciudad Trujillo, R. D.	Mon. to Sat., 12:10-1:10 P.M., 4:40-5:40 P.M. Sunday, 7:40-9:40 A.M. Tues. and Fri., 8:10-10:10 P.M.
6130	48.94	ZGE	●Kuala Lumpur, S.S.	Sun., Tues., Fri., 6:40-8:40 A.M.
6130	48.94	TGX	●Guatemala City, Guate.	Irregular
6130	48.94	COCD	●Havana, Cuba	Sunday 11 A.M.-2 P.M., 7-10 P.M. Week days 11:30 A.M.-11 P.M.
6130	48.94	VE9HX	●Halifax, Nova Scotia	9 A.M.-11 P.M. daily
6130	48.94	LKJ1	●Jeloy, Norway	10 A.M.-6 P.M.
6122	49.00	HJ3ABX	●Bogota, Colombia	11 A.M.-2 P.M., 7-11 P.M.
6120	49.02	XEFT	●Vera Cruz, Mexico	Daily 11 A.M.-4 P.M., 7:30 P.M.-12 A.M.
6120	49.02	W2XE	●Wayne, N. J.	10-11 P.M. daily
6115	49.06	——	●Prague, Czechoslovakia	4 A.M.-3:45 P.M. daily
6110	49.10	HJ4ABB	●Manizales, Colombia	11 A.M.-1 P.M., 5-8 P.M.
6110	49.10	VUC	●Calcutta, India	Mon., 8-9 A.M. Wed., 10:30-11:30 A.M.
6100	49.18	Belgrade	●Belgrade, Yugoslavia	2 A.M.-12 midnight daily
6100	49.18	W9XF	●Chicago, Illinois	Sun., Tues., Thurs., Fri. 8 P.M.-12 A.M.; daily 12-1 A.M.
6100	49.18	W3XAL	●Bound Brook, N. J.	Mon., Wed., Sat., 5 P.M.-1 A.M.
6090	49.26	CRCX	●Bowmansville, Ont.	Week days 5-11 P.M.; Sundays 2-11 P.M.
6090	49.26	ZTJ	●Johannesburg, S. Africa	11:45 P.M.-12:30 A.M., 3:30-7:00 A.M., 9 A.M.-4:45 P.M.
6090	49.26	HJ4ABE	●Medellin, Colombia	11 A.M.-12 noon, 6-10:30 P.M. daily
6085	49.30	HJ5ABD	●Cali, Colombia	11 A.M.-2 P.M., 6-11 P.M. daily
6080	49.34	W9XAA	●Chicago, Ill.	6:30-8:30 A.M., 5 P.M.-12 A.M. daily
6080	49.34	ZHJ	●Penang, S.S.	6:40-8:40 A.M.
6080	49.34	HJ4ABC	●Pereira, Colombia	9:30-11 A.M., 6:30-9:30 P.M. daily
6080	49.34	CP5	●LaPaz, Bolivia	11:30 A.M.-1 P.M., 6-7:45 P.M., 8:30-11 P.M. week days; Sunday 3:30-6:00 P.M.
6080	49.34	HP5F	●Colon, Panama	Daily ex. Sunday, 11 A.M.-1 P.M., 7-10 P.M.; Sun. 10:45-11:30 A.M., 7-10 P.M.
6079	49.35	DJM	●Zeesen, Germany	Irregular
6072	49.41	OER2	●Vienna, Austria	Week days 9 A.M.-5 P.M.; Sat. to 6 P.M.
6070	49.42	YV7RMO	●Maracaibo, Venezuela	Daily 8 P.M.-12 A.M.
6070	49.42	VE9CS	●Vancouver, B. C.	6:00-7:00 P.M. Sunday 1:45 P.M.-1:00 A.M.
6065	49.45	HJ4ABL	●Manizales, Colombia	11:00 A.M.-12 noon Sat. to 5:30, 5:30-7:30 P.M.
6060	49.50	W8XAL	●Cincinnati, Ohio	Daily 6:30-7 P.M., 10 P.M.-2 A.M.
6060	49.50	HJ4ABD	●Medellin, Colombia	6-11 P.M. ex. Sun., 10:30 A.M.-1 P.M.
6060	4.50	W3XAU	●Philadelphia, Pa.	8-11 P.M. daily
6060	49.50	VQ7LO	●Nairobi, Kenya Colony, Africa	Mon. to Fri. 5:45-6:15 A.M., 11:30 A.M.-2:30 P.M. Tues. and Thurs., 8:30-9:30 A.M. Sat., 11 A.M.-3 P.M. Sun., 11 A.M.-2 P.M.
6060	49.50	OXY	●Skamleback, Denmark	1-6:30 P.M. Sunday 11 A.M.-6:30 P.M.
6050	49.59	GSA	●Daventry, England	Irregular
6050	49.59	HJ3ABD	●Bogota, Colombia	Daily 9-11 A.M., 12-2 P.M., 6-11 P.M.
6043	49.65	HJ1ABG	●Barranquilla, Colombia	Daily 11 A.M.-11 P.M. Sun., 11 A.M.-8 P.M.
6040	49.67	HI9B	●Santiago de los Caballeros, R. D.	Daily 6:10-9:40 P.M.; Sat. 11:40 P.M.-12:40 A.M.
6040	49.67	PRA8	●Pernambuco, Brazil	9:30-11:30 A.M., 2:30-8:30 P.M.
6040	49.67	YDA	●Tandjong Priok, Java	Week days 5:30-11 A.M., 6-7:30 P.M., 10:30 P.M.-2 A.M. Sundays 5:30-10:30 A.M., 7:30 P.M.-2 A.M.
6040	49.67	W4XB	●Miami, Florida	Temporarily off the air. Undergoing repairs.
6040	49.67	W1XAL	●Boston, Mass.	Sun. 3-9 P.M.; Mon. to Fri. inc., 7-9 P.M.
6030	49.75	HP5B	●Panama City, Panama	12 noon-1 P.M., 8-10:30 P.M.
6030	49.75	HJ4ABP	●Medellin, Colombia	6-10:30 P.M. daily
6030	49.75	PGD	Kootwijk, Holland	(P) Phones Java and E. Indies irreg.
6030	49.75	VE9CA	●Calgary, Alberta, Canada	10 A.M.-12 A.M. daily
6025	49.79	PGD	Kootwijk, Holland	(P) Phones Java and E. Indies irreg.
6025	49.79	HJ1ABJ	●Santa Marta, Colombia	11:30 A.M.-2 P.M., 5:30-10:30 P.M. daily
6020	49.83	PGD	Kootwijk, Holland	(P) Phones Java and E. Indies irreg.
6020	49.83	DJC	●Zeesen, Germany	Irregular
6020	49.83	XEUW	●Vera Cruz, Mexico	10 P.M.-1 A.M. daily
6018	49.85	ZHI	●Singapore, S.S.	Mon., Wed., Thurs. 5:40-8:10 A.M.; Sat. 10:40 P.M.-1:10 A.M.; 2nd & 4th Sundays, 5:10-6:40 A.M.—organ
6015	49.88	HI3U	●Santiago de los Caballeros, R. D.	Week days 7:10-8:40 A.M., 10:40 A.M.-1:40 P.M., 4:40-9:40 P.M. Sundays, 10:40 A.M.-1:40 P.M. only
6012	49.90	HJ3ABH	●Bogota, Colombia	11:30 A.M.-2 P.M., 6-11 P.M.; Sun. 12-2 P.M., 4-11 P.M.
6011	49.91	HJ1ABC	●Quibdo, Colombia	Sun., 3-5 P.M., 9-11 P.M.; Mon. to Sat., 5-6 P.M.; Wed., 9-11 P.M.
6010	49.92	VP3MR	●Georgetown, Br. Guiana	Sunday, 7:45-10:15 A.M. Week days, 4:45-8:45 P.M.
6010	49.92	COCQ	●Havana, Cuba	8 A.M.-10 P.M. daily
6005	49.96	HP5K	●Colon, Panama	7:30-9 A.M., 12-1 P.M., 6-9 P.M.
6005	49.96	CFCX	●Montreal, Que.	Week days, 6:45 A.M.-12 A.M.; Sunday, 8 A.M.-10:15 P.M.
6005	49.96	VE9DN	●Montreal, Que.	Sat., 11:30 P.M.-1 A.M., Fall, Winter & Spring
6000	50.00	XEBT	●Mexico City, Mexico	10 A.M.-1:45 A.M.
5980	50.17	HJ2ABD	●Bucaramanga, Colombia	Daily 11:30 A.M.-12:30 P.M., 6-10 P.M.
5975	50.20	XEWI	●Mexico City, Mexico	Not in use. See 11900 K.C.
5969	50.26	HVJ	●Vatican City, Vatican	2-2:15 P.M., Sunday 5-5:30 A.M.
5950	50.42	HJN	●Bogota, Colombia	8-10:45 P.M. irregular
5940	50.51	TG2X	●Guatemala City, Guat.	Daily 4-6 P.M.; Mon., Thurs., Sat., 10 P.M.-1 A.M.; Sundays, 1-2 P.M.
5910	50.76	HH2S	●Port-au-Prince, Haiti	7-10 P.M.
5880	50.85	YV8RB	●Barquisimeto, Venezuela	Daily 11:30 A.M.-12:30 P.M., 5:30-9:30 P.M.
5880	51.02	IUA	●Addis Ababa, Ethiopia	Used irregularly
5875	51.11	HRN	●Tegucigalpa, Honduras	Week days 12-1:30 P.M., 6-7:30 P.M., 8-11:15 P.M.; Sun., 3-5 P.M., 6-7:30 P.M., 8-11:15 P.M. and later

KC	Meters	Call	Location	Time
5865	51.15	HI1J	●San Pedro de Macoris, R. D.	Daily 6:25-7:40 A.M., 11:40 A.M.-1:40 P.M., 4:40-9:40 P.M.
5853	51.20	WOB	Lawrenceville, N. J.	(P) Phones ZFA P.M.
5850	51.28	YV5RMO	●Maracaibo, Venezuela	Week days 8:45-9:45 A.M., 11:15 A.M.-12:45 P.M., 4:45-9:45 P.M. Sundays 10:45 A.M.-12:45 P.M.
5850	51.28	GBT	Rugby, England	(P) Phones U.S.A. irreg.
5845	51.33	KRO	Kahuku, Hawaii	(P) Tests early mornings
5830	51.46	TIPGH	●San Jose, Costa Rica	8-11 P.M. daily ex. Sun.
5825	51.50	HJA2	Bogota, Colombia	(P) Phones HJA3 afternoons irreg.
5800	51.72	KZGF	Manila, P. I.	(P) Tests A.M. irreg.
5800	51.72	YV2RC	●Caracas, Venezuela	Sun., 8:30-11:30 A.M., 3:30-9:30 P.M. Week days, 10:30 A.M.-1:30 P.M., 4:15-9:30 P.M.
5790	51.81	JVU	Nazaki, Japan	(P) Phones JZC early mornings
5780	51.90	CMB-2	Havana, Cuba	(P) Phones and tests irregularly
5780	51.90	OAX4D	●Lima, Peru	9-11:30 P.M. Wed., Sat.
5760	52.08	HJ4ABD	●Medellin, Colombia	10:30 A.M.-1 P.M., 6-11 P.M.
5750	52.17	XAM	Merida, Mexico	(P) Phones XDR-XDF early evenings
5730	52.36	JVV	Nazaki, Japan	(P) Phones JZC early A.M.
5725	52.40	HC1PM	●Quito, Ecuador	Tuesdays 9-11 P.M.
5720	52.45	YV10RSC	●San Cristobal, Venez.	11 A.M.-12 noon, 6-8:30 P.M.
5713	52.51	TGS	●Guatemala City, Guat.	Sun., Wed., Fri., 6-8 P.M.
5705	52.59	CFU	Rossland, Canada	(P) Phones CFO and CFN eves.; news, 8:30-8:45 P.M.
5670	52.91	DAN	Nordenland, Germany	(P) Phones ships irreg.
5500	54.55	TI5HH	●San Ramon, Costa Rica	3:30-5 P.M., 8-9:30 P.M. daily
5445	55.10	CJA7	Drummondville, Que.	(P) Phones Australia early A.M.
5435	55.20	LSH	Buenos Aires, Arg.	(P) Relays LR4 and tests evenings
5410	55.45	ZBW	●Hong Kong, China	1:30-3:15 A.M., 6 A.M.-12 noon
5400	55.56	HJA7	Cucuta, Colombia	(P) Phones irreg.; broadcasts music in evening at times
5400	55.56	HJA7	●Cucuta, Colombia	Monday, 4-8 P.M.
5395	55.61	CFA7	Drummondville, Que.	(P) Phones No. America irregular
5260	57.03	WQN	Rocky Point, N. Y.	(E) Program service; irregular
5140	58.37	PMY	●Bandoeng, Java	Daily 4:45-10:45 A.M., 5:45 P.M.-2:15 A.M.
5110	58.71	KEG	Bolinas, Calif.	(P) Phones irregularly evenings
5080	59.08	WCN	Lawrenceville, N. J.	(P) Phones GDW evenings seasonally
5025	59.76	ZFA	Hamilton, Bermuda	(P) Phones WOB evenings
5040	59.25	RIR	Tiflis, USSR.	(P) Phones afternoons irregular
5015	59.82	KUF	Manila, P. I.	(P) Phones Bolinas; irregular
4975	60.30	GBC	Rugby, England	(P) Phones ships afternoon and nights
4905	61.16	CGA8	Drummondville, Que.	(P) Phones GDB - GCB afternoons
4820	62.20	GDW	Rugby, England	(P) Phones WCN-WOA evenings
4810	62.37	YDE2	●Solo, D. E. I.	5:30-11 A.M., 6-10 P.M., 10:30 P.M. - 2 A.M. daily
4795	62.56	VE9BK	●Vancouver, Canada	Weekdays 11:30-11:45 A.M., 2:30-3 P.M., 7:30-8 P.M. Sat. (same ex. last), 7-7:30 P.M.
4752	63.13	WOY	Lawrenceville, N. J.	(P) Tests irregularly
4752	63.13	WOO	Ocean Gate, N. J.	(P) Phones ships irreg.
4752	63.13	WOG	Lawrenceville, N. J.	(P) Phones Rugby irreg.
4600	65.22	HC2ET	●Guayaquil, Ecuador	9:15-10:45 P.M., Wed. & Sat.
4555	65.95	WDN	Rocky Point, N. Y.	(P) Tests Rome and Berlin evenings
4550	65.93	KEH	Bolinas, Calif.	(P) Phone; irreg.
4510	66.52	ZFS	Nassau, Bahamas	(P) Phones WND daily; tests GYD - ZSV irregular
4465	67.19	CFA2	Drummondville, Que.	(P) Phones No. America; irregular days
4355	68.88	IAC	Pisa, Italy	(P) Phones and tests irreg.
4348	69.00	CGA9	Drummondville, Que.	(P) Phones ships and Rugby evenings
4320	69.40	GDB	Rugby, England	(P) Phones CGA8 and tests evenings
4295	69.90	WTDV	St. Thomas, Virgin Is.	(E) Weather reports, 8 A.M.-12 Noon; 3-6 P.M.
4295	69.90	WTDW	St. Croix, Virgin Is.	(E) Weather reports, 8 A.M.-12 Noon; 3-6 P.M.
4295	69.90	WTDX	·St. John, Virgin Is.	(E) Weather reports, 8 A.M.-12 Noon; 3-6 P.M.
4273	70.21	RV15	●Khabarovsk, USSR.	Daily 11 P.M.-10 A.M.; English, 1:30 A.M.
4272	70.22	WOO	Ocean Gate, N. J.	(P) Phones ships afternoons and eve.
4272	70.22	WOY	Lawrenceville, N. J.	(P) Tests evenings
4002	75.00	CT2AJ	●Ponta Delgada, Azores	Wed. and Sat., 5-7 P.M.
3770	79.60	HB9B	●Basle, Switzerland	Mon. Thurs. Fri. 4-6 P.M.
3750	80.00	HCK	●Quito, Ecuador	Mondays 8:30-10:30 P.M. and occasional specials
3310	90.63	CJA8	Drummondville, Que.	(P) Phones Australia A.M.
3040	98.68	YDA	●Batavia, Java	Week days 5:30-11 A.M., 6-7:30 P.M., 10:30 P.M.-2 A.M.; Sundays, 5:30-10:30 A.M., 7:30 P.M.-2 A.M.

ume control is then turned up and no further tuning is necessary.

The receiver controls are smooth and easy of operation. Both the volume and tone controls are quiet and have wide ranges. The tuning mechanism is free of play and backlash.

The tuning indicator will operate on practically all broadcast-band stations and the stronger short-wave stations. It does not effectively indicate the presence of weak signals at the higher frequencies.

The receiver does not have 10-kc selectivity on strong signals, but that would be expecting too much. Nevertheless, we encountered very few cases of interference in the broadcast band and found it sufficiently sharp in tuning to separate the majority of stations in the higher frequency bands. We have no complaints to make in this respect.

The set suffers slightly from a certain amount of image interference on strong signals in the short-wave bands—notably Berlin in the 19-meter band and a few code stations between 16 and 31 meters.

PILOT MODEL 293

[*Continued from page 517*]

The frequency drift of the set at 14 megacycles amounted to approximately 30 kc from a cold start, which is not bad. No further drift preceptible. Nothing turned up during the tests to indicate any form of instability, and no dead spots were found in any of the bands.

The quality of reproduction is good up to normal, "room volume." Beyond that point there is distortion which becomes rather severe if the volume is turned up too high. The speaker is naturally small, and therefore is not capable of handling excessive audio power.

Air Test

The highspot of the receiver is sensitivity. A total of 39 stations in the broadcast band were hauled in during an early afternoon, and 63 at mid-evening. Starting at 7 P. M. one evening and tuning right through, no stations were heard on 16 meters, 3 on 19 meters, 8 on 25 meters, 12 on 31 meters and 27 on 49 meters. Random tuning at different periods brought in 3 stations on 16 meters and there would have been more had we listened in on this band at a more appropriate time. VK2ME was brought in early one morning but the signals were weak.

London and Berlin were picked up well and consistently on all their bands from 16 meters up; Berlin closed the electron-eye on 25 and 31 meters and came through like a local broadcaster, with London and Radio Colonial almost as good on 25 meters.

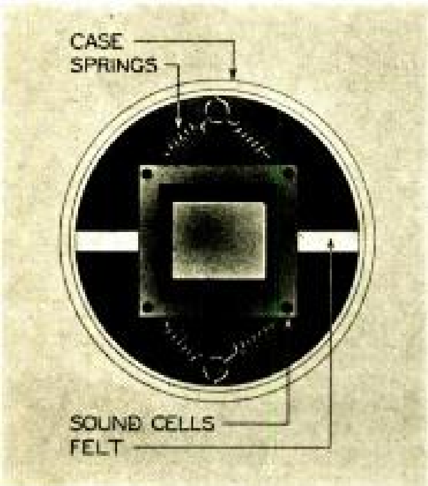
A short period of listening in the 20-meter amateur band one early evening brought in LU5CZ in the Argentine with an R8 signal, G5ML in England with an R7 signal, and VE4KX, HI5X, NY2AE, TI2RC, SM5SX, YN1FS, VP4PH, CO7CX and CO8VZ—all well up.

Considering the price and the number of tubes, this receiver performed in fine shape.

On the Market

Brush Mike Spring Mounting

THE LATEST DEVELOPMENT in microphone construction tending toward quietness in use is the newly developed spring mounting in the BR2S microphone manufactured by The Brush Development Company. This mounting makes unnecessary any external mounting ring or rubber stand shock absorber.



This device enables anyone using the microphone to pick it up and move it when in use. It is formed by fastening springs to two opposite sides of the unit of sound cells and pieces of felt on the other two sides. This makes the instrument unresponsive to jarring or other rough handling.—ALL-WAVE RADIO.

◆

Portable Servicing Laboratory

MODEL 1206 TRIPLETT Master Unit Test Set is a complete servicing laboratory in portable form.

The four interchangeable units that comprise this new laboratory set incorporate the latest engineering developments for their respective servicing applications. Included in the set are Master Unit Models 1200 Volt-Ohm-Milliammeter; 1210-A Tube Tester; 1220-A Free Point Tester, and 1231 Direct Reading All-Wave D. C. Signal Generator.

Each of the individual Master Units is housed in a compact metal case with durable black wrinkle finish. Size of the individual cases is 7⅞" x 6⅝" x 4⅝". Panels are in matching modernistic silver and black.

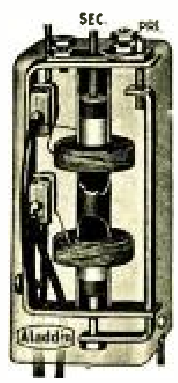
Model 1206 may be purchased complete, or units may be obtained separately at no difference in cost per item. Leatherette carrying cases are available for one, two, three or four units.—ALL-WAVE RADIO.

◆

Iron-Core Tuned I-F Transformers

THE LATEST ALADDIN Polyiron core i-f transformer, Model L series, has been designed to meet four specific requirements.

First—stability secured through limiting and selecting the various materials comprising the device. The most fundamental change involved is the substitution of iron core tuning as disclosed by Polydoroff of the Johnson Laboratories, Inc., in his developments some years back. The tuning is brought about by the movement of Polyiron cores in the fields of the respective coils, together with the substitution of high



quality fixed capacitors instead of the variable trimmers heretofore in general use.

Second—Economy. Most obvious is the novel and economical arrangement in which this is accomplished. The fixed capacitors themselves are anchored securely to the frame within the shield, the terminals being formed in such manner that they serve as an anchor for both the natural leads and the colored hookup leads coded for connection to proper terminals.

Third—Adaptability. The basic structure as far as mounting and adaptability is concerned remains unchanged from conventional transformers of this size, both primary and secondary being tuned from the top of the 1⅛" aluminum shields.

Fourth—Performance. The result of this development exhibits a gratifying improvement in performance under extreme conditions of temperature, humidity, vibration and shock. Gain and selectivity is adequate for present day circuits where the tube characteristics limit the gain which is economically obtainable in current production practice.—ALL-WAVE RADIO.

◆

New ARHCO Products

AMERICAN RADIO HARDWARE CO., 476 Broadway, New York, N. Y., have added to their line of parts and accessories for the amateur and experimenter, a series of midget variable condensers and Mycalex tube sockets.

The condensers are designed especially for short-wave and ultra-high-frequency work and are Mycalex insulated. These condensers can be mounted in any position either by a single nut or by mounting posts. A shaft extension is furnished and can be knob-or screwdriver adjusted. Two or more of these condensers can be ganged together, and provisions are made for locking them in any desired position.

The midget condensers are available in maximum capacities from 10 to 100 mfd, or 3 to 19 plates.

The Mycalex receiving tube sockets are particularly adaptable to short-wave and ultra-high-frequency receivers. The sockets may be either panel or base mounted. The contacts are made of phosphor bronze and are cadmium plated. They have self-wiping contacts with large area. The contacts are firmly riveted to the Mycalex base.

The sockets are available in 4, 5, 6 and 7 prong types, and small 7 prong.

The dielectric strenth of Mycalex at 20° C is .125 in. = 350 v/mil. or 43,750 volts breakdown per ⅛ inch.—ALL-WAVE RADIO.

◆

New General Radio Volume Control

A NEW VOLUME CONTROL of small size, improved terminal connections and better contacts, has been introduced by the General Radio Company, 30 State St., Cambridge, Mass. They are specially designed for use in conjunction with speech amplifiers in amateur 'phone transmitters and in public-address systems.

A few of the features of this new Type 653 Volume Control are: beryllium-copper contacts and switch arms, removable dust cover, finger index button on knob (easy to set without looking at knob), new type easy-to-solder terminals, and smaller depth—2 3/16" behind panel.

Stock impedance ranges of the Type 653 Volume Control are: 50, 200, 250, and 500 ohms. ALL-WAVE RADIO.

Tobe Flexidons

A NEW electrolytic condenser design announced by the Tobe Deutschmann Corporation, Canton, Mass., features unit or "Flexidon" construction which permits the removal of any single section of a multiple section condenser in case of failure.

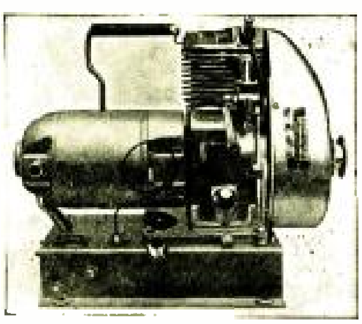
Obviously, the rest of the condenser is salvaged, with resulting replacement economy. Individual sections have separate positive and negative leads. Made in the usual capacities up to and including 16 microfarads, companion item, the replacement section, is known as the "Unidon."—ALL-WAVE RADIO.

◆

Katolight, Junior

FULLY PORTABLE, 50-pound power and lighting plants, which furnish standard 110-volt, 60-cycle, alternating current, have recently been placed on the market by the Kato Engineering Co., Mankato, Minnesota, U. S. A.

The Model JR35 Katolight, Jr., has a capacity of 350 watts and can be made self-cranking by simply connecting it to one standard 6-volt auto battery. The Model JRA3 has a capacity of 300 watts and is hand cranked with a rope starter.



These a-c models of the Katolight, Jr., can also be used for charging 6-volt batteries. The Model JRA3 has a low capacity d-c winding which will charge a 6-volt battery at the rate of about 3 amperes under full a-c load, and has a maximum charging rate of about 10 amperes, at 6-volts, under no load. The Model JR35 has the same winding and the same charging rate under full a-c load, with a maximum charging capacity of about 20 amperes at no load.

Katolight, Jr., plants are single, self-contained units. Equipped with handle for convenient carrying. Generator is directly connected to, and mounted on engine block. Fuel tank contained in base. Operates without being bolted down; quickly hooked to a-c line or appliance. Radio interference eliminated. Remote control equipment can be furnished for the Model JR35 at an additional cost. This makes it possible to start and stop the plant from distant points by simply installing bell push buttons at convenient places.—ALL-WAVE RADIO.

◆

New "Allied" Catalog

THE NEW 1937 Allied Radio Catalog has just been published and is now ready for distribution. It contains 152 pages, featuring 10,000 exact duplicate and replacement parts; complete lines of Amateur gear, P.A. equipment and Service instruments; All-Wave kits and sets; books, tools, etc. A free copy may be obtained by writing to Allied Radio Corporation, 833 W. Jackson Blvd., Chicago, Ill.—ALL-WAVE RADIO.

◆

Universal Tester

AN AC-DC multi-meter designed for radio servicing, providing for measurement of

ac-dc voltages and resistances, dc currents, and inductance and capacitance. Foundation of outfit is d-c meter with rectifier. Range of meter controlled by rotary selector switch. Will test electrolytic condensers for capacitance and leakage.

Model 611 Universal Tester is described in Bulletin 611-V. Shallcross Mfg. Company, Collindale, Penna.—ALL-WAVE RADIO.

◆

New "Wholesale Radio" Catalogue

WHOLESALE RADIO SERVICE Co., Inc., 100 Sixth Avenue, New York, have just announced the release of the 1937 "Blue Ribbon Catalogue." This catalogue, like its predecessors, is distributed free of charge to those interested in radio.

The "Blue Ribbon Catalogue" lists the most comprehensive collection of radio items, including all-wave and short-wave receivers, transmitters and transmitter parts, experimenter parts, service replacement parts, and a complete line of service test equipment.

This catalogue comprises more than 150 pages, contains over 2,000 illustrations, and lists more than 50,000 items. It has a beautiful cover, and the inside is split up into several sections, the set section being in rotogravure.

Copies may be obtained for the asking at any of the five branches of Wholesale Radio Service Co., Inc., located at 100 Sixth Ave., New York; 430 West Peachtree St., N. W., Atlanta, Ga.; 901 West Jackson Boulevard, Chicago, Ill.; 219 Central Avenue, Newark, N. J.; and 542 East Fordham Road, Bronx, New York.—ALL-WAVE RADIO.

◆

New C-D Condenser Catalogue

A SPECIAL CATALOGUE has been issued by the Cornell-Dubilier Corporation covering the new reduced prices recently announced for their line of "Dwarf-Tiger" condensers.

This catalogue lists the entire line of this series, together with catalogue numbers, and shows both the old and new price schedules. The savings shown average over 30%. This catalog No. 132A may be obtained from jobbers, or will be mailed to those requesting it from the Cornell-Dubilier Corporation, 1000 Hamilton Boulevard, South Plainfield, New Jersey—ALL-WAVE RADIO.

◆

2-Watt IRC Insulated Resistor

AN IMPORTANT ADDITION to the well known line of IRC Insulated Metallized Resistors as well as reduced prices on ½-watt and 1-watt Insulated Resistors have been announced by the International Resistance Company of Philadelphia, Pa.

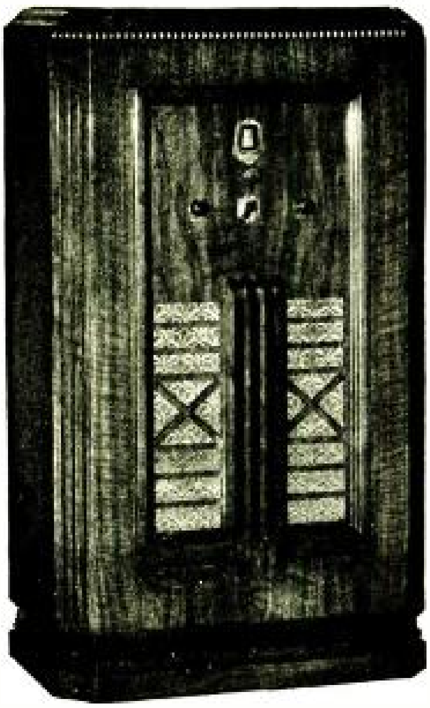
The new resistor is a 2-watt (Type BT-2) Insulated unit with the famous Metallized type resistance element and has all the features of the popular ½-watt and 1-watt resistors. These features include complete sealing against moisture, lower operating temperatures with proportionately higher wattage dissipation and exceptionally low noise level. Completely insulated with crack-proof Bakelite, the resistors may be used anywhere, even against metal chassis parts, without danger of shorting. The new 2-watt resistor is 1¾" long by 5/16" diameter and is made in all practical ranges.

Another recent addition to the IRC line was the ½-watt and 1-watt Insulated Wire Wound Resistors. Made in the low ranges from fractional ohmages, they offer new opportunities for stabilized, inexpensive resistors or series resistors for air cell batteries. They are likewise applicable for use as center tap resistors, enabling many combinations of values to be obtained through parallel and series arrangements.

A new catolog (No. 41) fully describing these as well as other important IRC developments will be sent upon request to International Resistance Co., 401 North Broad St., Philadelphia, Pa.—ALL-WAVE RADIO.

"Does Your Radio Miss this half the Program?"

With a SCOTT Hear ALL the High Tones and Overtones



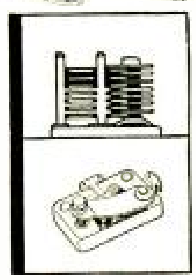
Why the SCOTT *Full Fidelity Radio* Gets More Stations with Finer Tone-

SCOTT I.F. Transformer (left) and production radio's transformer (right) in true comparative sizes.

At right—5-inch SCOTT I. F. Transformer designed in SCOTT Laboratories and used exclusively in SCOTT 23-Tube Full Fidelity Radio. Large shield three times size of shield on transformer of production type radios—Five of these powerful Transformers in every SCOTT.

HERE IS THE SECRET OF WHY THE SCOTT ALONE GETS ALL THE BEAUTY OF THE PROGRAM ALL THE GLORIOUS HIGHS AND OVERTONES ON THE AIR.

Far right—Three such small transformers used in mass production radios. Holes in shield let in dust and moisture. Cramped shield prevents full amplification of program signal.

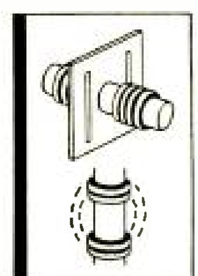


Top—SCOTT 8 segment air condensers in I.F. Transformers of SCOTT radios. Each segment does its share in capturing full signal. No dust can settle between segments to cut down sensitiveness or damage tone quality.

Bottom—Semi-fixed condensers in production radios. Less ability to pull in distant stations. Dust collects. Makes hiss in tone.

Top—SCOTT 8 section transformer coils. Higher efficiency. Permanently fixed on bakelite tube. No shifting of space between coils. Sharper station selection.

Bottom—2 section coils of ordinary radio. Mounted vertically. Wood dowell shrinks in dry climate—coils slip down. Expands in wet climate — compresses wires, causes short circuit.



Top — SCOTT brass shield between primary and secondary coils. Increases sensitivity which can be built into set. Enables you to get more stations.

Bottom—No shield between coils in ordinary radio. Signals jump back and forth, making howl. Factory cuts sensitivity to end howl—thus you miss many stations.

WE have long made unmistakable claims for the marvelous tone and incredible distance performance of the 23-tube SCOTT. Here you see the proof—proof that backs these claims! You find the same superior engineering and custom-building throughout *every detail* of the SCOTT—*just as demonstrated here with the* I. F. Transformers. As a SCOTT owner you receive the positive guarantee that if your SCOTT does not bring in more foreign and domestic stations with more startlingly true, beautiful tone, with less noise and greater undistorted volume—you may return it anytime within 30 days if you live in the U. S. A. and your money will be refunded without question.

THE SCOTT IS NOT EXPENSIVE

How amazing it is that hundreds of celebrated musicians such as Guy Lombardo and Toscanini, and financial leaders such as Baron de Rothschild have chosen to own a SCOTT—when the SCOTT is actually priced at $25 to $100 less than many ordinary mass production sets! You cannot overestimate the importance of this astonishing fact.

Here is the explanation! When you a buy a SCOTT you pay no middlemen's profits. You get custom-building for the price of mass production sets—with all the superior performance custom-building gives.

Put the SCOTT in your own home for 30 days—in a side by side comparison test with any other radio, regardless of price. Get the glorious domestic short wave programs from the east—*the pick of American popular music—of finest concert music—music in the morning!* Programs directed at Europe — yet your SCOTT pulls them in with a truth and beauty of tone which is unbelievably real.

Turn up the SCOTT Variable Selectivity—you can aim it so sharply that you get WOR—jammed between WGN and WLW.

Get Germany, Australia, Italy, England, Spain, Holland—the news and music of all the world from the lands of their exciting origins. Compare your results with those on any other radio.

MANY EXCLUSIVE FEATURES

The only radio—by test of national High Fidelity radio station*—which gives you all the radiant, vital high fidelity overtones up to 16,000 cycles, wherein lies the greatest beauty of all music.

Exclusive SCOTT Magic Maestro, actually restoring the musical expression cut by the broadcasting station. Exclusive SCOTT Rotary Wave Band Changer. Exclusive SCOTT variable Station-Tuning Condenser. Exclusive SCOTT Air-Cooled Power Transformer. Exclusive 35 watts "A" Power—from the faintest whisper, to the mightiest crescendo, without any distortion or rattle detectable to the human ear.

These are but a few of the features which have made the SCOTT probably the outstanding custom-built radio in the world today. Fill out the coupon now — get this *unparalleled* story of tone and distance performance! Discover for yourself the vast new wealth of fascinating radio entertainment which is enjoyed only by SCOTT owners.

*Name upon request.

FREE-SEND TODAY FOR DETAILS

E. H. Scott Radio Laboratories, Inc.
4476 Ravenswood Ave., Dept. 31T6
Chicago Ill.

Send "PROOF" of unequalled tone and DX performance of 23-tube SCOTT.

Name ....

Address ....

City .... *State* ....

E. H. SCOTT RADIO LABORATORIES, INC.
4476 Ravenswood Avenue, Dept. 31T6, Chicago, Illinois

630 Fifth Avenue, New York, N. Y. — 115 N. Robertson Blvd., Los Angeles, Cal.

BUILDERS OF THE WORLD'S FINEST CUSTOM-BUILT RADIOS

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JOSEPH CALCATERRA **DIRECTOR**

ANY of the catalogs, booklets and folders listed in this department may be obtained by ALL-WAVE RADIO *readers simply by filling in the coupon and drawing circles around the numbers listed in the coupon corresponding to the numbers of the items desired, and mailing the coupon to Readers' Data Bureau,* ALL-WAVE RADIO, *16 East 43rd Street, New York, N. Y.*

A complete stock of these catalogs and other literature is kept on hand and will be sent in answer to requests as long as the supply lasts. There is no limitation on the number of items you may ask for, but to avoid waste please do not ask for material in which you are not actually interested.

Only the literature listed in this issue is available. Please do not ask for catalogs which are not listed. Do not include letters for information from other departments with your request for booklets as that will cause delay in answering your inquiries.

◆

2. HAMMARLUND CATALOG. A complete, 12-page catalog containing specifications, illustrations and prices of the entire line of Hammarlund variable and adjustable condensers; intermediate-frequency transformers, coils and coil forms; sockets; shields, chokes and miscellaneous parts for broadcast, short-wave and ultra-short-wave reception and transmission. Also contains description and prices of the Hammarlund line of "Comet Pro" and "Super Pro" receivers.

◆

5. ELECTRAD VOLUME CONTROL AND RESISTOR CATALOG. Contains full engineering and servicing data and prices on Electrad standard and replacement volume controls, Truvolt adjustable resistors, vitreous wire-wound fixed and adjustable resistors and voltage dividers, precision wire-wound non-inductive resistors, center-tapped filament resistors, high-quality attenuators, power (50 and 150-watt) rheostats and other Electrad resistor specialties.

◆

29. THE KEY TO SUCCESSFUL SERVICING. This 24-page booklet gives complete information, including outlines and costs, of four different types of combinations of courses on Radio Servicing, Public Address Work, and Television, developed by the Radio Service Institute. Two of the courses are designed for the more advanced and more ambitious service men who are anxious to get to the top of their profession. The other two are for less-experienced service men who want to advance more rapidly in the Radio Servicing Field. Please do not ask for this booklet unless you are interested in taking a course in these subjects.

◆

53. POLYIRON COIL DATA SHEET 536. This folder contains complete catalog descriptions, specifications, prices, performance curves and circuits showing applications of the complete line of Polyiron radio components made by the Aladdin Radio Industries, Inc.

◆

57. AMPERITE MICROPHONES AND HOW TO USE THEM. Describes the entire line of Amperite Velocity Ribbon Microphones and gives instructions and wiring diagrams on how to use them to best advantage.

◆

65. THE 1937 LINE OF SUPREME TESTING INSTRUMENTS. This 12-page catalog gives complete information on the entire Supreme line of testing instruments, including the Model 585 Diagnometer; the Model 540 and 550 Radio Testers; the Model 500 Automatic; the Model 505 Tube Tester; the Model 555 Diagnomoscope and other Supreme oscilloscopes, tube testers, signal generators and multimeters. Complete details of the Supreme Easy Payment Plan for purchasing testing instruments on the installment plan are also given.

◆

73. HOW TO ELIMINATE RADIO INTERFERENCE. A handy descriptive folder of the Sprague Interference Analyzer showing how it can be used to locate various sources of radio interference and pointing out the remedies which can be used to eliminate the different types of radio interference.

◆

74. SPRAGUE ELECTROLYTIC AND PAPER CONDENSER CATALOG. The complete Sprague line of paper and wet and dry electrolytic condensers are listed in this catalog together with technical specifications and list and net prices. Information on the Sprague Capacity indicator for making capacity tests on condensers and in servicing radio receivers is included.

[*Continued on page 529*]

ALL-WAVE RADIO READERS' DATA BUREAU,
16 EAST 43RD STREET,
NEW YORK, N. Y.

AR-1136

Please send to me, without charge or obligation, the catalogs, booklets, etc., the numbers of which I have circled below.

2 5 29 53 57
65 73 74 75 76

My connection in radio is checked below:

( ) Service Man operating own business (IS)
( ) Service Man for manufacturer (MS)
( ) Service Man for jobber (JS)
( ) Service Man for dealer (DS)
( ) Service Man for servicing company (SS)
( ) Dealer (D)
( ) Jobber (J)
( ) Short Wave Listener (SW)
( ) Broadcast Listener (BC)
( ) Experimenter (EX)
( ) Professional Set Builder (SBP)
( ) Amateur Set Builder (SBA)
( ) Licensed Amateur (LA)
( ) Station Operator (SO)
( ) Radio Engineer (RE)
( ) Laboratory Technician (LT)
( ) Public Address Worker (PA)
( ) Manufacturer's Executive (ME)
( ) Student (S)

I am a:
( ) Subscriber
( ) Newsstand reader

I buy approximately $ .00 of radio material a month. (Please answer without exaggeration or not at all.)
(Please print name and address)

Name ....
Address ....
City ....State ....

Avoid delay. The catalogs and booklets listed are now in stock and will be sent promptly as long as the supply lasts.

75. TEL-U-HOW CONDENSER GUIDE. A valuable chart, compiled by the Sprague Products Co., which tells the proper types, capacity values and voltages of condensers required in the various circuits of radio receivers and amplifiers. It includes data on condenser calculations and information on how to locate troubles due to defective condensers.

◆

76. FACTS YOU SHOULD KNOW ABOUT CONDENSERS. This folder, prepared by the Sprague Products Co., explains the importance of various characteristics of condensers, such as power-factor, leakage, capacity and voltage in determining the efficiency or suitability of a given condenser to provide maximum filtering and safety in operation.

Book Reviews

OFFICIAL RADIO SERVICE HANDBOOK, by J. T. Bernsley, published by Gernsback Publications, Inc., 99 Hudson St., New York, N. Y. Stiff cloth cover, 5¾ by 8¼ inches, 1008 pages, well illustrated. Price $4.00.

Though written and compiled principally for the radio serviceman, this text-book will also prove a welcome addition to the shelves of radio experimenters, amateurs and students. It contains a wealth of well-written and concise information on both the practical and theoretical aspects of radio receiver and amplifier design, operation and testing. There are chapters given over to receiver modernization and conversion, noise interference elimination, hints on localizing trouble and making repairs, as well as detailed explanations of circuit fundamentals.

The chapters which will have a particular appeal to servicemen are those dealing with Fundamentals of Meter and Test Instruments, Commercial Types of Test Equipment (with diagrams and illustrations), The Theory and Application of the Cathode-Ray Oscillograph, How to Build Servicing and Test Instruments, Short Cuts With Test Equipment, and Notes on Installation.

The Operating Notes section of the book is a complete encyclopedia in itself. There are 30 pages of I-F Peaks, 10 pages of Voltage Divider Data, 16 pages of Speaker Field Resistance Values, 87 pages of Volume Control Data, 65 pages on Receiver Tube Complements, 66 pages of Receiver Operating Notes, and 142 pages of Condenser Replacement Data.

The book is well printed, on a very good grade of paper; the illustrations are clear and easily readable. An Index is contained in the back of the book. A really fine treatise.—ALL-WAVE RADIO.

◆

"PROGRESSIVE" II—A Supplement to the "Progressive" Transmitter Guide For Amateurs, published by Amateur Press, 1300 W. Harrison St., Chicago, Ill. Paper cover, 5½ by 8½ inches, 27 text pages, profusely illustrated. Price 15 cents.

A fine booklet for the ham, covering in detail the step-by-step construction of the units comprising a complete high power c-w and/or phone rig with a pair of 803's in the final stage. The ham can start out with the simple 6F6 Universal Exciter and use this as a low-power transmitter until his pocketbook permits progression to an RK-20 stage (used as the buffer amplifier in the complete job), and so on, up the line into the "heavy equipment," without the necessity of scrapping any previous units.

The booklet gives construction details (including circuit diagrams, panel and chassis drawings, photos and lists of parts) on a 6F6 Universal Exciter, RK-20 Buffer Amplifier, Low Power Stage Supply, Bias Supply, 803 Stage, High Power Supply, Modulator Amplifier, and Power Modulator.

A sketch giving the interconnections between the various units comprising the complete rig is included in back of the booklet.—ALL-WAVE RADIO.

◆

THE "RADIO" ANTENNA HANDBOOK, by the Engineering Staff of "Radio"; under the direction of J. N. A. Hawkins; edited by Frank C. Jones and W. W. Smith; published by Radio, Ltd., 7460 Beverly Boulevard, Los Angeles, Calif. Stiff paper cover, 6¼ by 9¼ inches, 80 pages, profusely illustrated. Price 50 cents.

An excellent compilation of antenna dope, with consideration given to the practical as well as the theoretical aspects. This book is bound to eliminate a lot of head-scratching.

Its particular value lies in its completness; such points as length of spans and feeders for each amateur band, angles of reflection and direction, etc., are not left to the imagination. The dope given is based on practical application.

The nine chapters of the book cover: Antenna Fundamentals, Choice of an Antenna, Methods of Feeding Antennas, Coupling to the Transmitter, Harmonic Operation, Directive Antennas, Receiving Antennas, Special Antennas and Miscellaneous Tables, and Supporting the Antenna.

Methods of feeding cover; End Fed, Marconi. Resonant and Non-resonant, Current and Voltage. Zepps, Collins Multi-band, Linear Transformer, Johnson Q, Two-Wire Open, Coaxial, Twisted Pair, Y and Delta Match. Off-Center, etc.

In the chapter on directive antennas there is dope on V jobs, Rhombics, Stacked Dipoles, End-Fire and Broadside Arrays, Folded Arrays, etc. Though not in the same chapter, the Reinartz Rotary Beam and Hawkins Double Vee are also included.

Formulas are included for those who want to use 'em.—ALL-WAVE RADIO.

GLOBE GIRDLING

[*Continued from page 501*]

issue to report similar information for the benefit of readers.

Broadcast—21520 W2XE; 15310 GSP; 15180 GSO; 12130 DZE; 11450 COCX; 11280 HIN; 9610 YDB; 6820 XGOX; 5410 PMY; 4810 YDE2, 3040 YDA.

Others—15150 PLH (PMH); 13820 SUZ; 11490 PLO (PMK); 10055 ZFB.

We are indebted to the following listeners for their helpful information: Messrs. J. Wendell Partner, Tacoma, Washington; Lyle Nelson, Yamhill, Oregon; Wilbur Britting, Los Angeles, California; S. P. Herren, Jr., Haskell, Texas; Byron Silvius, Hollywood, California.

In addition to this we have decided to print complete the best list received each month from whatever section of the country it may come, and we are therefore listing below such a report compiled and filed by Mr. Ed McKay of Rome, Georgia. This list is a report of stations received during the period of August 12th to September 2nd, inclusive.

Mr. McKay calls atention to a large gap in the broadcast stations where the 49-meter "regulars" camp and states that due to so much QRN on this band he possibly refrained from exerting too much effort in that locality. He says he was "too lazy," but the list appears below and speaks for itself. It includes 20-meter phones, broadcast and special transmissions. It might be said that Mr. McKay uses two aerials, one for reception above 25 meters and the other below 25 meters.

It is hoped that these reports will be interesting and valuable.

VLZ, VK3LR, VK3ME—Australia; LZA—Bulgaria; ORK—Belgium; COCX, COCH, COCQ, COCO, COCD—Cuba; HJ1ABP, HJ1ABG, HJ1ABJ, HJN—Colombia; OLR—Czechoslovakia; CJRX, CJRO—Canada; TI4NRH, TIPG, TIEP—Costa Rica: ZBW—China, HI1S, HIT, HIN, HIZ HI3C—Dom. Rep.; HC2CW, HCJB—Prado, Ecuador; GSN, GSG, GSP, GSF, GSC, GSB—England; TPA2-3-4—France; VPD—Fiji Islands; DJA, DJB, DJD, DJE, DJL, DJN, DJQ, DJR—Germany; TGWA—Guatemala; PCJ (2). PHI—Holland; HH2S—Haiti; HAS3, HAT4—Hungary; 2RO—Italy; PLP, PMN, YDB—Java; JVH, JVN—Japan; XEXA, XEUW, XEBT, XEWI—Mexico; ZLT—New Zealand; HP5J—Panama; CT1AA—Portugal; EAQ—Spain; HBJ—Switzerland; YV6RV, YV2RC—Venezuela; W2XAD, W3XAL, W2XE (2), W8XK (2). W2XAF, W1XK, W8XAL, WOO—United States.

20 Meter Phones

Following is the list of stations picked up by Mr. McKay in the 20-meter amateur phone band.

Call	Location	Frequency	Time
VK2IQ	Australia	14110	1:28 A.M.
VK2AP	Australia	14120	1:45 A.M.
VK2OG	Australia	14090	7:06 A.M.
VK2VA	Australia	14138	7:02 A.M.
VK2HS	Australia	14250	1:40 A.M.
VK2ABD	Australia	14135	1:20 A.M.
VK2QR	Australia	14060	1:25 A.M.
VK2CG	Australia	14275	1:40 A.M.
VK3OC	Australia	14065	7:24 A.M.
VK3ZZ	Australia	14080	7:20 A.M.
VK5KG	Australia	14290	7:00 A.M.
EI2J	Ireland	14090	11:20 P.M.
J1KT	Italy	14395	1:14 A.M.
CO8PC	Cuba	14350	6:15 P.M.
PY2ET	Brazil	14075	6:20 P.M.
PY5AQ	Brazil	14325	6:09 P.M.
NY2AE	Canal Zone	14175	1:30 A.M.
G2XV	England	14140	1:05 A.M.
G2MV	England	14135	1:20 A.M.
G5ML	England	14100	7:03 P.M.
VP9G	Bermuda	14135	6:03 A.M.
SU1CH	Egypt	14300	7:10 P.M.
VP7NA	Bahamas	14400	7:00 P.M.
LU4BH	Argentina	14305	7:20 P.M.
SM5SX	Sweden	14125	5:25 P.M.
HI7G	Dom. Rep.	14125	6:05 A.M.
CE1BC	Chile	14055	7:25 P.M.
OA4AK	Peru	14275	7:26 P.M.
YN1HS	Nicaragua	14145	7:28 P.M.
VO1J	Newfoundland	14135	11:02 A.M.
VV5AM	Venezuela	14095	4:25 P.M.
F8XN	France	14135	1:32 A.M.
K6FKN	Hawaii	14200	2:33 A.M.
PK1MX	Batavia	14125	7:45 A.M.

The following is a list of 20 meter amateur phone stations received by listeners and forwarded to this department in late reports:

LU8DR—Argentina; VK2QR, VK2TI, VK3DY, VK3XZ—Australia; VP7NA—Bahama Islands; ON4UT ("LF"—4:10 P.M.), ZA ("HF—3:20 P.M.). PH. HW, AA—Belgium; TI3AV, TI5RC—Costa Rica; CO2WS, CO7CR, CO8EG, CO8RQ—Cuba; SU1RO—Egypt; G2XV, G2ZY ("LF" side—4:50 P.M.), G5JS, G5XG, G6CW, G6DW, G6HW, G6VX—England; F8VP, F8II, F3CC, F8VA—France; EI8J—Irish Free State; OA4AB—Peru; EA3ER, EA6AB, EA7AF, EA7BB—Spain; YV5AA ("LF"—5:55 P.M.)—Venezuela.

No stations reported previously are included in the above listing. The majority of stations reported were received in the late afternoon, except the Australian stations which were received in early morning.

CO8RQ, Cuba, is working phone on 14040 and 14120 kc as well as 7020 and 7061 kc. and Ellsworth Dumas, Beloit, Wisconsin, advises that this station desires reports and will answer all correct reports by veri card.

Burton W. Bostad, Minneapolis, Minn., and Frank A. Hefner, Jr., Philadelphia, both report hearing W10XDA, the schooner *Morrissey* in the early evening coming in with good strength, relaying messages to amateurs in New York. It is on "HF" side of 20-meter band.

Please make subsequent reports in conformance with our outline in October issue so that the information may be compiled and presented to the advantage of those interested.

We are very grateful to the following listeners for 20-meter reports: E. G. Collister, Baldwin, N. Y.; Galen Balfe, Lowell, Mass.; E. H. Clark, Hollister, Calif.; Charles Miller, Covington, Ky.; E. W. Hollon, Royal Oak, Mich.; Roy Waite, Ballston Spa, N. Y.; Sydney G. Newman, Los Angeles, Calif.; Michael M. Elliott, Minneapolis, Minn.; H. Francis Shea, East Machias, Maine; R. Carek, Lorain, Ohio; S. P. Herren, Jr., Haskell, Texas; Harry T. Burhans, Morton, Pa.; Ellsworth Dumas, Beloit, Wisconsin; and Burton W. Bostad, Minneapolis, Minn.

We are again reporting the following stations as delinquent in forwarding verification of reception reports—HJN, HKV, HJ1ABB, HJ3ABF, HJ4ABD, HJ4ABB — Colombia; HC2CW, HC2ETC—Ecuador; XBJQ—Mexico; HRN—Honduras; YNVA—Nicaragua; CB960—Chile; HI2D, HI4V, HI5N, HI7P, HI9B—Dominican Republic.

Acknowledgements

We again have pleasure in acknowledging interesting reports and letters from the following:—James M. Alexander, Jr., Lookout Mountain, Tenn.; Lennart C. Anderson, Denair, Calif.; Harry Brown, New York City, N. Y.; Fred Bryant, Jr., Lebanon Jct., Ky.; Burton W. Bostad, Minneapolis, Minn.; A. L. Beatty, Tampa, Fla.; Harry H. Burhans, Jr., Morton, Pa.; C. R. Cottonn, Roanoke, Va.; Clyde Criswell, Phoenix, Ariz.; R. Carek, Lorain, Ohio; Wm. DeLeon, New York City, N. Y.; Ellsworth Dumas, Beloit, Wisc.; Robert H. Ekelberry, Norwood, Ohio; Frank A. Hefner, Jr., Philadelphia, Pa.; Stephen Levy, Cedarhurst, N. Y.; Joe Montague, Yuma, Ariz.; Ed. McKay, Rome, Georgia; Sydney G. Newman, Los Angeles, Calif.; Mrs. Jaques Robitaille, Montreal, Canada; J. F. Satterthwaite, Toledo, Ohio; Peter A. Terwiel, Chicago, Ill.; John L. West, Lakewood, Ohio; S. A. Whitt, Itmann, W. Va.; C. M. Whelan, Denver, Colo.; George Yetter, Winnetka, Ill.; and to extend to them and many others the thanks of ALL-WAVE RADIO and the writer for their assistance and kindly comments.

Comments Appreciated

We will appreciate your comments and criticisms, and will be grateful for information sent us as to changes in time schedules, frequencies which may be noted upon receipt of verifications or letters from the stations or any information which will be of interest to our readers.

Address your letters to me at 85 St. Andrews Place, Yonkers, New York, enclosing self-addressed stamped envelope in case a reply is desired. We will continue to gladly answer all inquiries pertaining to reception, stations unknown, or station matters in general. All questions of a technical nature should be forwarded to Queries Editor, ALL-WAVE RADIO, 16 East 43rd Street, New York, N. Y.

CHANNEL ECHOES

[*Continued from page 502*]

bourne transmitter coming through nicely with a tenor and soprano duet and VK3LR filling in with an equally good baritone.

Decidedly worth listening to if one has dogs to let out, cats to let in, joker stoves to attend to, early trains to catch, bicarbonate of soda to mix—or just plain insomnia.

[*Continued on page 532*]

SHORT-WAVE LISTENERS who occasionally find themselves stymied on the amateur 'phone bands and marvel somewhat at the nomenclature and jargon will be interested in the short article appearing in the August issue of *QST*, written by Wilfred A. Thompson, W3AQV, and dedicated to the noble purpose of improving English as it am spoken by the average ham. Mr. Thompson suggests that the more intelligent and better educated amateurs set the example, and he asks—"After . . . contact is established with another 'phone, and he is one of those fellows who gives no thought to the construction of his sentences, uses slang and mispronounces half his words, what will he think when you go back to him speaking correctly with well enunciated words and with the absolute absence of silly slang?"

He will doubtless think that you don't know how to speak correct English.

◆

AFTER ALL, why jump on the poor amateur when bad grammar is deliberately written into more than one-half the plugs in our commercial long-wave broadcasts? It would almost seem that the FCC had passed a law making manditory the use of adjectives in place of verbs and of split infinitives.

HAM LINGO

[*Continued from page 487*]

technical words and phrases employed in amateur fone communication that are mystifying to the uninitiated. For instance, if you hear a ham say he is using a "Johnson Q," a "half-wave vertical," a "zepp," a "signal squirter," a "Hertz," etc., you'll know he is referring to the type of antenna he employs for transmitting. The numbers you hear are types of transmitting tubes which are used in the various stages of the complete transmitter—the speech amplifier, the modulator, the oscillator, the doubler, the buffer and the final amplifier. The "final" is connected to the antenna "feeders" or "transmission line" through a "tank" coil. One tube is said to "feed" or "drive" another, and that's exactly what they do. The complete transmitter is called the "rig" and, as you have probably observed, the location of the complete station is always referred to as "the shack" no matter if it is the cellar, an upstairs room, the garage or the sun parlor.

Then there is that mystifying word "skip." It is an abbreviation of "skip distance," the area on the surface of the earth over which a signal jumps. A signal with a "short skip" returns to earth within a short distance; one with a "long skip" may not hit earth for a distance of 1000 miles or more. The length of the skip is dependent upon natural conditions, and when "short skip" conditions prevail nearby stations are heard.

And there are the references to "cross-band" or "cross-channel" operation, "duplex" operation and "break-in." And also to "working through."

In cross-band operation an amateur in, say, the 20-meter band talks to an amateur in the 75-meter band. Amateur No. 1 transmits on 20 meters and tunes his receiver to 75 meters, while amateur No. 2 transmits on 75 meters and tunes his receiver to 20 meters. The two can then leave their carriers on the air and talk to each other as they would on the telephone.

Duplex operation is carried on in the same manner except both amateurs work in the same band, with transmitters and receivers in continuous action.

In break-in operation, both receivers are left in action (one between pauses) but only the carrier of the station transmitting is on the air. This leaves the listening amateur free to "break in" through a hole in the transmission at any time if he misses a part of the message.

The system of "working through" is a form of re-broadcasting. For instance, one amateur will pick up the signals of a second amateur operating on, say, 5 meters and re-transmit them on 20, 75 or 160 meters to a third amateur. Since signals on 5 meters do not normally travel over great distances, the advantage of the system is obvious.

And that brings us to the end of our "lingoistic" dissertation. It's not complete by any means. But we believe most of the more commonly used words and terms are included. No—we missed one, and that's "CUL." Have you heard it? It means "see you later."

TUNING INDICATORS

[*Continued from page 514*]

diode-circuit voltage is greater than 8 volts.

Conclusion

The difference in cut-off voltage between the 6G5 and 6E5 may determine which of these tuning-indicator tubes will be used in a receiver. Receivers having a large number of tubes under the control of the avc system usually develop a small voltage in the diode circuit; the 6E5 is generally suited for use in these circuits. The diode-circuit voltage may increase beyond the cut-off voltage of the 6G5 in receivers that have comparatively few tubes under the control of the avc system; in such cases, either tube type can be used.

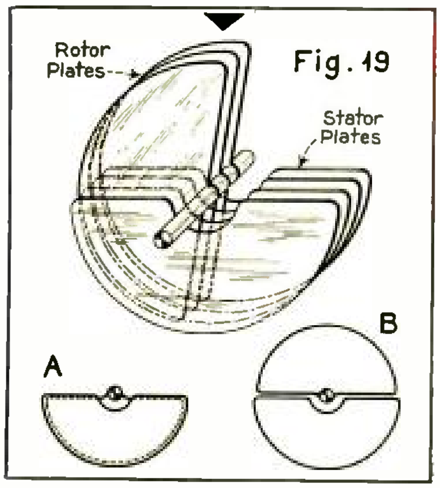
EMBRYO HAMS

[*Continued from page 508*]

that the condenser in this case would be charged to capacity positively one instant and then charged to capacity negatively. The result, then, is much the same as though the alternating current were actually flowing through the condenser from one plate to the other.

The capacity of a condenser is dependent upon the effective area of the metal plates or conductors, the distance between them, and the nature of the insulation or *dielectric* as it is called.

A condenser composed of two plates separated by air will increase in capacity as the plates are brought closer together and decrease in capacity as the plates are moved further apart. If one plate is made movable, therefore, the capacity of the condenser can be varied.



Typical variable tuning condenser. "A" shows position of maximum capacity and "B" minimum capacity.

If the effective area of one plate of a condenser to the other is increased the capacity of the condenser will increase; if the area is decreased the capacity of the condenser will decrease. Therefore, if the two plates are cut in semi-circular form and one of the plates rotated, the effective area and hence the capacity of the condenser can be altered. This is the principle used in variable condensers for radio receivers and transmitters, except that instead of two plates, a series of stationary and rotary plates are used, as shown in Fig. 19. The rotor plates interleave with the stator plates and are separated from the latter by air space. The capacity of such a condenser is maximum when the rotor plates are completely interleaved with the stator plates, as shown at "A," and minimum when the rotor plates are completely unmeshed, as shown at "B."

Fixed condensers are made of sheets of tin or alumium foil with paper or mica insulation. The so-called *dielectric constant* of paper and mica is considerably greater than that of air and permits the manufacture of condensers of comparatively large capacity that do not occupy much space in a radio set. The use of paper or mica also permits the foil plates of the condenser to be placed very close together which further increases the capacity. The still higher capacity electrolytic condensers have a very thin insulation film between the sheets of foil which is developed chemically.

A condenser, like a coil, has reactance and therefore impedes the flow of an alternating current. The reactance of a coil is referred to as *inductive reactance* and that of a condenser as *capacitive reactance*. The reactance of a condenser is dependent upon the frequency of the current and the capacity of the condenser. But, the reactance or impeding force of a condenser *decreases* with an *increase* in frequency whereas the reactance of a coil *increases* with an increase in frequency. It may be said generally, therefore, that a high-frequency current has more difficulty in flowing through a coil than through a condenser. This is an important point, and I'll show you in my next letter how these particular properties applied to a radio circuit permit tuning, and how they make it possible to guide various electrical currents through wire circuits.

Gerald

QUERIES

[*Continued from page 515*]

another month or so of not too good operation, it went dead completely.

"I should like to know when it was manufactured, because I thought it might possibly be an old set of which the dealer wanted to get rid. Would this fading appear in a set which had been stored for a long time—or could this be due to improper alignment?"

J. T., North Reading, Mass.

Answer:

This question is of no general interest except in so far as it indicates to what extent we, or anyone else can be of assistance in determining radio faults without examining the set, and when a *good* serviceman should be called in.

Unfortunately, we cannot fix J. T.'s receiver for him—or even tell him how to go about doing it. His set is a 1936 model, and it should give excellent results. Poor installation may be responsible for unsatisfactory reception. Improper alignment is doubtful. It was undoubtedly well inspected, and its age is such as to make illogical the possibility of its getting out of alignment. J. T. does not tell us how many hours the receiver has been in operation, so we are unable to hazard a guess as to the condition of the batteries. Complete in-operation, however, would indicate at least one dead section in the "B" battery. A faulty tube may account for the one that burned out.

But the fact of unsatisfactory operation when the receiver was first installed still remains—and this indicates a job for the expert serviceman—one who knows modern receivers. The Westinghouse 601 employs two tubes out of five which require intelligent attention in servicing —the 1C6 pentagrid converter and the 25S duplex-diode triode.

This receiver sells for $34.95. There is no good reason why it should not give satisfactory results over the two wave-bands it covers. If a complaint is made within the time limit of the guarantee any reliable dealer will see that his customer is satisfied. The burden of making the set perform is upon him. After the guarantee period it will usually be the job of an expert serviceman—unless the set owner himself is a technician and possesses the required equipment. However, before calling in a serviceman, (unless he works on a free inspection basis) have your tubes tested at the nearest radio shop. There is rarely any charge for this, and a new tube or two will be all that is required to make a set satisfactorily operative.

FIVE-METER SUPER

[*Continued from page 497*]

Condensers C-1 and C-2 are worked by knobs from the front of the panel. C-1 can be set for any given antenna and left unchanged as long as the antenna is not changed. C-2 tunes very broadly and can be tuned to the center of the five-meter band and left alone. This coupling device may look and sound complicated, but it does not add much to the difficulty in tuning the set since it needs no attention after it is once set.

This completes the electrical layout of the super. The complete diagram showing all the different units connected together is shown in Fig. 7.

Mechanical Details

The mechanical arrangement can be seen from the photographs. In the front panel view, the two dials are the tuning controls. The first two knobs to the left control the antenna circuit, the center one controls the regeneration in the first detector, the next one is the tone control and the last one to the right is the audio gain. In the sub-panel view, the antenna tuning coil and condensers can be seen in the lower left-hand corner. The various other parts seen under the chassis were so placed to make the most direct and shortest possible paths in their respective circuits. The large square can just to the left of the meter in the rear view picture contains the two ultra-high frequency stages. The smaller can just to the left of the meter covers the oscillator, while the one to the extreme left is the audio transformer. The fourth photograph shows the ultra-high frequency stages out of their can. They were assembled and wired on heavy engraver's copper, then connected together and screwed to the chassis. The can is then placed over them.

Performance

In performance this super goes well below the background noises found in congested localities. It has not been tried in the country yet. Because of the wide tolerance of the intermediate frequency transformers, the quality of reception is excellent. In fact, when a five-meter oscillator twelve miles away was driven with only the voice frequency output of the modulator, the oscillator plate voltage being turned off, the voice was still intelligible though very rough. The tuning is not at all critical though fairly sharp. The oscillator is very stable, so there is no necessity for hanging on to the dial to chase a signal back and forth across the band. The push-pull 2A5's give more output than can be used and never have to be opened wide in order to hear a signal.

THE HAM BANDS

[*Continued from page 509*]

cuit and the neutralizing condensers are also mounted on this unit. The grid coil is mounted under the sub-chassis, and the split stator plate circuit on a panel above this unit. The grid and plate tuning controls consequently are on the side of the rack which is just as convenient as if they were on the front. By this means there has been realized perfect mechanical and electrical symmetry, optimum circuit connections and plate-grid circuit isolation, excellent tube ventilation, proper tube position, plus the flexibility and accessibility of unit construction.

◆

LOTS OF THE boys are going great guns with the new beam-power tube, affectionately known as the 6YELL6 in the more exclusive circles. This bottle is the nuts, and we, too, have been making it jump through hoops in a little xmtr just lousy with 'em. Hope to pass along the dope soon.

HAVE YOU noticed the number of rigs working portable these Fall days? W1IFK and W1FVL are two who have been getting out well on 20, while W9WL is doing very well on 75.

◆

FOUR WEEKS recuperating, with an attendant loss of work, was the share of W8IXP, who was badly burned on his high voltage. How he ever missed electrocution is one of the wonders of Ham Radio.

◆

WONDER IF A. Ham still operates W6BLR?

◆

W3FS AND his chimes supply that final musical touch on 75 meters. Hi.

◆

INCIDENTALLY, any of you fellows who have some news can save a lot of time by writing to us direct. The address is Broadmoor Apartments, Apartment No. 110 (Don't tell us you have BCL trouble!), 640-650 Delaware Avenue, Detroit, Michigan.

◆

SPEAKING OF BCL trouble, we found that key clicks are often caused by r.f. feeding back into the a-c line, and can be eliminated by connecting a pair of 1-mfd condensers in series across the line. Ground the central connection.

◆

THE GANG IS wondering how W2JGR knows so much about the show business, which he was discussing recently on the air, when he has been riding red wagons and putting out fires all his life!

◆

A CELOTEX BAFFLE, or a screen of drapes placed behind the operating position will eliminate the "barrel" tones of many a fone station. An old blanket will do the trick if the first two are not available.

◆

OVER 1600 AMATEURS attended the Central Division ARRL convention recently in Chicago. There was a varied program of fine entertainment and excellent technical sessions. An average speed of 52.2 words per minute gave W9ERU the non-commercial code championship of the world. W9KJY placed second and W8SS was runner-up. All in all, it was a great convention and we believe everyone had a grand time.

Of the Ham Exhibits the "Rubber Crystal," a commercially built unit to replace the crystal oscillator, the high power output transmitter with low power tubes, and the new receivers attracted the most attention.

SPARKING TANK condensers can be cured by giving the plates a thin coat of clear lacquer. This increases the breakdown voltage without materially affecting the capacity.

◆

W8DFM IS THE newest member of the W8XWJ staff. "Doc" Byrley is an old timer whose lectures at Lawrence Institute of Technology have made him well-known throughout the Mid-West.

◆

DID YOU GET your QSL from CO1J, W1IAS?

◆

WE'D LIKE TO have a photo of "Gladys" at Conneaut, Ohio, whose 75-meter fone, W8BKM, gets through here so well. What's the dope, YL?

◆

HEARD VK3ZZ and VK1MX on 20 the other afternoon. They both have fine signals.

◆

MADISON, TENN., is certainly on the map with W4AEE putting man-sized dents in the 75-meter ether.

◆

W6CIN, ARCADIA, California, continues to get out well. There is one station we would like to know more about. Like W3LM and W4BYY, he (and Mrs. CIN) can be counted upon to come through no matter what the weather. Of the VE's 2AR and 3AV are probably the best here as far as consistency is concerned.

◆

BEFORE SAYING 73 we'd like to suggest that you remove the Summer's accumulation of dust from the rig with the OW's vacuum cleaner. B.C. stations periodically use an air blower to remove all dust from the inductances and condensers. It really makes a difference.

BACKWASH

[*Continued from page 510*]

my S-C No. 61-H with horizontal table cabinet which gives excellent results with no boom.

A question protrudes (remember, no postal replies): must reproduction continue to come from the neighborhood of the floor in the console models? Either that or controls somewhere around the floor, but for the table type. My S-C No. 61 is perched on a colonnade between dining and living room, 42 inches off the floor and about 9 inches between cabinet and wall. Result: sound floats into and about the room with seemingly no traceable source thereof. When we are seated music comes DOWN to us with beautiful results. Too, the window drapes, (monks cloth) modify tones to a moderate level without offense to neighbors (whose radios are offensive on linoleum floor without drapes). Our combined living-dining rooms are 11 x 20 feet, and the 8½-inch speaker in this model is all we could wish. The more remote kitchen and bedroom are easily reached without noisome volume. As for speech, there's directness in this height which is appreciated.

Enough is enough! Just some gossip. You probably have forgotten more than some of us have ever known. But you

[*Continued on page 536*]

want to know our desires. A little more for the listener in proportion to his importance.

C. M. Whelan,
Denver, Colo.

(Wow! You have us on our ear! You have enough dope on hand to publish your own magazine. Everyone appreciates your letters. Keep them up, won't you? We'll read your letters and you watch the magazine. Maybe we'll both improve.—Ed.)

BACKYARD ANTENNA

[*Continued from page 493*]

Of course, you may say, "Well, I want to hear all the stations." The answer is simple—if you live, as we do, in a congested district or anywhere, for that matter, where poor reception is the rule rather than the exception, then we most heartily recommend one of these, particularly the latter. Their use with directivity along the great circle path will bring all of the major stations to your receiver and bring them in with a volume and freedom from disturbances that will more than gratify you. Since our first experiments we have built numerous antennas along these lines for friends, and in every instance the improvement has been so marked as to be readily distinguishable by ear alone. It is particularly apparent when a change-over switch enables an actual comparison between the old and the new.

EDITORIAL QUOTES

[*Continued from page 485*]

power tubes in the output. Acoustic devices are used in some of the sets to improve bass response. Philco and Grunow have receivers with supplementary rapid tuning devices for local stations that are operated like the dial on a telephone. The majority of sets have increased band spread which permits ease of tuning in the short-wave bands. Many of the larger receivers have extended tuning ranges, some of them tuning as low as 5 meters and as high as the "X" Band. At least three manufacturers have gone in for tuning dials on which are printed the call letters of the major U. S. broadcast-band stations and the locations of the foreign short-wavers. These are spotted on the dial in their proper frequency positions. The usual calibrations are also included.

It will be worth your while to go to your radio dealer and give these new sets a twirl.

THERE IS SOMETHING NEW IN RADIO!

Announcing:

NATIONAL NC-100

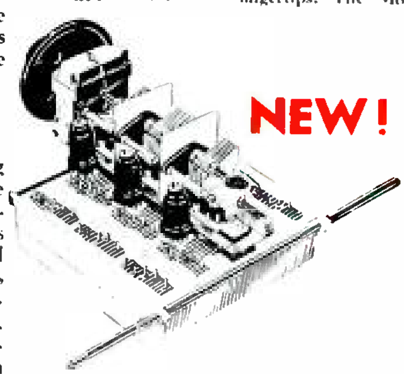
12 TUBE SUPERHETERODYNE

The NC-100 is more than a newly designed receiver, it is a new invention! Although coil ranges are shifted easily and quickly by the twist of a knob on the front panel, no coil switch is used. Instead, an ingenious mechanism moves efficient plug-in coils into position close to the tuning condenser and tubes, and plugs them in. Each of the fifteen HF coils is shielded in heavy cast aluminum, each is of high-Q design, each has low loss insulation, and each has its own individual air dielectric padding condenser. Idle coils are completely isolated. Leads are short. Calibration is permanent. For the first time, the uncompromised efficiency of plug-in coils has been combined with the convenience of the coil switch.

HIGH PERFORMANCE

The precise and efficient Movable Coil Tuning Unit is just one of many details that make the NC-100 so outstanding. Every tube in the NC-100—and there are twelve of them—contributes its full share to the remarkably high overall performance. The circuit employed on all ranges consists of one stage of RF, separate first detector and high frequency oscillator, two IF stages, a bias type power detector and a transformer-coupled push-pull output stage. Maximum undistorted audio output is ten watts. A separate tube is employed to provide amplified and delayed AVC action, and a separate beat oscillator is included for CW reception. A built-in power supply provides all voltages required, including the speaker field.

But equal in importance to the circuit and tube layout is the long list of small details that make the NC-100 the superlative receiver that it is. There is no substitute for quality. The heavy cast aluminum coil shield, the thorough use of low-loss insulation, the high-Q coils, and the air dielectric padding condensers, as well as a host of smaller details ranging from silver plated contacts to the non-microphonic speaker cabinet, all contribute to high intelligibility on weak signals.



NEW!

MOVABLE-COIL TUNING UNIT

OPERATING CONVENIENCE

Particular attention has been paid to the convenience of the operator in the NC-100. Swift control of every function of the receiver is at your fingertips. The Movable Coil Tuning Unit permits instant selection of any one of five coil ranges, ranging from 540 KC to 30 MC. Matching the accuracy of this precision unit is the Micrometer Dial, direct reading to one part in five hundred, and having an effective scale length of twelve feet. The tuning of the NC-100 is as smooth as its logging is precise.

A 6E5 tube acts as an indicator both when tuning and when using the RF Gain Control for signal strength measurement. Panel switches permit optional use of automatic volume control and of the CW oscillator, and provide for cutting the plate voltage during periods of transmission. In addition to RF Gain, an Audio Gain Control and a Tone Control are included. These together with the (optional) Single Signal Filter give the operator complete control of receiver characteristics. Even the phone jack has received its share of attention, for it has been carefully located so that the phone cord will interfere as little as possible with the manipulation of controls and the use of the operating table.

NO COUPON NEEDED

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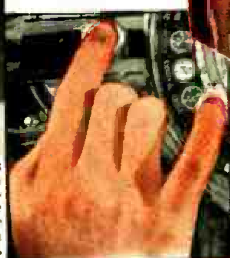

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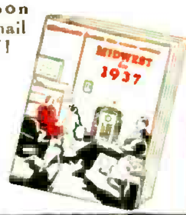

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