ALL-WAVE RADIO

DECEMBER • 1936

LAB. DX SUPER

MODULATION INDICATOR
for phone transmitters

P. P. 6L6 AMPLIFIER
with electronic mixer

REVISED VERI LIST
with station addresses

25c U.S. and CANADA

THE JOURNAL of WORLD RADIO

WHAT A "RADIO NEWS LISTENING POST" SAYS OF *the World's Only Truly Custom Built Radio!*

EARL G. DeHAVEN
SUNSET LISTENING POST OF RADIO NEWS

Los Angeles,

August 31

To Radio News Readers

Gentlemen:

Having had the extreme good fortune to see and hear the final laboratory tests made on the new MASTERPIECE V while a guest of Mr. Silver in Chicago, the thought uppermost in my mind EVERY MOMENT while homeward bound was: "My kingdom (not for a horse) but for my own MASTERPIECE V". I never have wanted to get my hands on anything so much as I wanted to get them on the controls of the GREATEST radio instrument that engineering and craftsmanship has ever given to the world.

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Never in all the time I have been a DXer have I thrilled to European reception as I have since tuning them in from this continent on my own MASTERPIECE V! The Olympic Games were heard here DIRECT via DJB on 15.2 Mc. MUCH BETTER than on the network broadcasts fed to LOS ANGELES STATIONS. The German stations made all other signals seem insignificant by comparison. With the MV I played DJB so loud they could be heard a FULL BLOCK AWAY using (get this!) a 21 inch SHOE LACE with a small wire run the length of it! A REAL "Shoestring catch" if there ever was one! Then I repeated the same feat on JVR, Tokyo, Japan -- making a "Shoestring catch" of the baseball game from Meiji Shrine Stadium. Of the Daventry stations, GSE on 15. 14 Mc. was the best during the past month, being almost equal to Germany's DJB. In like manner, TPA-3 - the French station on 11. 8 Mc. comes roaring in at 9:55 P. M. each night. The new Czecho-Slovakian station OLR on 15. 2 Mc. has made itself known with a mighty force here in the late afternoons and early evenings on test programs.

If you hear a MASTERPIECE V you'll "never be the same" until you OWN ONE.

Earl G. DeHaven

Earl G. DeHaven

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ALL-WAVE RADIO

Reg. U. S. Pat. Off.

VOLUME 2 • NUMBER 11

GENERAL

PUBLISHED MONTHLY by the Manson Publications Corporation, 16 East 43rd Street, New York, N. Y. Entered as second-class matter August 27, 1935, at the Post Office, New York, New York, under the Act of March 3, 1879. Additional entry, as second-class matter, at East Stroudsburg, Pa., August 27, 1936. M. L. Muhleman, President and Secretary; Edwin W. Lederman, Vice President and Treasurer.

SUBSCRIPTIONS

YEARLY SUBSCRIPTION rate: $2.50 in the United States and Canada; $3.00 in foreign countries. Single copy price, 25 cents. Notice of change of address required two weeks prior to publication date, or the 15th day of the month. Notifications received after this date will become effective with second issue.

ADVERTISING OFFICES

EASTERN ADVERTISING Manager, Sanford L. Cahn, All-Wave Radio, 16 East 43rd St., New York, N. Y.
CHICAGO OFFICE: William C. Shaughnessy, All-Wave Radio, Room 534, 30 N. LaSalle St., Chicago.
DETROIT OFFICE: Roy Buell, General Motors Building, Detroit, Mich.

CONTRIBUTIONS

MANUSCRIPTS ARE submitted at the author's risk and cannot be returned unless accompanied by postage. Notification of the acceptance or rejection of a manuscript is given within two weeks after receipt.

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Short-wave listener after a weak one during the early hours of the morning. (Candid camera photo by Ken Bohlen)

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the SKY BUDDY

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for only $29.50

THE SHORT WAVE RECEIVER THAT HAS WON THE ACCLAIM OF EXPERTS!

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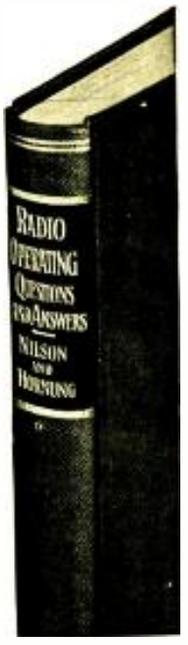

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by ARTHUR R. NILSON

Lieutenant (Technicist) (Communications) U.S.N.R. (Retired)

and J. L. HORNUNG

Formerly Radio Instructor, New York University

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EDITORIAL QUOTES

BY THE EDITOR

PLANS for the institution of the signal-survey league are well under way. Complete information will appear in the January issue, and we expect to see things in full swing before the turn of the year.

The original idea has been elaborated upon and now includes a number of services that logically fall into line with the principal purpose underlying the plan—the improvement of radio conditions.

For instance, we anticipate the formation of a division of the league for the sole purpose of undertaking surveys on man-made noise interference with a view to the elimination of such disturbances to radio reception. Campaigns of this nature have been conducted in a few communities with marked success, but no effort has been made to conduct a nationwide campaign.

But read the complete data in the January issue. In the meantime you will find of considerable interest the letters commenting on the proposed league, published in the Backwash section of this issue. Many excellent suggestions have been offered and some of them are to be put into effect.

◆

Sound and Fury

A FEW READERS lament the absence of data on television in the pages of ALL-WAVE RADIO. The opinion of these few readers seems to be that we are lagging behind the field in this respect. Television is a subject of keen interest—therefore why not keep readers abreast of the progress being made?

The reason for our almost complete silence on the subject is quite simple—there is as yet no practical information regarding the construction of television transmitters and receivers that would be of any value to the amateur or the experimenter. Until such information is available we prefer to let the subject rest, rather than print optimistic feature stories that, in the final analysis, are nothing more than so much "sound and fury, signifying nothing."

But we are not guilty of negligence; we venture to say that we have made more progress in the *design of practical equipment* than the next fellow. *When* we are ready to shoot, we will hit the mark—and it won't be a scattering of buckshot.

LEAGUE FORMATION UNDER WAY

Complete plans for the institution of the proposed radio-survey league have been developed. Everyone will have the opportunity of serving under one of the separate divisions.

International Broadcast Stations

UNDER THE NEW regulations of the Federal Communications Commission, no U. S. short-wave broadcast station may operate with less than 5000 watts power and all such stations must maintain a frequency tolerance of 0.01 per cent. Moreover, such stations are to be known in the future as "international broadcast stations" rather than "experimental relay broadcast stations" as they have been referred to in the past.

The new power requirements will discourage wild-cat competition in the short-wave bands and insure orderly progress in this type of broadcast service, to say nothing of keeping the bands comparatively free of interference.

In earmarking the short-waves as "international broadcast stations" it is the purported aim of the Federal Communications Commission to have emphasis placed on the foreign service of U. S. short-wave stations and to encourage programs of international scope. This is, of course, a commendable ideal, just so long as it is not misinterpreted. Let us hope that U. S. short-wave broadcasters do not make the mistake of employing their ethereal mouthpieces for the purpose of disseminating propaganda. Competition in that field is rather keen as it is without our stations throwing in their two-cents' worth.

◆

Short-Wave Guard Bands?

THE INTERNATIONAL Broadcasting Union, representing all the leading broadcasting organizations of Europe, has recommended in its proposals for the Bucharest radio conference that a minimum of 10-kc separation be adopted for short-wave broadcast stations.

The separation, which is uniformly observed in the United States, is necessary to insure good reception, and this is likewise the opinion of the International Broadcasting Union.

The Union is also of the opinion that a greater separation, corresponding to two or three channels of 10 kc, should be instituted between stations which can be received simultaneously with equal field strength in the same region.

Most foreign stations have come to realize the importance of establishing guard bands for the purpose of avoiding interference. Since short-wave broadcasting has become such an important factor, there seems little doubt that most nations will fall in line with the Union's proposals. We sincerely trust that they will. It is high time the short-wave bands were cleared up.

It is hoped the Union will also make proposals relating to the elimination of harmonic radiations. After all, no one station should be permitted to occupy more than one channel at a time.

◆

High Power, Clear Channels

ACCORDING TO AN official survey made by the Federal Communications Commission, 75 per cent of rural radio listeners prefer programs from the powerful clear channel broadcast stations rather than those of regional or local stations. The actual percentages are: 76.3 per cent for clear channel stations and 20.6 per cent for regional stations.

The survey and the report are regarded as strong support for the chain networks and clear channel stations as well as the demand for further high-power allocations by the Commission.

It is worth observing that the Radio Manufacturers Association has urged the Commission to grant high power where advisable, maintain clear channels, and assist in the expansion of short-wave broadcasting.

◆

Automatic Band Spread

WE HEAR RUMORS of a new band-spread system that is entirely automatic in operation. No specific details available as yet, but we gather that as the receiver is brought into resonance with a signal, the channel is automatically elongated. In other words; no signal, no band spread!

WHAT'S IN A STATION'S CALL?

By Madeleine Moschenross

Information Department, WESTERN ELECTRIC CO.

Speech input equipment at Station WOW, Omaha, Nebraska. (Photo courtesy Western Electric Co.)

MORE ON THE MEANINGS OF STATION CALLS—

IN the September issue of ALL-WAVE RADIO, this survey began with the *Worst Station from A to Z* and ended with *Wonderful Jacksonville.* Civic-minded "K" (Western) stations as a rule are at a distinct disadvantage when it comes to extolling communities. There's not a single superlative starting with "K" in the entire dictionary. Not a little ingenuity is required to bring out salient features.

Therefore, says KTAR of Phoenix, Arizona, *"Keep Talking Arizona Resources"* (and why not?) has been a most effective slogan although the letters identify KTAR's affiliation with *The Arizona Republic,* Phoenix's favorite newspaper.

"KTAR at present is operating full time with 1,000 watts power and rendering an increasingly excellent service," concludes Richard O. Lewis, General Manager, which is as it should be.

Station KRKD is proud of its call letters and what they signify. The Arcade Building, downtown Los Angeles, in which their offices and main studios are located, is the only one of its kind in this Coast city. It has an arched promenade lined with shoppes extending its entire length. In order to satisfy a desire to properly identify his station the owner resorted to phonetic spelling, and believes the combination not only distinct but distinctive. And so it is.

Kernel of an Idea

Another civic-minded station is known as the KERN Station. It is located in Kern County, Bakersfield, Calif., and this is one instance where the K actually has some geographical significance. Although the call letters do not so indicate, Kern County is noted the country over for its profusion of wild-flowers. In one section of the County alone are grown over 108 varieties, and in the Spring the flowers that paint the slopes so vividly form a color-pattern which is seen 22 miles away.

The Woodmen of the World have a word for it and it's WOW in Omaha, Neb. In 1923 when this station broadcast its first program, the call letters were WOAW. At that time the letters WOW belonged to the steamship "Henry J. Bibble" operating off the Pacific Coast. In 1926, the steamship abandoned these call letters and WOW was assigned to the Woodmen.

Many colleges maintain broadcasting stations, and as befits these dignified halls of learning call letters are always neat but not gaudy, or should we say precise but not pretentious?

College Calls

Anyway, WOSU is promptly identified as Ohio State University's station. WSUI is the voice of Iowa's State University, and so on and on. Few, if any, letter combinations begin with WU, this small mouthful with its triple-threat pronunciation apparently not being in favor with announcing staffs.

The University of Florida compromises by sticking an R before the U, thereby making it Station WRUF . . . and the University of Illinois solves the problem by simply calling her Station WILL. Sometimes when a college changes its name it raises hob with call letter assignments. Thus, when Kansas State Agricultural College became The Kansas State College of Agriculture and Applied Science, the original letters were retained. After all, you couldn't do much with KSCOAAAS.

"This," added W. E. Peery, the station's chief engineer, somewhat wistfully, "leaves the call letters at the present time with no more significance than the memory of the former name of the college."

To get back to the University of Florida, there is an unique "behind the mike" story concerning their station. It maintains a staff of 42, and only four are full-time employees. The other 38 are earning their way through college, and probably no "working-their-way-through-college" group has a more enjoyable time of it. Both theory and practice are included in the training, and a number of students, upon graduation, have obtained permanent positions in the field of radio.

Come-and-go

Because in the pioneer days of aviation Montgomery, Ala., had one of the finest airports in the country, it was only natural that WSFA should mean the South's Finest Airport. Since those days, however, larger southern cities passed Montgomery in pretentiousness of their airports, although, added H. E. Pill, the station's general manager, none yet of Montgomery's size can approach them in landing field and general airport facilities.

Subsequently, the call letters changed to advertising slogans to fit the program. For instance, *We Sell For Advertisers,* was one combination; on long distance programs, such as DX late night programs, *Where Sunshine Fills The Air* was the motto of the hour. Having no

definite slogan since the airport change, WSFA continues on this basis rather than risk the confusion resulting in a change.

They Got Religion

"Where Salvation's Power Delivers" is often heard over Station WSPD, but that's not the real significance of the letters. The real significance has to do with oil. The oil, manufactured by the Fort Industry Company, in Toledo, Ohio, is called *Speedene.*

However, The Toledo Gospel Tabernacle has used Station WSPD to broadcast its Sunday services for six years and it has been customary to open them with the above salute.

Not to be outgeneraled by the Speedene crowd, along came the Magnolia Petroleum Company of Beaumont, Tex., with Magnolene. *Kall for Dependable Magnolene* became the byword of KFDM—but alas, Magnolene didn't last; the call letter, however, did.

A large number of the smaller stations are owned and operated by private interests: for example, WEEI is the voice of the Edison Electric Illuminating Company in Boston . . . WDGY in Minneapolis for Dr. George Young . . . KMMJ in Clay Center, Neb., for M. M. Johnson, successful incubator manufacturer (and before the Dionne episode, too).

KOIL for oil, said another oil combine, this time the Mona Motor Oil Co. in Council Bluffs, Iowa; and KRSC for the *Radio Sales Corporation* in Seattle; and that friendly station in Shenandoah, Iowa, run by Mr. Henry Field, who for more than 40 years has been selling seeds and nursery stock by direct mail to farmers and small town people. Twelve years ago, when the station was licensed, the Radio Commission allotted call letters KFNF to Mr. Field, who proceeded to use his fertile imagination and a number of slogans took root.

Keeping Fairness Near the Farmer was one of them. Also: *Known for Neighborly Folks* and *Keep Finding New Friends.* Eventually a simpler way of identifying the station was desired and now it's known everywhere as *The Friendly Farmer Station.*

Sometimes a listener is responsible for a slogan, as when a contest is held, or a suggestion made. *"Keep Forever Radiating Cheer"* is a good bit of advice and is the result of a contest held by Station KFRC in San Francisco. Station WOOD-WASH is an odd one. It's in Grand Rapids, Mich.

Nice, Clean Call

"The WOOD," explains Frances Billings of the station, "is synonymous with Grand Rapid's furniture fame. As for WASH, the call letters formerly were WBDC for the Worldwide Baxter Dry **Cleaners, original** licensees. Later the change was made to WASH, which was even more appropriate for a laundry." Practically perfect, wouldn't you say?

What self-respecting announcer would mouth "This is Station WJDG?" But that's the combination Mr. S. H. Bliss, Manager, had in mind when his company purchased WCLO—with a bow to the Janesville Daily Gazette. But he decided to sacrifice sentiment for practicality and musical tone quality and WCLO remained as is.

Newspaper-owned stations, as a rule, use the initials of their papers where possible. Wisconsin News station is known as WISN . . . South Bend Tribune, is WSBT . . . WMC for Memphis Commercial-Appeal, and so on.

From the farming section, KMA *Keeps Millions Advised* via a large seed company in Shenandoah, Iowa . . . *Keep in Tune* with KIT, is the musical note struck by the Valley Broadcasters, Inc. in Yakima, Wash. . . . in Raleigh, N. C., the Durham Life Insurance Company's WPTF tells the world that *We Protect the Family,* while WSM, the National Life and Accident Insurance Company's station in Nashville, Tenn., maintains that *We Shield Millions.*

In the Money

Whether C. W. Myers, President of Station KALE in Portland, Ore., is ribbing the 67-year-old Western Electric Company, we wouldn't be knowing, but says he:

"No significance particularly, except that we owned Station KOIN which spelled 'coin' and we thought it would be a pretty good idea to make our second station look like money also. Therefore we have KOIN and KALE."

One of the generous gestures for which the late Roxy will always be remembered was the result of his sympathetic interest in hospital-bedded World War veterans. Station WRHF—*Washington's Radio Hospital Fund*—was inaugurated in 1924 for the purpose of broadcasting news and outstanding events daily to the boys, for several years.

When the work of the Roxy Radio Committee, of which Le Roy Mark, President of the American Broadcasting Company, was a member, came to an end, some 40 public institutions, without regard for creed or color, had been equipped with radio receiving sets; and this work completed, they disbanded. It was at that point Mr. Mark took over the station. Listeners-in with poor reception were forever writing in to another station—and such a situation was far from tolerable. A request was made for a new set of call letters, and WOL was supplied.

"We're Out of Luck"

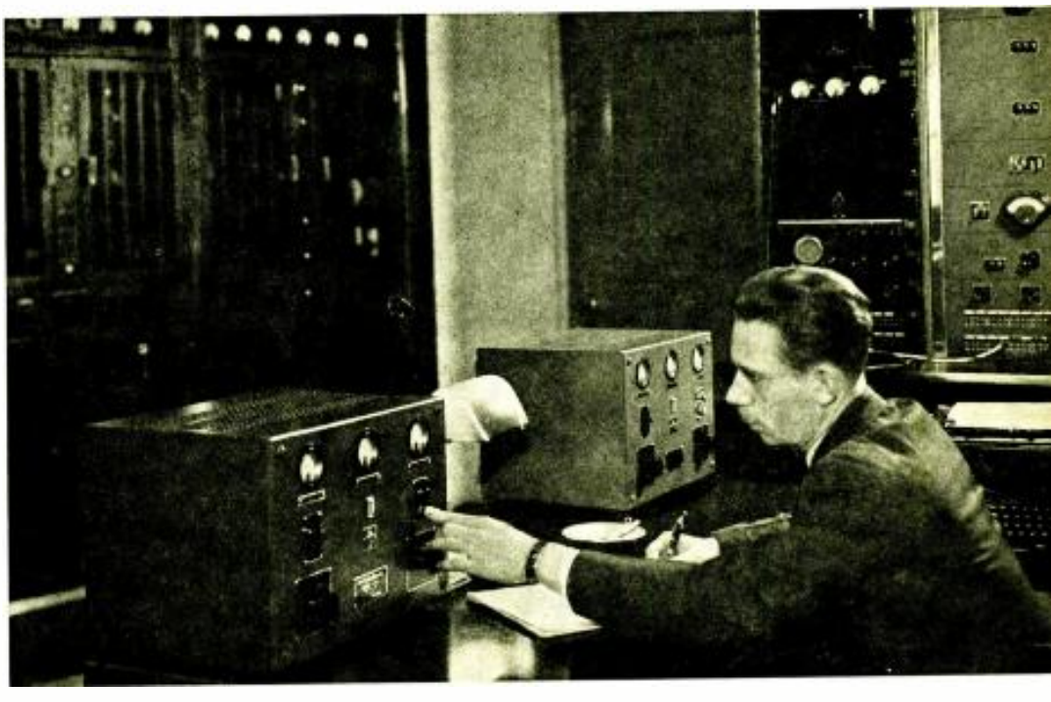
Some people, according to Mr. Mark, call it *Washington's Only Local* but the folks at the station moan "We're Out of Luck" because they've been begging for increased power but up to date have not succeeded.

And so, concluded Mr. Mark, there you are.

St. Louis's KMOX is a Christmas present to the folks because the first program went on the air on Christmas Eve . . . WIND means (Gary) Indiana . . . Anderson, S. C., is *Where Agriculture and Industry Meet* (WAIM) . . . WXYZ in Detroit is the result of a slogan selected through a contest: *The Last in Radio.*

[*Continued on page 584*]

Bernard Stahl, Transmitting Supervisor of Station WHN, New York, at the controls. (Photo courtesy Western Electric Co.)



A LABORATORY MODEL EXPERIMENTAL SUPERHETERODYNE

By Raymond P. Adams

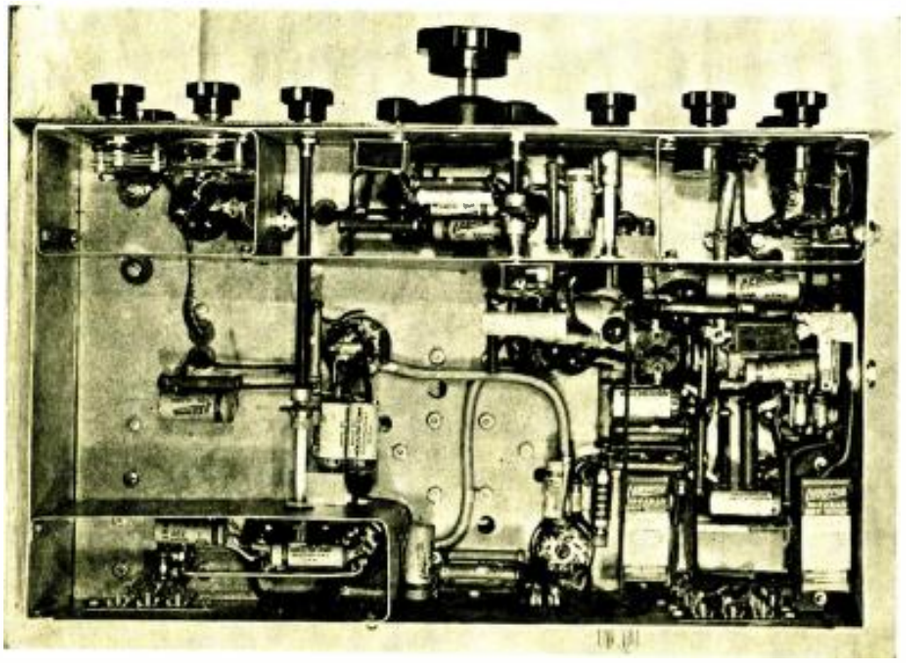
LET us begin with a word in suggestion and one in explanation.

The suggestion concerns the method of shielding high-frequency coils and perhaps anticipates some reader objection to the particular set-up shown. If the constructor doesn't take kindly to the inconvenience of lifting cans for each band-change and yet wishes to conform more or less exactly to the electrical and physical design as published, two alternative methods of shielding might be found suitable; the "upside down" use of the round cans shown—permitting shields to remain in place at all times, with open tops for quick band change; and the use of oblong, larger cans built to surround not only the coils but the associated tubes.

A shield between the two sections of the main tuning condenser, and some sort of both r-f and i-f shielding above the chassis may be found in some instances advisable.

The explanation, to get on, has to do with the "reason why" for this receiver.

The set was primarily designed as a laboratory job and as an instrument of such selectivity, sensitivity, etc., that it might constantly serve as a standard for comparison, to which we might refer in analyzing the performance of various short- and all-wave sets under construction.



Under-chassis view of the Experimental Superheterodyne. Note compartment shields and shielded wire.

The Circuit

The r-f stage uses two paralleled 6K7s (do I sense the raising of a multitude of alarmed eyebrows?) with screen voltage varied for input sensitivity control, or regeneration control if feedback is added and designed for wide spreading of narrow bands with really low-C tuning. The two tube arrangement proved its worth in the laboratory model, and though the conventional single 6K7 will work to give the normal and expectable amplification at this end, the paralleled tubes are suggested for the utmost in r-f gain on the higher frequency bands, *with no regeneration required.*

The detector or mixer is the conventional 6L7, with a screen potential of 150 volts, and with a minus 6-volt bias on the control grid (grid No. 1). The number 3 or injector grid is capacity coupled to a 6J7 oscillator, adjusted to give an output of something like 12 volts.

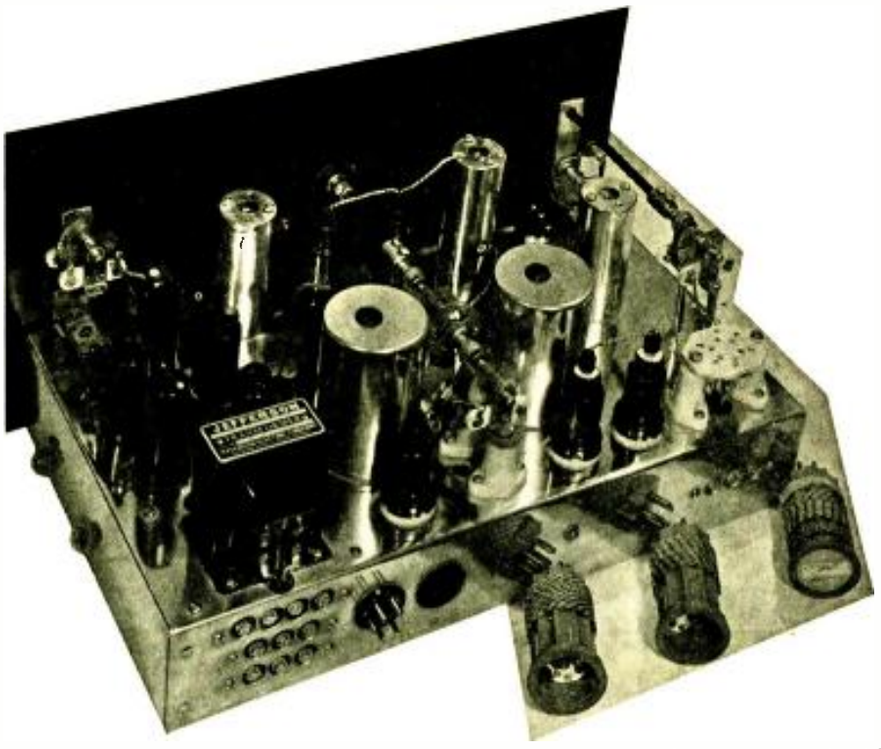
Detector and oscillator coils are simultaneously tuned by a two-gang variable condenser of .0001 mfd maximum capacity each section (condenser shafts isolated electrically from ground and from each other) series connected with Hammarlund APC trimmers installed within the coil forms. The exact coverage in capacity terms (and frequency) is determined with each set of coils by the setting of the trimmers—permitting not

only an accurate alignment for tracking but a simple means for obtaining band spread over any selected width of dial scale. With most bandspread systems, electrical or mechanical, a fixed amount of capacity spread is generally had at all times for all bands, and even after the best possible compromise adjustment, some bands will necessarily be restricted to relatively few dial divisions. With this system, the adjustment is made for each individual coil, and the spreading feature is made really practical for all ranges. Where band spread is not desired, the main tuning capacity may be wired for grid-to-ground connection within the coil forms, with trimmers paralleled for spotting and alignment.

The crystal filter is a nice refinement and well worth the extra coil and accessory items. It is quite conventional in hookup. No compromise in control has been made—full switching for off-series-parallel operation having been found a practical convenience. The knob-adjusted balancing or phasing condenser for the crystal might have been set away under the chassis where the operator would not be tempted to play with it once it had been accurately set—but it's there on the front panel for amateurs and others who insist that on the panel it rightfully belongs. It can be used, of course, with paralleled crystal, to drop had phone heterodynes.

C-18 is a panel controlled variable which effectively governs crystal filter selectivity by varying the characteristic of the input circuit. It is normally adjusted for circuit resonance at its midway point, and tuning to right or left (for a reactive circuit condition) increases selectivity, such selectivity being greatest at points of maximum departure from resonance.

The speaker-power supply unit of the Experimental Super.



Rear view of Experimental Superheterodyne. The three plug-in coils shown are wound with special r-f wire, and provide band spread on 20 meters.

The Intermediate Amplifier

The i-f system will probably raise more and bushier eyebrows and bring forth a highly audible protest that "it can't he done." But it can be and has been done. Yes, even with polyiron-core transformers for highest possible gain. The set-up shows no signs of instability, even when electrical values are adjusted for maximum tube conductance and the screen voltage is 150.

6L7s are used simply because they contribute to efficient avc control for this stage.

The cut-off and characteristic curve are such that effective signal leveling action may be had with our particular set-up *and with avc control actually limited to the i-f stage alone.* What is more, with the particular avc system employed, use of the 6L7s affords unbelievably effective noise suppression action, especially in tuning between stations—so effective an action, in fact, that the originally planned-for noise amplifier was found an unnecessary refinement for the final model.

The i-f signal grids are biased three volts negative by means of cathode resistance to ground. This represents fixed bias at this point, with signal attenuation effected by manually or automatically increasing the bias on the number 3 or injector grids.

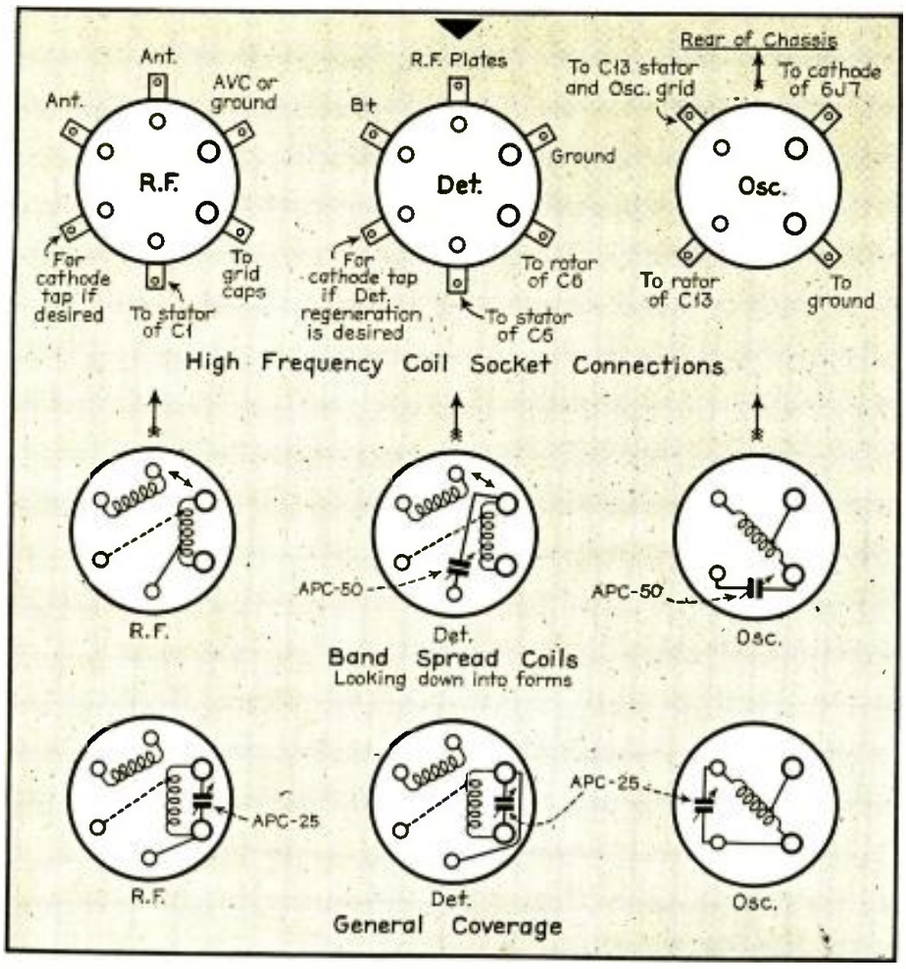
The 6C5 second detector, apparently wired in rather strange fashion, is actually the conventionally connected tube with the grid return made to B minus rather than to ground. Incoming signals are plate rectified here and fed through to another 6C5 first audio, wired for medium high gain, and looking into a load represented by the grid circuit of a 6F6 output pentode. The output transformer is of the universal type, designed to match this pentode—or other tubes, single or in push-pull—to a 500-ohm line, a 2000-ohm magnetic speaker, or single or paralleled voice coils. This convenience permits experimental last audio tube changes. (Try one of the new 6N7 Class A twin jobs for high output with excellent fidelity).

The Power Supply

The power supply-speaker is physically a separate unit, with a transformer designed to supply 360 volts d.c. from the rectifier into 8 mfds input filter capacity. As the input capacity specified is much greater than this, and as the published d.c. rating is for current pulls much higher than that actually called for with our set, the measured output becomes appreciably more than 360 and permits utilization of this particular transformer in the circuit as shown. The voltage is such, in fact, that with a 100-volt drop across the B minus-to-ground section of the filter-field, and drops across the input section of the field and across the separate choke in the positive B lead, the measured B plus-to-ground supply, with the receiver connected, is the required 250.

The speaker field is of the 1800-ohm tapped at 300 type—with the 300-ohm section used as input filter. A 10-henry choke in the plus lead affords additional filtering, and humless operation may be expected.

Note that a B minus lead is con-



Above: Layouts and connections for the general coverage and bandspread coils.

nected at the 300-ohm tap and brought to the output receptacle.

The AVC Amplifier

The avc amplifier is biased past cut-off by an amount equal to the detector bias at operating signal level. For no signal and weak signals up to the arbitrarily selected strength, the avc amplifier therefore remains out of operation and no attenuating effect is had. When signals beyond this level hit the detector, however, several important things happen: the signals increase the detector current and the detector cathode bias voltage; the bias on the d-c amplifier (avc tube) is reduced and the tube is made operative; the varying voltage across the detector cathode resistor is amplified; and the amplified voltage, phase inverted, appears across R-45 and is fed to the r-f and i-f stages. The adjustment for R-17 and R-33 is such that the avc amplifier operates to keep all signals at the selected level, breaking down the strong ones and preventing any increase or fade-in in the individual signal's strength. The system will prevent fading in effect, so long as the receiver is sensitive enough to bring the point of deepest fade up to the level at which avc begins to take hold.

Values and constants for the avc circuit differ little from those originally suggested by Offner. We did try various values and a number of arrangements but inevitably got back to the base of departure. R-31 is a potentiometer, about 100,000 ohms in value, which when the avc tube is switched out of action serves as manual control for the receiver. The amplified d.c. is built up across R-45. R-32 and R-44 are limiting resistors, R-32 designed for minus 3-volt bias on the r-f and i-f stages with the manual control adjusted for full gain, and R-44 being something like 25,000 ohms. (It is suggested that several values for R-32 be tried). R-33 is an adjustable Electrad Truvolt 10,000 ohm wire-wound, so set that the d-c amplifier is biased beyond cut-off by an amount, as we have earlier noted, equal to the drop across R-17 at full signal.

The d-c voltage, amplified by the avc tube or manually drawn from the filter system, is impressed on the signal grids of the 6K7 r-f amplifiers and on the injector or number 3 grids of the 6L7s in the i-f stage. Note that R-45 is bridged by two 1-meg resistors in series and that the avc for the r-f is taken from the point of series juncture. This about halves the available avc voltage for the

Below: Complete winding data for the general coverage and bandspread coils.

BAND	L1	L2	L3	L4	L5	Remarks
10 meter amateur	4T	6T	4T	6T	6T	grid windings spaced 1". Use r-f wire.
20 meter amateur	5T	12T	8T	12T	12T	grid windings spaced 1". Use r-f wire.
19 meter broadcast.	Same specifications as 20 meter					
25 meter broadcast	5T	15T	10T	15T	14T	R-F wire, close wound.
31 meter broadcast	5T	17T	10T	17T	15T	R-F wire, close wound.
40 meter amateur	5T	25T	20T	25T	22T	R-F wire, close wound, or No. 22 D.S.C. spaced 1" for grid coils, others close wound.
80 meter amateur *Interwound with L2	10T	40T	*35T	40T	34T	No. 22 D.S.C., close wound.
GENERAL COVERAGE COILS (R-F wire for short waves, No. 22 D.S.C. for longer)						
19-30 meters	5T	6T	5T	6T	6T	paralleled trimmer.
25-50 meters	5T	11T	8T	11T	11T	par. trimmer.
38-100 meters	5T	20T	15T	20T	17T	par. trimmer.
100-250 meters	10T	50T	30T	50T	43T	par. trimmer.

r-f stage, preventing reduced input sensitivity when fishing for weak signals near strong carrier interference, and puts the heaviest burden of control upon the i-f.

Layout

The tuning dial (a slow motion job with exceptionally smooth action and indirectly lighted through a non-glare filter) is centered on the panel. It is controlled by one of the large Crowe "finger-tip tuning" knobs and is geared down for 100-to-1 vernier movement with the single large knob, with the convenience of alternative movements of 100-to-1 and 30-to-1 when used with a special set of knobs.

Other controls, reading from upper left and down and around to upper right are for: Input Circuit; Crystal Filter Input Selectivity; Phasing; Crystal Switching; R-F Sensitivity; Communications Switching; AVC Switching; AVC Adjustment or Manual Volume Control; Audio Volume; Tone; BFO Switching; BFO Adjustment.

A look at the chassis shows that the layout is unusual but simple and arranged for functional placement of parts.

On the far right of the rear chassis wall (looking toward the panel) is the three-terminal input assembly, for ground, antenna, or doublet connection. Near it is the r-f coil socket, set up high for short leads to both the paralleled 6K7s and the r-f tuning condenser (which last is mounted on supports tall enough to bring the unit into line with the panel control hole). Immediately behind the r-f tubes is the detector coil shield, and to the left of the two-gang main tuning condenser are the high-frequency oscillator tube and coil can. The detector tube is behind the detector coil shield and works directly into the crystal input transformer, which is positioned near the selectivity control. The circuit follows around the front of the chassis through the crystal, input i-f transformer, paralleled i-f tubes, and output i-f transformer to the 6C5 second detector, then, moving toward the output transformer, the second 6C5 or first audio. To the left of the triodes are the beat oscillator and output audio; to the right of the detector is the 6J7 avc tube; and behind the detector, near the panel, is the bfo transformer, with its on-off switch and variable control.

As can be seen, such a layout permits short leads and a natural sequence hook-up. Input and output connections are made directly at the rear of the chassis, and input and output components are right there close at hand.

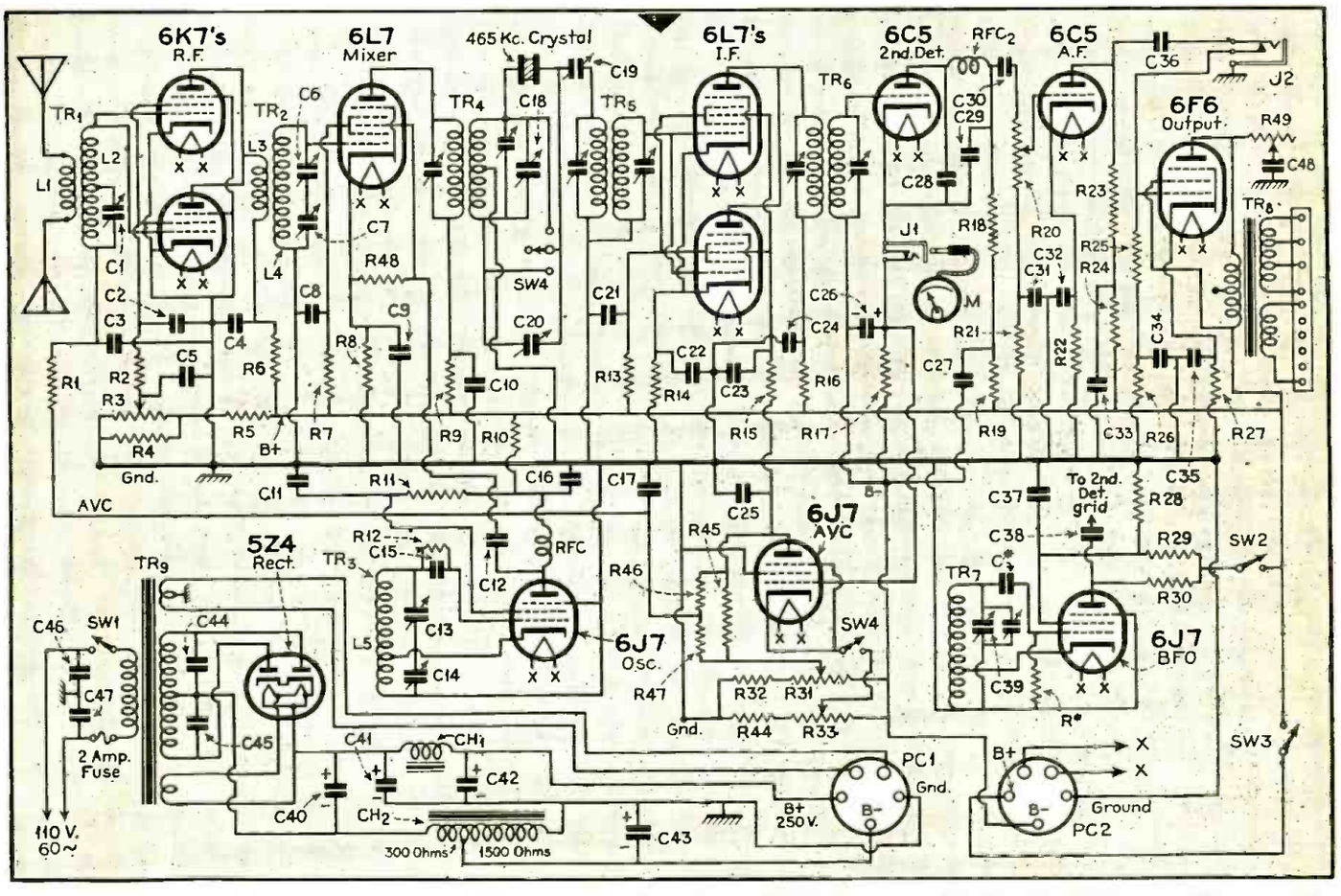
The two receptacles on the chassis wall are connected in parallel. One is for the power cable connection from the supply pack; the other (the male one) is a refinement permitting access to the A and B voltages for powering an additional preselector or for any other service.

No attempt will be made to identify the various resistors and condensers beneath the chassis. The layout simply shows that such items have been grouped around the tube sockets with which they are associated for single point grounding wherever possible. Note that r-f sockets are shielded, and that the input sensitivity control is mounted on the r-f shield. Also that the avc switch and manual volume control are mounted near the avc tube socket and on another shield piece which isolates the i-f, beat oscillator, and crystal input sections.

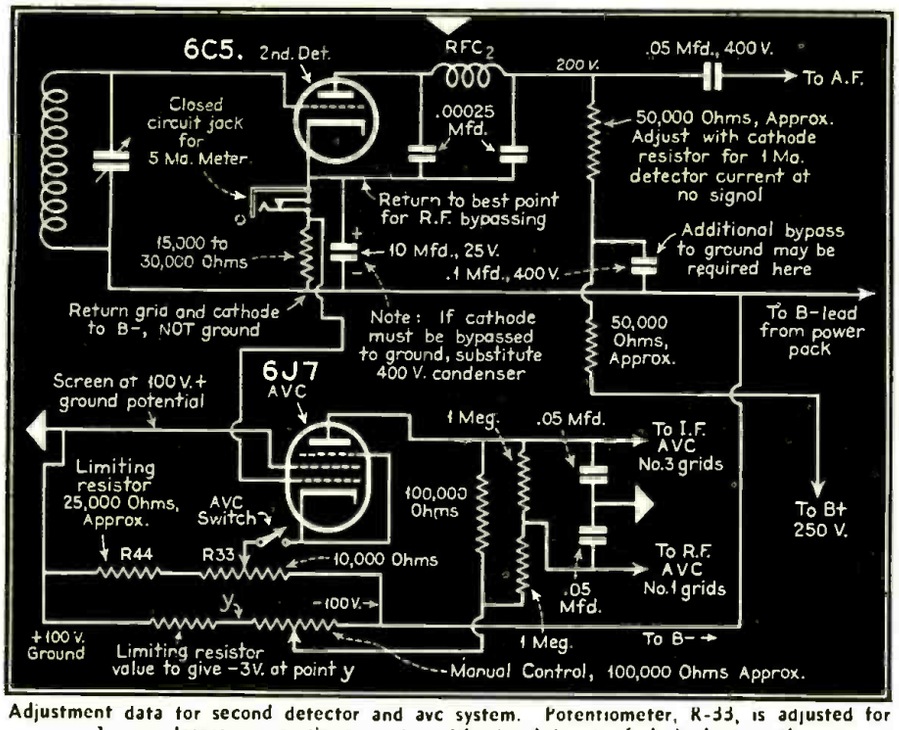
The power supply layout is clearly shown in the photograph. All electrolytics, except C-43, which is not of the can type, are above the chassis.

Construction

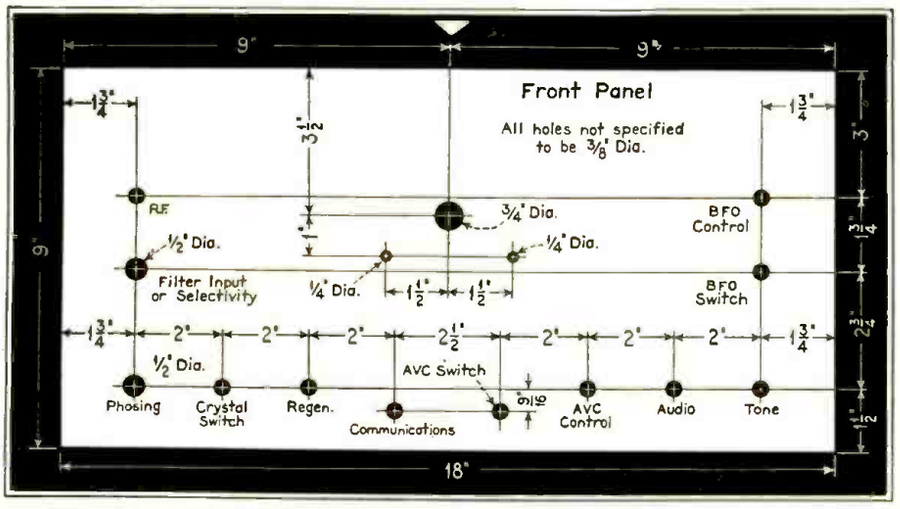
A detailed description of the construction of the receiver would be impractical, both because the builder can readily reproduce this job by carefully studying the photographs and layout data and then proceeding to mount and wire parts, and because such description would call for more space than can be given to one article in one magazine issue. Consequently, we shall simply give a brief



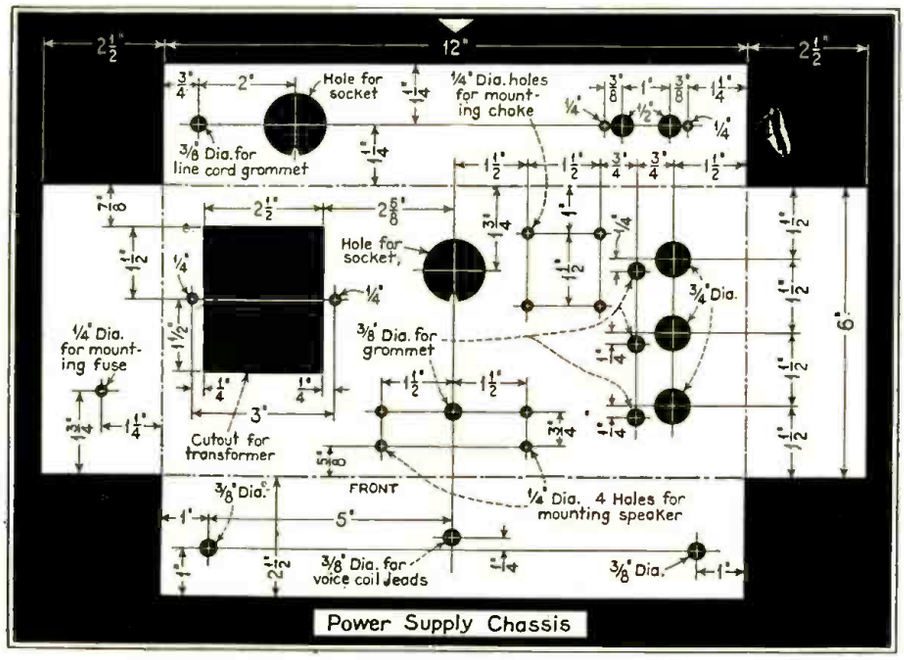
Complete schematic diagram of the Experimental Superheterodyne. Note that paralleled tubes are used in the r-f and i-f stages. The meter, M, is optional; it is used for adjusting the circuits.



Adjustment data for second detector and avc system. Potentiometer, R-33, is adjusted for 1 m.a. detector operatingcurrent w ith signal input of desired strength.



Above: Construction details of front panel. Below: Layout of power-supply chassis.



presentation of the suggested steps which the builder should take.

Drill the receiver and power supply chasses and the front panel, referring to the layout diagrams given. Use heavy steel as a material—or, if possible, Electraloy, which is easily machined by hand and provides a really substantial support. Cut and form the shield partitions. No data is given on shield cuts, and it will be best to simply form and fit the pieces for approximate installation as shown. If "upstairs" shielding is desired, build cans to requirements—remembering that it might be wise to magnetically isolate both r-f and i-f stages. Mount the sockets, positioned for short leads to associated components. (The sockets, by the way, are retainer ring mounted, and it may be wise to beg, borrow, or deliberately buy one of the Amphenol special tube dies, so that holes with a locking feature may be punched). Mount all parts except shields and components mounted on shields, reserving installation of these last until at least the socket wiring has been done. In mounting the r-f tuning condenser use supports just long enough so that an extended rotor shaft will line up with the front panel hole for control of this condenser.

Mountings for the selectivity control, r-f tuning extension, and beat oscillator controls may be five-and-ten-cent-store angles. Do not let the angle or support holding the selectivity control ground either to the chassis or to the panel. Isolate it by pulling it back from the panel and by bolting it to the chassis *through insulating faucet washers*, making sure the bolts themselves do not make chassis contact.

Mount the main tuning condenser gang, rotors physically connected by means of a flexible *insulated* coupling, on stand-offs, raised so that a bakelite or fenoline shaft extension lines up properly with the tuning dial center hole. *Do not use a metal extension unless necessary and do not let condenser rotors ground at any point.*

Slip on the front panel, securing it rigidly to the chassis by means of the various control nuts, and to the angle-support which mounts the bfo switch and beat control. Make sure that the selectivity control shaft, the support or angle for that control, and the phasing condenser shaft do not make panel contact. Insulating washers will be necessary for the phasing control.

Mount the dial, after cutting the condenser tuning extension to proper length, then couple dial, extension, and condenser securely together. *Make sure that the condenser shaft and dial hub are exactly aligned.* If the bakelite or fenoline extension twists under dial drive and does not give proper condenser control, the alignment is improper. It may be neces-

sary to use a metal extension if such twist persists—but in such a case *couple the extension to the condenser shaft with an insulating coupling.*

Wiring

Wire up the power supply, using, wherever possible, the surplus lengths of the rather long and husky transformer leads. Point-to-point connections will be perfectly all right here, or the wiring may be "bundled" or in other ways more neatly arranged. Simply follow the schematic closely, and when the job is done test for opens and shorts, then continuity. Finally connect a resistor approximating the estimated resistance of the receiver under full load (about 2500 ohms, 50 watts) in the output circuit from B plus to *ground* and make output and filter drop tests.

Build a reasonably long power line from five wire shielded cable, with male and female shielded plugs at the respective ends for connection with power pack and receiver receptacles.

In wiring the receiver, it may be good policy to follow some sort of color coding, so that the various connections and leads may be the easier identified when following continuity or trouble shooting. Wire up the filaments with heavy cable—or at least No. 18 pushback. *Wire all r-f and i-f grid circuits, ground returns, and wire the avc circuit with special Lenz r-f wire.* This is really advisable, for reasons which will become apparent as we discuss the use of this special wire later on. Connect up all parts, using plenty of tie points.

Some leads may stand shielding. In the lab. model, some parts of the filament circuit, the avc circuit, etc., were so shielded—as were the leads of appreciable length leading from front panel controls to a-f components and that coupling the high-frequency oscillator and detector circuits. All shield cable or tubings should be of the true low-capacity type—with a thick loom between wire and shield material. Better to use no shielded leads at all if low-capacity materials are not available.

Both high-frequency and beat-frequency oscillator circuits are electron coupled, and the builder must remember *not* to tie suppressor grids to cathodes. In electron-coupled circuits, such connection tends to nullify the effect of internal shielding. *Connect suppressor grids for these oscillator tubes to ground.*

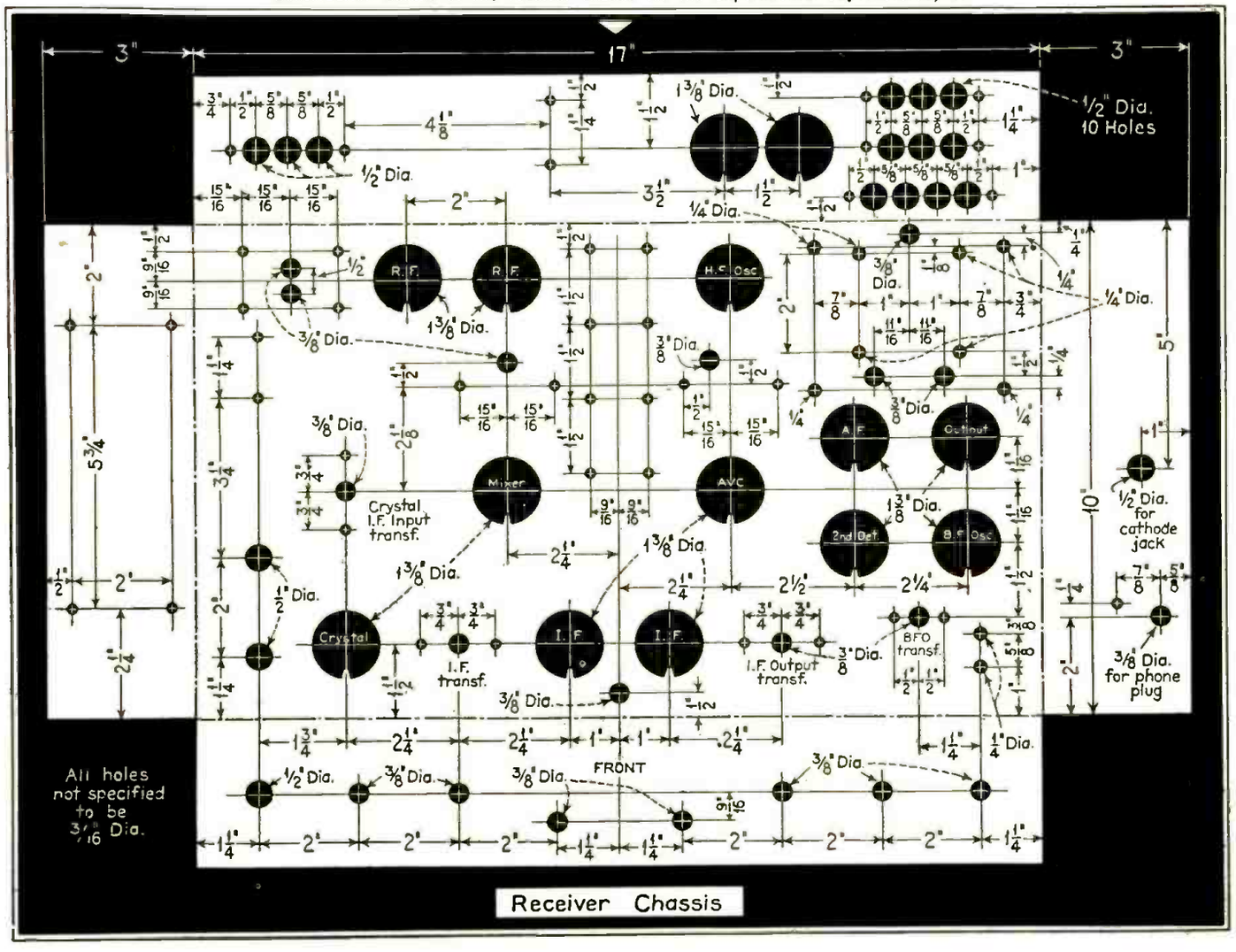
Coils

Reference to the coil data will give the reader the approximate number of turns and spacing for the various bands, but the author cannot guarantee that coils built to these specifications will "hit" desired frequencies. After all, we are using no tank tuning condensers, variable or fixed, except where general coverage calls for parallel connection of the APC trimmers, and it is difficult if not impossible to more than estimate winding requirements. This holds especially in our case, as minute deviations from the exact coil and r-f connection lengths used in the lab. model will drive all directions haywire. Call the published data simply rough or near approximation—then build one set of coils at a time, adjusting turns and spacing for tracking, spotting, and band spread as you go along. Build one set before adjusting the receiver, by the way.

The coils for the 20-meter and similar bands may be wound with No. 22 spaced D.S.C, a heavier D.S.C, or with the special Lenz r-f wire used for grid and similar connections. Frankly speaking, the special wire becomes well worth

[*Continued on page 585*]

Construction details of the receiver chassis for the Experimental Superheterodyne.



Globe Girdling

By J. B. L. Hinds

identifying stations . . . panama prize contest . . . harmonic verification club! . . . java stations . . . the numerous hj's . . . ussr english broadcasts

THE question of how to identify foreign stations is quite perplexing to many listeners, and some are even hesitant in filing reports as a consequence. To the mind of the writer this is not as difficult a task as it would seem.

After one has become acquainted with his receiver, he is able to determine from its scale readings the frequency to which it is tuned, and with the aid of a reliable list showing all short-wave stations actually on the air, he has already taken quite a step towards surety.

In addition, there are but few stations, if any, that do not use some distinguishing signal or signals at stated times. Most of these signals are outlined in our identification section, which we are fast improving, and which we hope, through the aid of the stations, to make much more complete as time passes.

Most stations at some time during the transmission use English, and these facts will also be shown in the revised list. Many stations are now using English at stated times; many more will do so as radio improves and expands.

We would suggest the plan of tuning by time and by reference to your station list. Pick up the station you desire some fifteen minutes before its time *off* the air. By this method you can secure the details of the program before the closing and thereby know just where you stand.

By constant tuning you will be surprised how you can tell one language from another without being able to speak or understand them. You will also be agreeably surprised at the results obtained by a constant checking of the bands.

Station Changes

Many changes have again been made in the station lists, which are covered in the recapitulations shown below. It will be noted that "New Stations" include certain Daventry outlets. All frequencies of the British Broadcasting Company are now included and the station lists will hereafter indicate those in use by the time on the air and those not in use will be so shown.

Photo-veri from the Zeppelin Hindenburg—a nice prize.

NEW STATIONS

KC.	Meters	Call	Location
21530	13.93	GSJ	Daventry, England
19200	15.62	HS8PJ	Bangkok, Siam
15260	19.66	GSI	Daventry, England
11860	25.29	GSE	Daventry, England
11820	25.38	GSN	Daventry, England
11730	25.58	FJ1CD	Saigon, Indo-China
11705	25.63	SM5SX	Stockholm, Sweden
9870	30.40	CSW	Lisbon, Portugal
8710	34.44	KBB	Manila, P. I.
7030	42.67	EA9AH	Tetuan, Sp. Morocco, Africa
6977	43.00	XBA	Tacubaya, D. F., Mex.
6548	45.82	XBC	Vera Cruz, Mexico
6350	47.24	YV1RH	Maracaibo, Venezuela
6150	48.78	HJ4ABU	Pereira, Colombia
6110	49.10	GSL	Daventry, England
5900	50.85	HJ4ABD	Medellin, Colombia
4107	73.05	HCJB	Quito, Ecuador

STATION CHANGES

New Frequency	Call	Old Frequency
31600	W1XKA	55500
9600	RAN	9520
9530	LCJ1 *	9515
8948	HCJB	8775
8795	HKV	8790
6850	XGOX	6820
6668	HC2RL	6635
6482	HI4D	6555
6340	HIX	6131
6325	HH3NW	6135
6138	HJ4ABD	6060
6128	HJ1ABB	6447
6097	HJ4ABE	6090
5955	HJN	5950
5780	HJ4ABD	5960

* Call changed from LKJ1.

STATIONS DELETED

Kc.	Meters	Call	Reason
14100	21.25	HJ5ABE	Not in service
13075	22.94	VPD	Not in service
11800	25.40	HJ4ABA	Not in service
7074	42.48	HJ1ABK	Not in service
6451	46.50	HJ4ABC	Not in service
6275	47.81	HJ1ABH	Not in service
6150	48.78	HJ2ABA	Not in service
6080	49.34	HJ4ABC	Changed to HJ4ABU (6150)
6065	49.45	HJ4ABL	Not in service

NON-AUTHENTICATED STATIONS

Frequency	Call	Location
15795	XOJ	Shanghai, China
15740	TFM	Reykjavik, Iceland (Dec.)
15600	HS8PJ	Bangkok, Siam
15000	SV1KS	Athens, Greece (Nov.)
14000	PZ1AA	Paramaribo, Dutch Guiana
11895	HP5I	Aguadulce, Panama (Dec.)
11740	HP5L	David, Panama (Nov.)
10370	EHZ	Tenerife, Canary Islands
9590	VK6ME	Perth, West Australia (May) (Aug.)
9540	CB954	Santiago, Chile
9540	——	Armenia, Colombia (Dec.)
7580	HI9J	Ciudad Trujillo, R. D. (Dec.)
7100	FO8AA	Papeete, Tahiti (Nov.)
6767	PMH	Bandoeng, Java (Dec.)
6580	YN1GG	Managua, Nicaragua (Dec.)
6330	YV13RV	Valencia, Venezuela (Mar.)
6270	YV14RC	Caracas, Venezuela (Aug.)
6240	CO9RY	Matanzas, Cuba (Aug.)
6130	KZEG	Manila, P. I. (Aug.)
6120	XEOK	Tia Juana, Baja, Mexico (Dec.)
6120	HP5Z	Panama City, Panama (July)
6075	HI3E	Puerto Plata, R. D. (Nov.)
5910	YV15RC	Valencia, Venezuela (Aug.)
5000	ZUD	Roberts Heights, So. Africa (Dec.)

Experimental Stations

As some listeners are interested in radiophone and experimental stations broadcasting special programs and tests, another special block will be set up monthly and such stations as may be heard will be listed therein. The following stations have been recently reported:

TFM, Reykjavik, Iceland, will soon be testing with GBC, Rugby, on 15740 kc, according to information received from Lyle Nelson and Kendall Walker, Yamhill, Oregon, and W. H. Stark, Wauwatosa Wisconsin.

IUG, 15450 kc, Addis Ababa, Africa, on test programs between 9 and 10 A.M. Signals strong and clear. Reported by J. Wendell Partner, Tacoma, Wash., and Werner Howald, Los Angeles, California.

IUC, 11955 kc, Addis Ababa, Africa, heard by W. H. Stark, Wauwatosa, Wisc., testing with Rome between 3 and 4 P.M.

XOJ, 15785 kc, Shanghai, China, heard by LeRoy Waite, Ballston Spa, New York, on two Friday mornings in succession, testing with GBA, Rugby, between 6 and 7 A.M.

ZLT, 11050 kc, Wellington, New Zealand, heard Sundays 1 and 3 A.M. and at midnight on test by Werner Howald, Los Angeles, Calif., and John L. West, Cleveland, Ohio.

GAU, Rugby, 18620 kc, calling VWY, Poona, India, on 17480 kc at 12:30 P.M. VWY contacted and heard on test and condition "A" until 12:45 P.M. by John L. West, Cleveland, Ohio.

SUZ, Cairo, Egypt, 13820 kc, has been heard by Mr. West on three Sundays in succession with R6 signal testing with GBB, Rugby, on 13585 kc.

ZUD, 5000 kc, is reported as testing with England and located at Roberts Heights, South Africa. Reported by Galen Balfe, Lowell, Mass. It is not understood that this station was heard.

KBB, 8710 kc, Manila, P. I., tests with musical programs irregularly near 7 A.M. EST. Lyle Nelson, Yamhill, Oregon, says if you wish a verification from Manila try KBB, who furnish veri upon receipt of correct report. Address is F. J. O'Classen, Radio station KBB, Box 444, Manila, P. I.

HBO, 11490 kc, Geneva, Switzerland, reported by Kendall Walker, Yamhill, Oregon, as testing with Amsterdam near 4 A.M. Sundays.

HBF, 18450 kc, Geneva, Switzerland, reported sending special program 10 A.M. to 1 P.M., by Werner Howald, Los Angeles, California.

These notes may bring out some interesting reports in subsequent issues, and it is hoped that all hearing such unusual broadcasts will report them.

Scene in brown wash, with call in red. An unusual card.

The Java Stations

There appears to be some confusion as to the exact call letters of certain stations in Java. PMH, 6720 kc, is reported as relaying programs of the Eastern native network from 5 to 10 A.M. The Western World Wave Club says the call of this station is PMQ. Late information from Java, however, says the call is PMH, but that it is on 6767 kc or 44.33 meters, 1500 watts power and broadcasting on same schedule as shown in station lists for YDA and YDB, 3040 kc and 9610 kc. PMH will be shown in non-authenticated stations and transferred to station list in next issue.

PLO, 11500 kc, reported by many. Others state official advice is that call is PMK. J. Wendell Partner, Tacoma, Wash., has verification for PMK on this frequency.

There is also a station on 15150 kc and many listeners report call as PLH, PLP and PMN. Mr. Partner and Mr. Nelson both advise they have word from Mr. Sanders, Chief Engineer of Java stations, that call is YDC, located at Soerabaja and that it broadcasts 5 to 10:30 A.M. This statement is correct according to late advice we have received from Java. These stations have not yet been listed, as we are awaiting a complete list from Java. In the meantime if any one secures such an official list, will they please forward same.

Blue border with call in red letters—a double veri card from Angola, Africa.

Random Notes

W1XAL, Boston, has been reported by several as testing with program on 15250 kc. This station advises that this frequency is not to be used on regular broadcasts, but only on occasional special test programs.

HJ1ABB, Barranquilla, Colombia,

has been changed in station list from 6447 to 6128 kc where it is working, but not getting out any too well. From advice from Colombia we learn that this station is also using 9560 kc in the morning and on lunch hour program but changing in the afternoon to 6128 kc. It is understood this station is broadcasting some 18 hours daily beginning at 8:00 A.M.

HJ5ABE, 14100 kc, Cali; HJ4ABA, 11800 kc, Medellin; HJ1ABK, 7074 kc, Barranquilla; HJ4ABC, 6451 kc, Ibague; HJ1ABH, 6275 kc, Cienaga; HJ2ABA, 6150 kc, Tunja; HJ4ABL, 6065 kc, Manizales and HJA7, 5400 kc, Cucuta, Colombia, are all deleted from station lists in this issue.

HJ5ABE, HJ4ABL, HJ4ABC and HJ4ABA are now operating only on long waves.

HJ1ABK, HJ1ABH and HJA7 were amateur stations but not now broadcasting.

HJ2ABA is not transmitting as they have not increased their power for short waves to the required one kilowatt according to the regulations in Colombia.

From semi-official advice it is learned that HJ5ABC on 6150 kc is not broadcasting for the last named reason but it will be allowed to remain in list until the advice is confirmed by reliable sources. If in the meantime this station should be heard, your reporting to this department will be appreciated.

HJ4ABU—Radiodifusora "La Voz de Pereira" furnishes a veri card with white background and red lettering with fill-in in blue typewriting. This station operates on 6150 kc and replaces HJ4ABC at Pereira.

HI4D advises by card that they are now on 6482 kc, although some listeners say they are much higher in frequency. Checks on this station would be appreciated.

HJN, Bogota, Colombia, is now on 5955 kc or 50.35 meters and has furnished veri card. The station is operated daily except Sunday, 11 A.M. to 2 P.M. and 5 to 10:30 P.M. Their opening selection is an organ solo "Ah! Sweet Mystery of Life" and at their closing they use a carillon which is also used at other times during the program. HJN is now using 1000 watts power.

HP5I, Aguadulce, Panama, is a new short-wave station reported soon to be on the air with 50 watts power on 11895 kc or 25.22 meters.

VP3MR, "The Voice of Guiana" sends same veri card with frequency changed to 6010 kc or 49.92 meters. Operated by The British Broadcasting Company at Georgetown, British Guiana, week days from 4:45 to 8:45 P.M. and Sundays from 7:45 to 10:15 A.M.

YV1RH, Maracaibo, Venezuela, the new station being heard on 6350 kc is operated by Senor Nicholas Vale Quintero and is operating with 250 watts power simultaneously with YV1RG on 1120 kc (L.W.). Its transmitter is located five kilometers from the center of the city.

Three Frequencies

HJ4ABD, "La Voz Catia," Medellin, Colombia, advises that they use three frequencies which accounts for their being heard at different points on the dial. They transmit on 6138, 5900 and 5780 kc and are governed by weather conditions as to frequency used. Their time on the air is revised in station lists in this issue. The opening and closing selection is "Guillermo Tell ("William Tell Parte 4"). Later advice will be given as soon as received as to the assigned periods for use of the frequencies mentioned.

Veri card from the Minister of War, Republic of Colombia.

HJ1ABE, 9500 kc, advise they are receiving reports in the thousands from 30 countries. Australia and New Zealand report that they are heard there daily as locals since the installation of their new 1100 watt Collins transmitter. This station opens its programs with the organ selection "Song of the Islands" and closes with "Aloho Oe." Call is announced every hour in English. Special broadcast to short-wave clubs in the United States on Monday, 9:30 to 10:30 P.M. E. S. Time.

RNE and RAN, Moscow, 12000 and 9600 kc, respectively, appear in station lists as broadcasting at certain hours and days. These listings usually cover the time they broadcast in English but do not reflect the full hours on the air. RNE usually broadcasts from 3 to 6 P.M. and RAN from 6 to 7:30 and 8 P.M., E. S. Time, the remainder of time not listed in station lists covering broadcasts in languages other than English. As yet the Moscow radio authorities do not issue a complete schedule of the time of their short-wave transmitters on the air but seperate their time schedules according to the language spoken.

HP5J, "La Voz de Panama" on 9590 kc continues to broadcast good program material. The English news period broadcast nightly from 6:30 P.M. and usually running to 7:10 or 7:15 P.M., E. S. Time, is a very interesting period conducted by Lieut. George Williams, the English announcer, and containing the late news from all parts of the world. From reports received the station is being heard regularly in India, Japan, Norway, Australia and other distant points around the globe. It is understood that a plan is now being worked out to distribute monthly prizes to those reporting the greatest number of news items heard during the period.

"Harmonic Verification Club"

From comments gleaned from letters of listeners, we have under consideration the formation of a new club called the "Harmonic Verification Club," all being eligible for membership upon presentation of a verification originating from a report of reception of the harmonic output of a transmitter. Who will be the first to qualify? Hi!

From a late letter from Japan the Overseas broadcast test is still being carried on every Monday and Thursday between 21 and 22 G.M.T. or 4 and 5 P.M., E. S. Time on JVH, 14600 kc and JVN on 10660 kc. The Chief of the Engineering Department is very anxious to receive reports from listeners.

Mr. Thomas P. Jordan of Scranton. Pa., advises that about a year or so ago he picked up an amateur short-wave station, FB8VK, on the 20-meter band which he has never seen reported in any

of the short-wave magazines or elsewhere, although the writer notes it is shown in the Amateur Call Book. Mr. Jordan has since corresponded with the operator and received many interesting letters, but we will quote from Mr. Jordan's interesting letter:

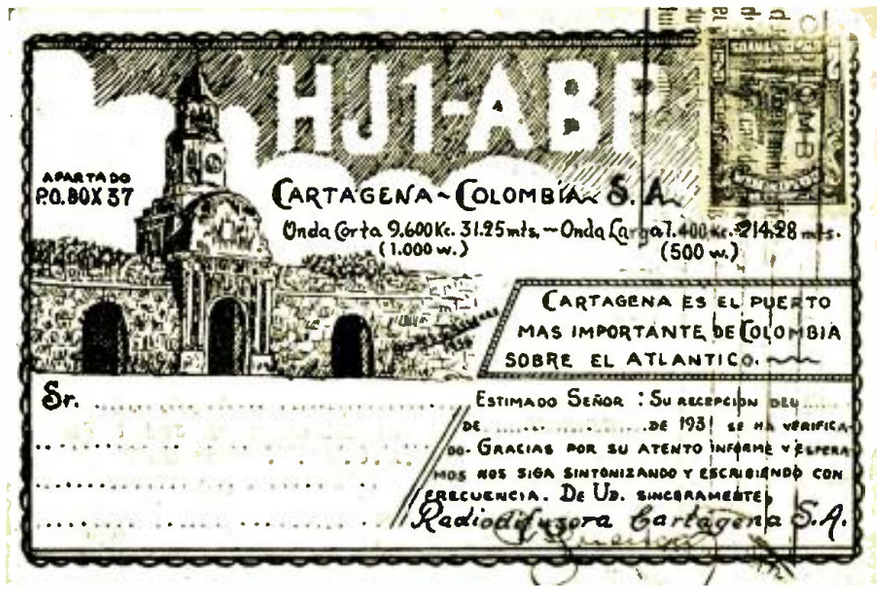
"His call letters are FB8VK. He operates on the following frequencies—14340—7170 and 28680 kc. He is on the air from 16.00 to 22.00 G.M.T. (11 A.M. to 5 P.M., E. S. Time). He is very anxious to contact some American amateurs. Last, and by no means least, his name and address: Prince Vinh San, 67 Rue St. Ann, St. Denis, Ile de la Reunion, Indian Ocean. H.R.H. is the former King of Annam, (French Indo-China) and was exiled to Reunion Isle in 1916 by the French Republic. He lives in a land so far away that a poet might refer to it as "Out where the pavement ends." It is so far away that it takes a letter six weeks to arrive there, so I do not hear from H.R.H. more than once in every three months. The island he is on is off the beaten path, as it is not touched by any of the large liners and the mail boat only stops there once every two or three weeks. So, is it any wonder that he gets lonesome at times. He says that his short-wave station is one of his main diversions. He uses a power of 100 watts. He speaks English, but with rather a strong French accent. You may publish this in your department and I feel sure that some of the boys or XYL's will some day estahlish contact with H.R.H."

(FB8VK is worked now and then by W2FF, in the Bronx, New York.—Ed.)

"La Voz de Armenia," assigned to 9540 kc and located at Armenia, Colombia, is the new station heard testing around that frequency. Advice from Colomhia is that it is working experimentally and for that reason the call letters have not been assigned. Howard Wilson, Jr., Ithaca, N. Y., reports it on 9535 kc; R. B. Oxrieder, State College, on 9525 kc and others close to the assigned frequency but not heard well due to interference from other stations working there. Mr. Wilson also reports hearing a station with call HJ3ABC on 9570 kc "La Voz de Publica." Has any one else heard this one?

Mr. J. Wendell Partner, Tacoma, Washington, whose reliable short-wave reports from the West Coast are much appreciated, is receiving publicity in one of the local papers there, who are publishing his likeness and a reproduction of his choice verifications received. The veries are also displayed in one of the local stores. Congratulations and best wishes are extended.

TPA 2-3-4 have chimes in studio which strike the hour and sound on the



Red-brown on a white background—a decorative veri from Cartagena.

¼ and ½ hours. The news broadcasts are in English, Italian, Arabic, Portuguese, Spanish and German.

Prague, Czechoslovakia, has not yet published its permanent schedule of time on the air, but are being heard at different hours in the evening as well as the time reported in station lists. It is understood they recently announced they would soon be on 11870 kc or 25.26 meters on Monday and Thursday. This frequency is not listed. They have mostly been heard on 15230 kc. Station now known as "Radio Prague." Reports as to frequencies used, time on the air, or any calls given, would be most appreciated.

The report is that the Japanese Overseas programs are soon to be carried by new 50-watt stations. The calls and frequencies mentioned are as follows: JZH, 6095 kc, JZI, 9535 kc, JZJ, 11800 kc, JZK, 15160 kc, JZL, 17785 kc. From the power mentioned it would seem that some error has been made in the report, as it would not seem that 50 watt transmitters would consistently cover the territory desired to be reached.

Peruvian Stations

The new Peruvian broadcasting station is nearing completion, although the call is not yet known or the frequency on which it will work. The advice is that it is being constructed by the Marconi Company and the short-wave transmitter will employ 10 kw power.

It is noted from the Department of Commerce bulletin that in addition to the two short-wave stations in our station lists, namely, OAX4D, 5780 kc and OAX4G, 6230 kc, there are other short-wave broadcasting stations in Peru as follows: OAX4I, 9520 kc and OAX4K, 6425 kc, Lima; OAX4P, 6122 kc. Huancayo: OAX5A. 11800 kc, Ica; OAX6A, 6122 kc, Arequipa; OAX7A, 6128 kc, Cuzco.

This information is given so that you may have record, and reference will also be recorded in the non-authenticated block.

Mr. C. H. W. Nason, Technical Director of TGWA, has forwarded this department the report of a DX fan for verification which reads as follows: "Enclosed find three cents for return postage for verification of reception." Nothing else enclosed. This is a new way to try and secure a veri card, but not the correct method. Mr. Nason says this is a sample of the type of reports they receive. Needless to say the veri was not furnished. But let us give the fan making the report a break; possibly he neglected to enclose the reception details. For your information Mr. Nason states that no International Reply Coupons need accompany reports filed with TGWA or TG2X as they have governmental franking privileges, and therefore return postage is unnecessary. But reception details are!

Reports to Moscow should be addressed as shown in address section, never to Russia. They do not reply to letters addressed thusly, and it is said that some letters have been returned as "uncalled for."

Icelandic Stations

For the information of listeners, the Icelandic Broadcasting Service has the following assigned frequencies:

KC.	Meters	Call
17890	16.77	TFN
15740	19.06	TFM
13965	21.48	TFL
12235	24.52	TFJ
9060	33.11	TFK

ZBX or ZBW, Hong Kong, China. 9530 kc. The first report received was from George C. Sholin. Radio Journalist.

San Francisco, who advised he heard a new Hong Kong station on 9530 kc using the call ZBX and broadcasting the same program on ZBW on 8750 kc. Signals reported very clear and volume much better than ZBW. Reports have since been received from Lyle Nelson, Yamhill, Oregon, LeRoy Waite, Ballston Spa, N. Y., J. Wendell Partner, Tacoma, Wash., John L. West, Cleveland, Ohio, Kendall Walker, Yamhill, Oregon, and Werner Howald, Los Angeles, Calif. The writer also has had the pleasure of hearing it. Some say it is ZBW and others are not sure, but all are agreed that it is Hong Kong. ZBW has also been heard on 8750 kc, but not on 5410 kc, the other assigned frequency. And while closing, along comes a card from Mr. Nelson that he has information that the station has moved to 15190 kc or 19.75 meters. So there is the story and we will await developments.

PZ1AA, Paramaribo, Dutch Guiana, (Surinam) 14000 kc, shown in the non-authenticated block, is reported by Fred Atherton, Rutland, Vermont, who has a letter verification from them on 14 mc. The station is in charge of Mr. S. Mobach, Superintendent Government Radio Service. When the exact frequency and time on the air have been received from the operators, they will be added to the station list.

Chinese Stations

XGOX, Nanking, China, is now on 6850 kc and operating with a fairly good signal in accordance with its schedule of time on the air. The call in English is said to be given on the hour and at sign-off.

F3ICD, Saigon, Indo-China, is again on the air, but on 11730 kc, instead of the 31-meter band as anticipated. Several reports have been received, but the signal reported is none too strong. It is apparently operating between 7:30 and 9:30 A.M. announcing in French and English as Radio Saigon, P. O. Box 295. It is now shown in station lists.

XEOK, 6120 kc, Tia Juana, Baja, Mexico, is reported on the air between 10 and 11 P.M. by E. H. Clark, Hollister, California.

YN1GG, 6580 kc, "La Voz de los Lagos," Managua, Nicaragua, is reported as again being on the air, by Wilfred Siddle, Birmingham, Alabama, and as being heard about 9 P.M., E.S.T.

HI9J, 7580 kc, Ciudad Trujillo, R.D., is also reported by Mr. Siddle as being heard irregularly around 10 P.M. broadcasting and phoning.

CSW, Lisbon, Portugal, is broadcasting 4 to 7 P.M. daily. They have skipped around a bit and at last accounts were transmitting and announcing on 9870 kc, where they are listed in station list in this issue. Veri cards received from them show 9550 kc.

War News

EA9AH, 7030 kc, listed in non-authenticated block in November, has been added to station list. This station is heard daily from 4 to 4:25 P.M. EST and transmission consists mostly of war news items in various languages, with a little music now and then thrown in for good measure. It is called "Radio Tetuan," and operated from Tetuan, Spanish Morocco, Africa.

EAJ, 10370 kc, in November non-authenticated section is evidently EHZ, re-broadcasting occasional programs from Radio Club Tenerife, Canary Islands, between 6 and 8 P.M.

SPW, 13635 kc, Warsaw, Poland, is being heard at times on this frequency between 11:30 A.M. and 12:30 P.M. as listed. Thomas J. Taaffe, Elmsford, New York, states that while listening to one of these broadcasts he heard it said that they will soon broadcast an American hour between 9 and 11 P.M. EST, on about 49.05 meters on Mondays and Thursdays.

VK6ME, Perth, West Australia, is said to have been heard on test about 7 A.M. EST. This may be in error as it is understood that the transmitter is at present being set up.

HH3W, (9595 assigned) appears to be working closer to 9620 kc than 9595 kc, according to reports from several listeners.

SM5SX, Stockholm, Sweden, 11705 kc, is shown in station list in this issue. From advice received from station it broadcasts as shown, although heard in closing on Wednesday and Friday after 5 P.M., E. S. Time. It is owned and operated by the Royal Technical University, Stockholm, and broadcasts the regular Swedish program. They employ 500 watts power in the antenna, 100% modulated. Station is sometimes used on the 14-mc amateur band.

KIO, 11680 kc, is reported as now carrying the "Hawaii Calls" program 12:30 to 1:00 A.M.

VPD2, 9540 kc, Suva, Fiji Islands, is being heard daily with good signal strength until sign-off at 7 A.M., E. S. Time. According to various reports VPD, 13075 kc, is now off the air.

HCJB on Three Waves

HCJB, Quito, Ecuador—This station is now broadcasting with a new R.C.A. 200-watt transmitter. They now broadcast on three waves simultaneously: "La Voz de los Andes" 8948 kc, "Broadcasting Provincial" 4107 kc and "La Voz de Quito" 974 kc (L.W.) and all operate under the call HCJB. It is necessary to use three transmitters because of the peculiar and difficult atmospheric conditions of the equator. These three transmitters provide a complete coverage internationally, nationally and locally. They are now constructing a new 1-kw transmitter to operate on 33.50 meters, to be on the air this coming Christmas.

Quito is located about 15 miles south of the equator at an altitude of about 8,500 feet, in the heart of the Andes. The staff of HCJB is completely Ecuadorian, with the exception of the Director, Mr. Clarence W. Jones, who hails from Chicago, Illinois, to whom all reports should be addressed:—Casilla 691, Quito, Ecuador. Please note the changes in time on the air in station lists.

A special souvenir of a set of beautifully hand-painted scenes of Ecuador will be sent those who furnish correct reception reports.

[*Continued on page 584*]

Black on white from Guayaquil, Ecuador; 35.7 meters.

Channel Echoes

By Zeh Bouck

pills and pillage . . . salad dressing—razor blades . . . hi-fidelity

FOR those who have little in common with the birds at eventide, and who only weary of their roaming about the time said birds are getting up, we heartily recommend XERA—Doc Brinkley's border-line station on 820 kilocycles—along with the bicarbonate of soda. The Doc's Mexicanadyne is also to be prescribed to those unfortunates who must arise around 5:00 A.M., Eastern Standard Time. His station lays down a most powerful signal on the east coast and the program fare is *muy bueno*— an excellent band usually followed with Mexican music done in the best chilli con carnival style. The advertising is the Doc's own, and not bad, as most listeners probably take it no more seriously than a liver pill almanac.

But we do object when Doc Brinkley offers free health and medical examination by mail! This is dangerous business, and unfortunately the Rio Grande prevents the American Medical Association from doing anything about it . . . via the FCC. (Which, if we recall rightly, is exactly why Doc Brinkley is broadcasting from Mexico, where a diagnosis apparently is as reliable as a divorce.) It is difficult enough with tactile examination, x-ray, stethoscope, thermometer and a blood-pressure gadget to tell what is wrong with a person. The Doc has apparently set himself up as an expert on human mailments.

VK2ME adopted the Kookaburra bird as its ornithological symbol, and its laughing call is used as an identifying signature to the Australian's broadcasts. We suggest the duck for XERA.

◆

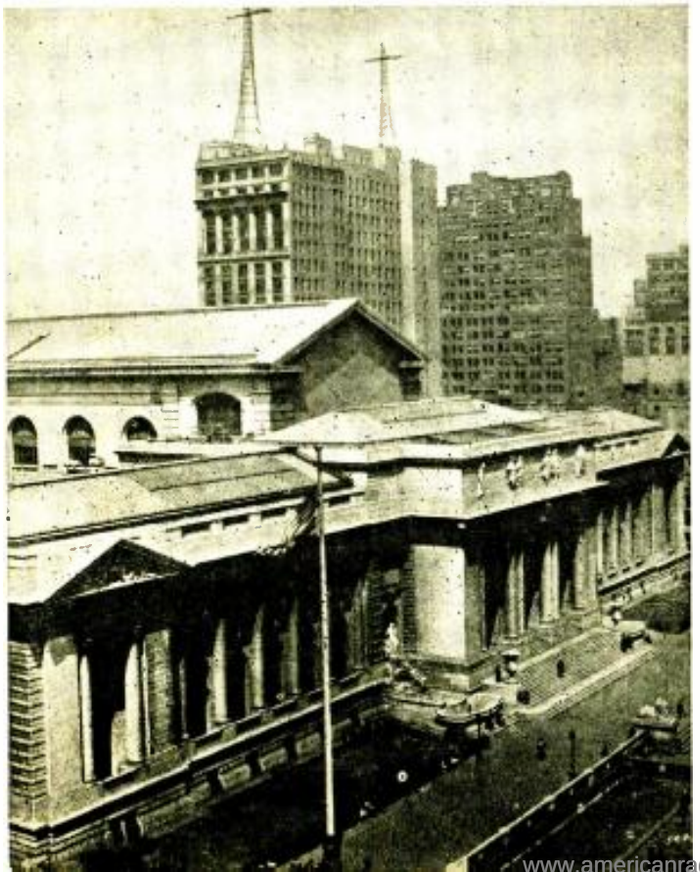
WE HAVE BEEN informed by a disgruntled office staff that our old timers' teaser in the October issue was too easy—the disgruntlement being the result of excessive secretarial labors. But the circulation department says that it was quite okay as it supplied them with names of newsstand readers looking for a free subscription! The majority of you correctly labeled the pair as Billy Jones and Ernie Hare—the Happiness Boys of commercial broadcasting's dismal dawn. One of the first correct replies to come in was from Arthur H. Lynch, whom, however, we were forced to rule out on the basis of unfair competition. We seem to recall attending a cocktail party with that gentleman, many years back, at either the Sherry Netherland or the Savoy Plaza—said party being presided over by Jones and Hare. Arthur never forgets a cocktail party. So the free subscription goes to Charles R. Steegmuller, 500 Liberty Street, Newburgh, N. Y.—for the identification, and his undoubted qualifications as an old timer. He writes:

"After looking at some of your old pictures, I dug into my junk box and found some interesting items—a veri from PWX at Havana, one from 6KW 'When you hear the coo of the cuckoo you know you're in tune with Tuinucu,' a membership card of the WBS honor roll, another membership with the WDAF Kansas City Star Night Hawk Club ('The Enemies of Sleep'), and a card from *Radio Broadcast* magazine verifying reception from 2LS at Leeds, England, during the trans-Atlantic tests of 1923."

Jones and Hare date back to the phonograph, ante-broadcasting era. They became famous as the Happiness Boys, broadcasting "every Friday night at eight" from the Happiness Candy restaurant, Fifth Avenue, New York City. Later they switched allegiance to socks and became the Interwoven Pair. They returned to gastronomics with Hellman's mayonnaise and are now plugging razor blades with the Gillette program. Jones is now 46 and Hare 52.

Among those who did not confuse the pair with Ford and Glenn, Gene and Glenn, the Gold Dust Twins, Sam 'n Henry and Amos 'n Andy (despite our tip to the contrary!), we particularly want to thank: Pierre Verseput, Frank Chambers, Lucian Neuls, William Burton, John Blecha, Lester Weinstein, Bernard Ahman, Joseph Slezak, Tomio Enochty, Leo Brigham, Francis Davidson, J. J. Befeler, Samuel Baillie, S. J. Zuck, James Combs, Joseph Blank, Harry Kehlenbeck, Walter Thom, Henry Wennberg, Myer Franman, Ralph McVey, Caspar Hasselriis, Jr., Harold Street,, A. Watton, Thomas P. Jordan, L. M. Clark, Charles Dutrow, Chris Mulrain, Jr., Richard Rogers, E.

[*Continued on page 588*]



Where Professor Armstrong stood on his head far above the milling crowds. Guess what and when.

A 6L6 PUSH PULL AMPLIFIER WITH ELECTRONIC MIXER

Front panel view of the completed resistance-coupled push-pull amplifier.

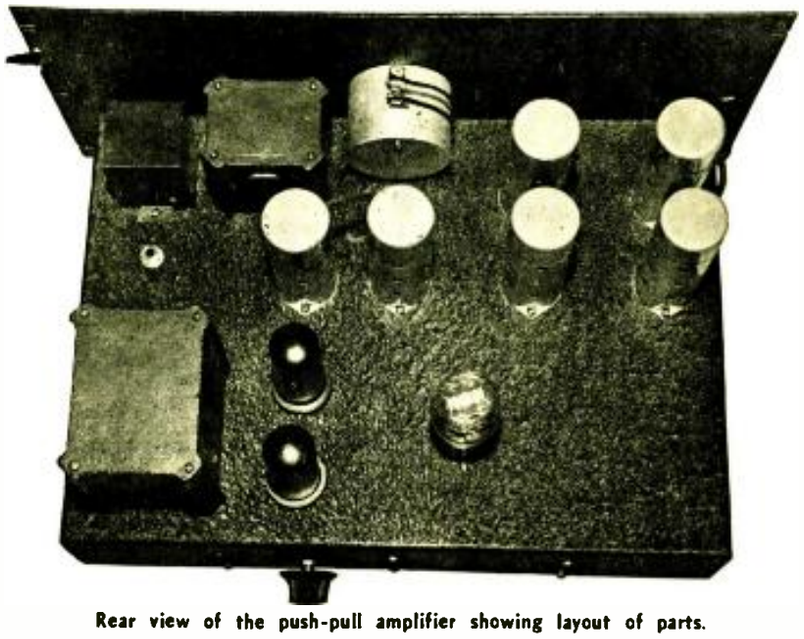
By Willard Bohlen, W2CPA

THIS amplifier was designed to adequately fill all the audio-amplification requirements of the modern amateur station in a single unit. In its complete form it is also well suited for use as a public-address amplifier. The experimenter will find included in this article a diagram and other data sufficient for the construction of a simplified version of the amplifier which will give the same high quality of reproduction at a substantially lower cost.

Full Resistance Coupling

Resistance coupling is used wherever possible in this amplifier to reduce cost, improve frequency response and to insure hum-free operation. While single-ended resistance coupling is an improvement over single-ended transformer coupling, push-pull stages are really essential for either type of coupling if the best possible performance is to be had. The biggest advantage of using push-pull throughout is that any hum picked up by the tubes, leads, etc., is cancelled out. Any hum still remaining in the power-supply output after filtering is also cancelled out. Moreover, various cathode bypasses, individual stage filters, etc., can be eliminated, thereby simplifying the design.

Recent developments in crystal microphones and phonograph pickups have made possible the construction of both devices in push-pull types. As these crystal microphones and pickups will work directly into the grid circuit of a push-pull audio stage without using an input transformer or other coupling device, it is possible to extend the resistance coupling right up to the microphone or pickup. The most sensitive point of an amplifier is, of course, the input which operates at the lowest level and is subject to the greatest amplification of any undesired hum or r-f pickup. The elimination of a transformer at this point is therefore a distinct advantage.



Rear view of the push-pull amplifier showing layout of parts.

Main-Channel Circuit

A study of the diagram of Fig. 1 will show that two electrically-mixed channels are used. Forgetting for the moment the low-impedance channel input stage at the lower left of the diagram, let us first study the design of the main four-stage channel at the top of the diagram, starting from the power output stage and working backwards, as all amplifiers and transmitters should be designed.

The output stage uses of pair of 6L6 beam-power tubes. The operating conditions under which these tubes are run in this particular amplifier provides 15 watts of audio with only 2 per cent distortion. The use of self-bias eliminates the complications of fixed bias. This 15-watt output is sufficient for most speech amplifier, broadcast and public-address requirements. However, if 30 watts output is desired, it may be had by changing the bias resistor, R-17, to 200 ohms and using a Type PA-16 output transformer in place of the Type LS-55 shown.

The driver stage uses a 6A6, which has two triodes, using a common cathode, in a single envelope. A tone control is connected across the grids of this stage. This

is necessary for record reproduction, as the high-frequency response of the amplifier is such that needle scratch becomes objectionable unless the higher frequencies are attenuated. A switch is mounted integrally with the tone control potentiometer so that it may be switched completely out of the circuit when desired.

Voltage-Amplifier Stages

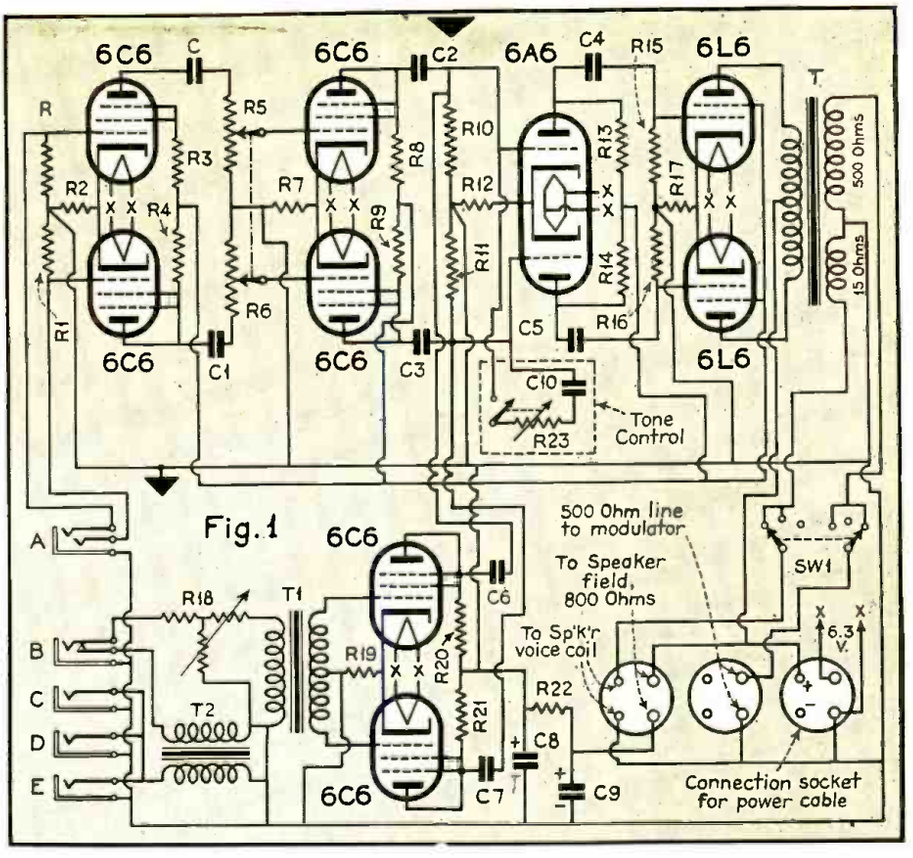
The next question arising in the design of this amplifier was that of the correct amount of amplification to use ahead of the 6A6 driver stage. It was thought desirable to keep the total number of stages in this channel down to four, if possible. On figuring voltage gain of various tube combinations it was found that two triode stages ahead of the driver stage should be sufficient for low-level crystal microphones, a finding which proved correct on final test.

Type 6C6s are used in these first two stages. Each tube is connected as a triode, that is, with the suppressor and screen tied directly to the plate. Raytheon has recently developed a 6C6 which has an extremely low hum content, ("F" construction) and these were used throughout the amplifier, wherever 6C6's are required.

The gain control on this channel is placed between the first and second stages, a position preferable to its placement in the input circuit. A dual potentiometer is used to preserve the symmetry of the push-pull circuit. The grid resistors of the first stage are quite large, being 5 megohms each. This value is necessary if the full frequency response of a crystal microphone or pickup is to be preserved.

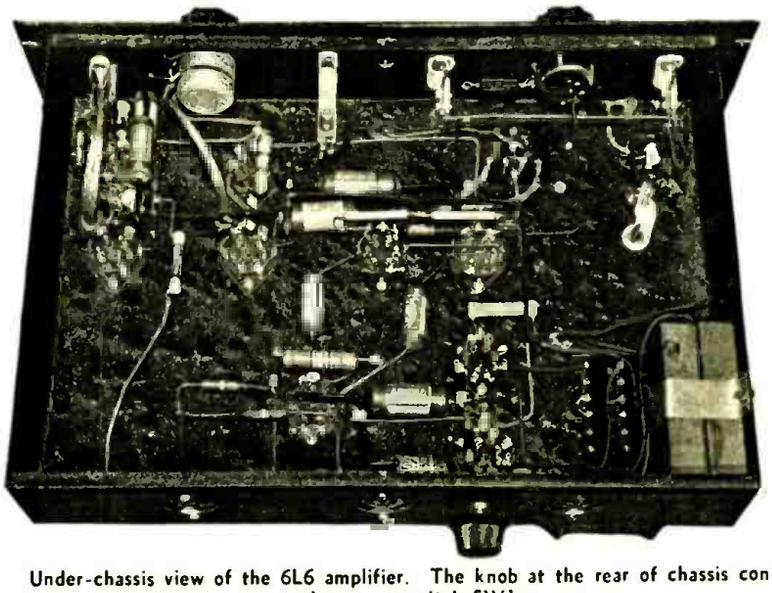
Mixing-Channel Circuit

The input stage for the other audio channel is shown at the lower left of the diagram. Disregarding the input jacks, T-pad and transformers for the moment, it will be seen that a single 6C6 triode stage is connected with its plate circuit in parallel to the plate circuit of the second audio stage of the upper channel. This gives a total of three stages in the lower channel, as compared to four stages in the upper channel. The gain of these three stages is more than sufficient for either receiver or phonograph input. The use of electronic mixing prevents the input of one channel appearing across the input of the other channel, which is a decided advantage during certain mixing operations.



Schematic diagram of the amplifier with electronic mixer.

The layout of the input connections to the lower channel is a matter that requires different treatment for different uses. The amplifier is now installed at one of the prominent East Coast amateur stations, and this particular layout of input connections suited purposes most conveniently. Four input jacks are provided on this channel. Jack "B" is for 200-ohm input, going directly to the 200 ohm T-pad, R-18, and thence to the 200-ohm winding of the input transformer, T1. An extra leaf on this jack connects to the 200-ohm winding of the matching transformer T2. The 5000-ohm winding of this transformer then connects to jacks "C," "D," and "E," which are paralleled. These latter three inputs will match satisfactorily to the outputs of various receivers.



Under-chassis view of the 6L6 amplifier. The knob at the rear of chassis controls output switch SW1.

Power Connections

Three standard four-prong wafer sockets are mounted on the back edge nf the chassis to take care of power supply connections and the outputs of the power stage. One socket takes the four-wire cable from the power supply. The B plus wire of this socket goes directly to the primary of the output transformer and also to the speaker-connection socket. Thus the speaker field coil is used as a third filter choke, the 8-mfd condenser, C-9 also connected to this speaker socket becoming the output filter condenser. The speaker field coil is thus energized,

the voltage to the 6L6 screens and plates of other tubes is dropped to a suitable value, and a third filter section is provided. The combination of the 10,000-ohm resistor R-22, plus the 8-mfd condenser, C-8, provides both a decoupling and fourth filter section for the three stages using 6C6s.

The 500-ohm and 15-ohm connections to the modulator and speaker-connection sockets, respectively, are switched so that either the modulator alone, the speaker alone, or both may be connected. An old type of dual toggle switch (SW-1) is used for this purpose. A two-gang, three point switch of the Yaxley type may be used instead. It is important, however, that a load be kept on the amplifier at all times during operation due to the tremendous output peak voltages the 6L6's are capable of generating.

Speaker and Power Supply

The speaker is of the same type as used with the AWR-13 receiver, described in the May issue of ALL-WAVE RADIO; a Jensen Model A-12 high-fidelity dynamic. The frequency range of this speaker is 30 to 8000 cycles. The field coil resistance is 800 ohms.

If a speaker with a different field resistance is used, it may be necessary to connect a heavy-duty resistor either in series or in parallel with the field coil to get the correct voltage drop across it. This may be easily done if a voltmeter is handy to connect across the field coil. With this particular setup the current drawn by the 6L6 screens and the 6C6 plates is sufficient to give approximately the correct voltage drop across the field. The output transformer in the speaker is not used, the voice coil leads being connected directly to the cable running to the speaker connection socket on the amplifier.

A heavy-duty power supply, with choke-input connection, is used. (See Fig. 3). The power transformer is rated at 250 m.a. and provides sufficient current for operation of the amplifier. The two 6.3-volt filament windings are connected in parallel, giving a total of 7 amperes for the heaters. Be sure to polarize these windings when connecting them together. The filter chokes are rated at 200 m.a.

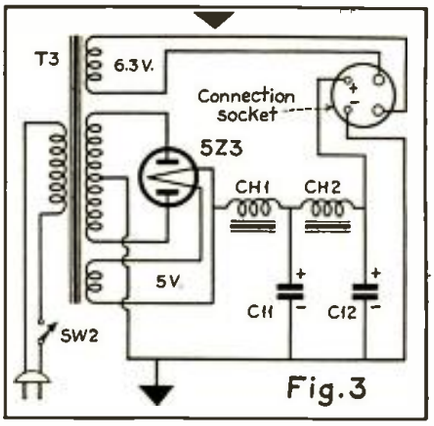
Constructional Details

The construction of this amplifier is simple. A standard 8¾" by 19" black crackled panel is used. The chassis is also crackle finished. This chassis is 12" deep, although one 10 or 11 inches deep may be used if necessary. The cabinet used by the owner of this amplifier is a standard Wholesale Radio Service Co. two-decker, a receiver having the same size panel being housed in the upper section. This provides a convenient centralization of all station equipment other than the transmitter itself.

The exact layout of parts is not important as long as the two tubes of each push-pull stage are kept together and the leads fairly symmetrical and short. However, it is important that the three stages using 6C6s be located so that the grid circuits are as short as possible—particularly the grid circuit of the input stage in the upper channel, as this circuit is at the lowest level in the entire amplifier and so most subject to unwanted pickup. The grid leads to all the 6C6s should be shielded, as well as the tubes themselves.

It is extremely important that condensers without leakage be used for the coupling condensers between stages. Some 400-volt tubular paper condensers originally used passed current to the grids of the following tubes. These were replaced with condensers having a 600-volt rating.

The circuit is so designed that the frames of all jacks are directly grounded. This puts one wire of each microphone, pickup or other line running to the amplifier at ground potential. All these lines should be preferably shielded. The shields may be grounded by connecting to the proper lugs in the connection plugs. One side of each of the 15-ohm and 500-ohm output circuits is also grounded. A common ground wire connects to all sockets, jacks and outputs to avoid the possibility of poor chassis grounds.



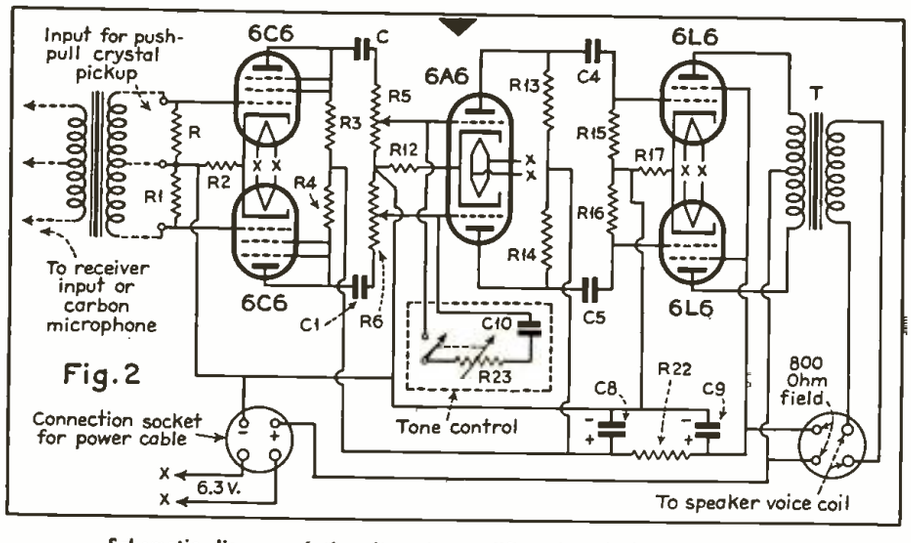
Schematic diagram of the power-supply used in conjunction with the 6L6 amplifier.

Results Obtained

The results obtained with this amplifier more than justify the use of resistance coupled push-pull stages throughout. When running with both gain controls wide open there is no audible hum even with the ear close to the speaker. No tendency toward motor-boating or instability was noticed. The gain is so great that tube hiss can be heard! When using a low-level crystal microphone of only —70 d.b. output, there is sufficient gain to realize the full 15 watts output of the amplifier.

The push-pull crystal phonograph pickup was tested with the amplifier using two different input connections. For the first test it was plugged directly into the upper microphone channel. The gain was entirely too high, necessitating the setting of the gain control for this channel near the off position. In the second test a transformer, matching the crystal pickup to a 200-ohm line, was used, this line being plugged into jack 'B." The gain was still ample with only the three stages of amplification this channel affords.

It is difficult to describe the quality of any amplifier setup in general terms, but suffice it to say that to our ears there was a greater response to both high and low notes than we had ever heard before. Several symphonic records were used for the listening test, affording a preponderance of both very low and very high tones. It was necessary to use the tone control on the recordings to reduce the needle scratch. A scratch-filter could be used instead, although the tone control is satisfactory.



Schematic diagram of the alternate amplifier, described in the article.

A test run was made, using an audio oscillator, and vacuum-tube voltmeter to keep the input constant at all test frequencies, and the regular "VI" decibel output meter which is used in this amateur station for checking amplifier output level to the modulator. This test was run from 10 cycles through to 15,000 cycles. The gain from 40 cycles to 15,000 cycles held constant to within one d.b. Below 40 cycles the gain dropped off several d.b., but was still quite high at only 10 cycles. This drop in low-frequency gain was due to the size of the coupling condensers, larger condensers increasing the gain at the very low audio frequencies.

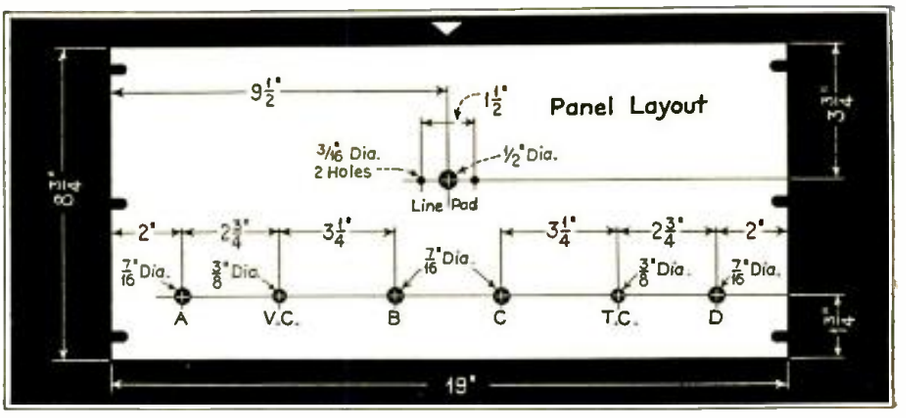
The jack arrangement for plugging in various microphones, phonograph pickups and lines is decidedly convenient. The complete amplifier has replaced a previous collection of mixer units, two separate pre-amplifiers and a main amplifier. With the receiver contained in the same cabinet and the "VI" meter mounted in a small case on top, a compact unit is had which may be moved to any place in the house and connected to the transmitter with only a two-wire audio feed line for the modulator input and an a-c line to the control box.

Mixing Combinations

Various mixing combinations are possible. Either a crystal microphone or crystal pickup may be plugged directly into jack "A" and so derive the benefit of the amplification of four stages. On the other channel jack "B" takes the input of any 200-ohm line. As the phonograph pickup used in this station is equipped with the pickup-to-line transformer previously mentioned, the microphone and pickup can be perfectly mixed by varying the two gain controls.

Jacks "C," "D" and "E" are connected in parallel to the "plate input" winding of transformer T-2. "C" and "D" are on the panel, as shown, while "E" is mounted on the chassis. This permits internal connection in the cabinet between the transformer T-2 and the receiver output, the receiver phone jack being mounted on the back edge of the receiver chassis. A pair of phones and the output of another receiver—in this case a five-meter set—are plugged into jacks "C" and "D," so that two signals may be heard simultaneously through a single headphone circuit. With the attenuator, R-18, in the off position the receivers are prevented from feeding through the amplifier and transmitter while the microphone channel is in use. With the attenuator opened, the outputs of the receivers are fed through to the transmitter, and the gain adjusted with the attenuator while watching the "VI" meter, the setting of which is known for 100 per cent modulation. Output from the microphone in the upper chan-

[*Continued on page 580*].



Parts for Amplifier

RESISTORS

2 — ½ watt, 5 megs, R, R1
8 — ½ watt, 50,000 ohms, R3, 4, 8, 9, 13, 14, 20, 21
2 — 1 watt, 1000 ohms, R7, R19
4 — ½ watt, 500,000 ohms, R10, 11, 15, 16
1 — 1 watt, 3500 ohms, R12
1 — 25 watt, 150 ohms, R17
1 — T-pad, 200 ohms, R18
1 — 1 watt, 1000 ohms, R19
1 — 10 watt, 10,000 ohms, R22
1 — Potentiometer with switch, 100,000 ohms, R23

CONDENSERS

9 — .01 to .1 mfd., 600-volt paper condensers, C, C1, 2, 3, 4, 5, 6, 7, 10
2 — 8 mfd., 500-volt paper-encased electrolytics, C8, C9

TRANSFORMERS

1 — Output transformer, 5000-ohm plate-to-plate to 500-ohm line and voice coil (UTC LS-55 or PA-16), T
1 — Input transformer, 200 ohms to two grids (UTC LS-10, PA-135 or HA-101), T1
1 — Plate-to-line transformer (UTC LS-50, PA-140 or HA-113), T2

TUBES

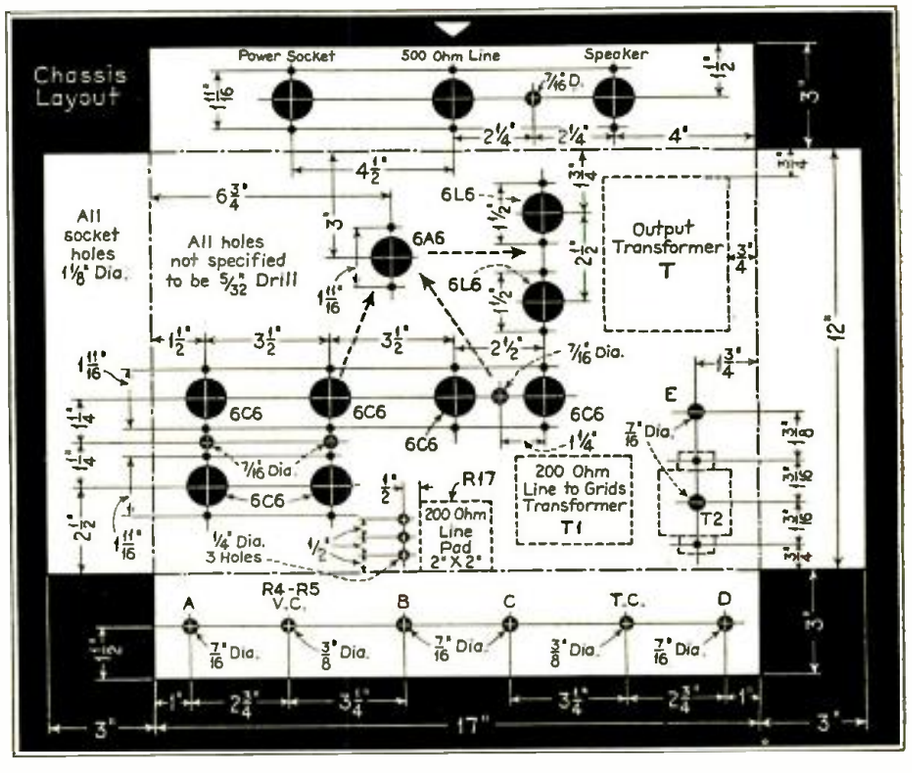
6 — 6C6
1 — 6A6
2 — 6L6

MISCELLANEOUS

Microphone jack, 3-way, A
Single circuit, circuit-opening jack, B
3 — Single-circuit jacks, C, D, E
3 — 4-prong wafer sockets for power connections
6 — Octal wafer sockets for 6C6s
2 — Isolantite octal sockets for 6L6s
6 — Small tube shields for 6C6s
1 — Large tube shield for 6A6
1 — Panel, crackle finish, 8¾" x 19"
1 — Chassis, 12" x 17" x 3"
1 — Double-acting dual single pole three throw toggle switch, SW1

Parts for Power Supply Unit

1 — Power transformer, 450 volts a. c. at 250 m.a. (UTC PA-428), T3
2 — Filter chokes, 12 henries at 200 m.a. (UTC Type PA-40) CH1, 2
2 — Electrolytic condensers, 16 mfd., 500-volt, C11 C12
1 — 5Z3 rectifier tube
1 — SPST toggle switch, SW2
2 — 4-prong wafer sockets
1 — A.C. cord with plug
1 — Chassis, 8" x 8½" x 2"



A Simple Modulation Indicator

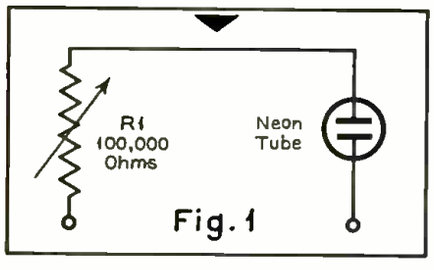
COST?—ABOUT 60 CENTS

By George B. Hart, ex8DK, W8GCR

THE Federal Communications Commission requires it, and modern Amateur practice dictates it, so there is no excuse for the phone station failing to own and use a means of determining the limit of modulation.

The simple device shown in Fig. 1 will not only indicate over-modulation, but it can be calibrated in percentages of modulation that will hold true for any given *d.c.* voltage modulated by a sine-wave voltage. The instrument is simply constructed and adjusted, and it will hold its calibration.

The circuit diagram of the modulation meter should be of interest to phone men, since the apparatus is simple (only two pieces of equipment) and inexpensive —*it can be built for less than 60 cents.*

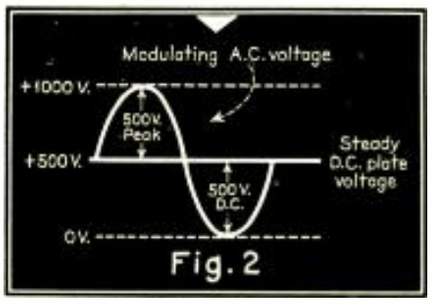


Circuit of modulation indicator.

Modulation

Looking at Fig. 2 we begin to see the story of modulation in its simplest form. Here we have a dark line to indicate the positive high voltage side of a 500-volt d.c. plate supply, on each side we see dotted lines indicating both 500 volts plus, or a thousand volts, and 500 volts minus, or zero volts. This is what we see when looking at a 500-volt modulated supply by means of an oscilloscope; of course, we are assuming that an a.c. peak modulating voltage of 500 volts is modulating our 500 volt d.c. supply. On the positive half of the cycle the 500 volts of the modulator's a.c. adds with the 500 volts of the d.c. supply to give 1000 volts, while on the negative portion of the modulator's a.c. cycle we have 500 volts d.c. *minus* 500 volts or 0 voltage. This adding and subtracting of voltage values is modulation.

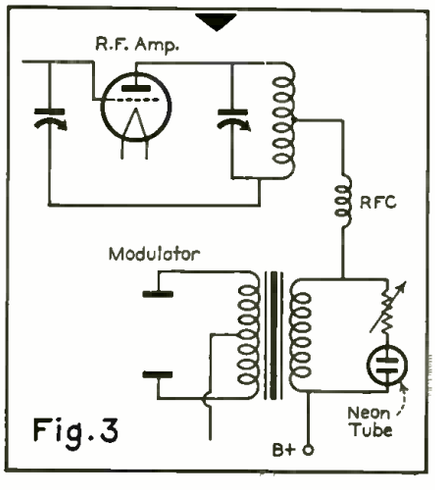
To obtain the 500 volts of modulating a.c. we do not impress 500 rms volts, but rather 500 *peak* volts, which is 70.7 per cent higher than the actual rms voltage. It is the rms value that our voltmeter reads; hence when supplying 500 *peak* volts from the modulator our a.c. voltmeter would read 70.7 per cent of this value, or 353.5 volts.



The story of modulation in sketch form.

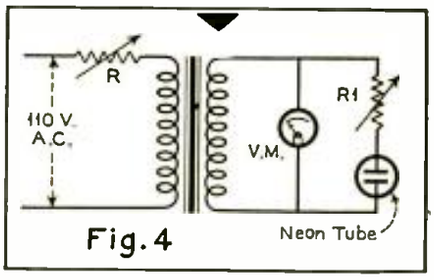
Calibrating the Indicator

To calibrate our device for over-modulation indication at 100 per cent alone, connect the instrument as shown in Fig. 3. Disconnect the plates of the modulator tubes and the high-power supply to them and connect the house 110-volt a.c. line to the primary of the modulation transformer through a suitable variable resistor, R, as in Fig. 4. Again assuming 500 volts d.c. on the plate of the modulated r.f. amplifier, adjust the primary line rheostat, R, so that the rms reading on the a.c. voltmeter is 353.5 volts; this is 500 volts peak and we are modulating our r.f. 100 per cent. Now adjust the potentiometer, R-1 so that the neon tube just lights at this value. In the event that the regular modulation transformer is of such a turns ratio that it does not lend itself to supplying this voltage, or the voltages necessary to calibrate your instrument, you may substitute a simple high-voltage transformer for it to make the measurements.



Connections of modulation indicator to modulator stage.

We have now found 100 per cent modulation and calibrated our instrument for it, so it becomes a simple task to calibrate the device at other a.c. inputs. It is only necessary to make a chart showing the settings of R-1 for each percentage of modulation that will light the neon tube and obtain these figures by varying the modulating a.c. voltage, remembering always that rms volts as read on your meter is only 70.7 per cent of the peak voltage.



Method of calibrating the modulation indicator.

Precaution

Naturally this simple little device cannot compare with an oscilloscope for measuring percentages of modulation, but it does satisfy the law and amateur requirements with the very minimum of expense. As a modulation indicator this type of instrument is subject to the defect that its readings are dependent upon the modulation envelope being a sine wave. If harmonics are present, or the modulation is complex, as with voice input, the readings may indicate either a higher or lower percentage of modulation than the actual. The same, however, applies to volume-level indicators whose readings are proportional to rms values, such as current-squared galvanometers.

The Ham Bands

By George B. Hart

W8GCR

remember when . . . everlasting pole sitter . . . purrty a-c hum . . . looped in brotherly love . . . click and chirp cure

FELLOWS, we want to thank you for your reception to these pages, particularly the old-timers who were kind enough to remember us and wonder if we remembered—when. Yeh. We did. In fact, we dug up some old cards and enjoyed a good cry. Like ghosts out of the past came Floyd McFarland of West Point's W2WP; Jack Thomas of W3AED; "Dynamite" Conner, who was our first "6" and we W6DYN's first "8"; from the Canary Islands came EO76—Arturo Gebauer, whose friendly reports helped us make our low-powered rig reach out time and again to Cape Town and the Continent. Then there was old W8CMU, who used to get out with a 201A in a Hartley circuit; and VE4JL, whose QSL apologized for his having "beginner's nerves." I doubt if 4JL is still afflicted by "beginner's nerves"! Hi. Hi. How about it, Lawson?

Just as a final reminder of the old bunch, we glanced at the wall where we have hanging a framed letter from E. Fret, of Wellington, New Zealand, reporting our greatest thrill—A Zedder QSO with only a '99 and 45 volts on the plate at our end.

Somehow we miss those old days, their friendships and explorations in the higher and ever higher frequencies, but most of all we miss those men who had been in the game long enough to have shed their supercilious attitudes toward beginners. Personally, we have never forgotten our first anxious days on the air fifteen years ago, and any "young squirt" who wants to can be sure of a friendly chat with us. So don't fail to call us O.M. when you hear us on the air, or drop a line to the Broadmoor Apts., No. 110, 640 Delaware Avenue, Detroit, Michigan, if you want to enjoy a pleasant QSO with us.

For the time being we are busy building, but can be heard occasionally from W8AIC, owned by old-timer Eddie Prested. Eddie, who is Chief Inspector for the Jam Handy Picture Service, was pounding brass on the Lakes when most of the fellows now in the game were teething.

◆

W9DEF, O. T. Zan Maitland, whose call is known wherever Hams gather, promises us an occasional line on the gang, so you'd better watch what you say to him. Thanks Zan. We did like your letter.

◆

6ZH, (HERB "ZILCH") decided to erect a twenty-foot 2 x 2 extension on top of one of his 70' poles last summer for 28-mc beam operation. Although he had steps on his pole for climbing he decided it was smart to wear an improvised safety belt made of a leather strap which he had around his waist and the top of the pole. After nailing the twenty-foot piece to the pole he found he had nailed safety belt and all to the pole and had no tools in his hands or pockets other than the hammer in his hand and the strap was fastened with harness rivets! ! (So?—Ed.)

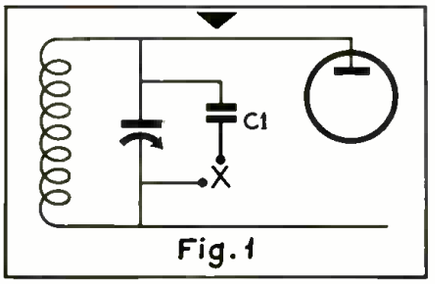


Fig. 1

Simple circuit for chirp and click elimination. Dope in text.

KEYING HAS LONG been the bug-a-boo of the Ham troubled with key-clicks and chirping. Various cures have been advanced for the evil and some have been highly successful, but none more so than the one shown in Fig. 1. It is applicable to rigs using receiving tubes in the first buffer stage.

Here "X" is a relay in series with a 1000-mmfd fixed condenser. The relay should be of the back-contact variety in which the contacts are normally closed. When the key is pressed the contacts open, taking C-1 out of the circuit. When the key is open the relay contacts are closed; C-1 adds so much capacity to the system that the buffer tank circuit is detuned cutting the r-f excitation to the final, which must be biased to cut-off or beyond.

Such a system is chirpless, without a backwave, and affords a splendid method of break-in operation. It is, however, subject to one disadvantage—the plate current on the tube keyed will rise to values which may be abnormal when the tank is detuned if the excitation from the oscillator is large. So long as this "detuned" plate current is not much greater than the rated plate current for the tube no damage will be done to receiving type tubes.

◆

9LD (BOB SMITH) was making some changes in the final tank of his 1-kw phone about two weeks ago, so, of course, set to work to cut out the "C" bias. The outfit uses 500 volts heavy duty "B" batteries which are connected with bare copper wire. In order to do the job quickly Bob grasped a bare wire in his right hand, pushed down on a spring connector with a finger of his left hand, and with a big jerk of his right hand put 9LD in series with the 500 volts. He said he never had such a salty taste in his mouth before.

◆

9DRD (HERB HOLLISTER) received reports of a pronounced a-c hum in his fone operation which disturbed him greatly, since his life's work is operating

[*Continued on page 572*]

W2IRM HEARD BY A "D"

W8EA's conception of the five-meter band—when it boils over into virgin territory . . . signals like bolts from the blue.

Night-Owl Hoots

By Ray La Rocque

b.c. band heredia . . . local and foreign station changes . . . contest news . . . 24-hour stations . . . radio normandie r9 plus

TUNING on the broadcast band this winter you may hear Heredia, the beautiful little city 4000 feet up in the mountains of Costa Rica, famed for its flowers of various hues and fragrances, for its bamboo trees, for its extensive coffee plantations, but above all famous because it is the home of Senor Armando Cespedes Marin who, with his "little NRH," was responsible for placing the city on the map of the world. Many know of TI4NRH on the short waves, but few know that the station has a sister broadcaster on the broadcast band.

Direct from Senor Cespedes we have news that his broadcast band station TINRH will transmit special programs each first Sunday of the month from 2 to 3 A.M. The frequency of the station at the time of writing was 980 kc, but due to interference Senor Cespedes is having new crystals ground and says that the station should be on one of the following three frequencies: 920, 980, or 1450 kc. News of this program reached us in time to include TINRH in the time-table last month.

In answer to our question regarding the stations in Costa Rica, NRH's master has the following to say: "Broadcast stations in Costa Rica are around *forty*—and do not laugh about it, but any shoemaker or breadtoaster feels like buying one and live out with it more independently, and so with a hundred dollar equipment they begin to make noise and the government allows it, as permission is given after paying ten dollars per year, no matter if it is a 7½-watt or a 2000-watt rig. So you can see what a basket we are in."

There you have the situation explained by Senor Cespedes in his own inimitable style. Now we can understand why every list of Costa Rican stations which we have received is entirely different. Costa Rica's apostle of friendship took time to type an answer to our letter even though suffering from a severely burned hand as a result of coming in contact with the 2500-volt power supply, and he lists for us the principal stations which are TIPG, TIGPH, TIEP, TIRCC and his TINRH. These are the only ones which are crystal controlled.

Station Changes

There have been quite a few changes this month in both the World Station List and the United States list. First let us give you the foreign changes. In the foregoing list the changes followed by the identification (IDA) are taken from the "Globe Circler" of the International DXer's Alliance.

Call	*Location*	*Frequency*	*Power*
YV1RG	Maracaibo, Venezuela	1120	——
OAX4J	Lima, Peru	1100	——
OAX4O	Lima, Peru	1000	——
OAX5B	Ica, Peru	1200	——
OAX6B	Arequipa, Peru	1405	——
2DU	Dubbo, Australia (IDA)	1060	100
....	—Assiut, Egypt (IDA)	731	——
....	—Vass Vassa, Finland(IDA)	1420	500
....	—Montevideo, Uru. (IDA)	650	50000
4PM	Port Moresby, Papua (IDA)	1350	100

The following stations are no longer in operation and should be dropped from the list: OA6D on 1400 kc, OA6E on 1350 kc, OA6U on 1443 kc, OAX4I on 1120 kc, OA4AR on 1210 kc, OA4D on 1210 kc. OA4K on 1360 kc, and OA4O on 1277 kc.

Station TI4NRH on 980 kc has changed to TINRH. OAX4L on 1250 kc is now located in Miraflores instead of Lima, Peru.

Frequency Changes

Call	*Location*	*Frequency*
XEPN	Piedras Negras, Mex.	585 to 730
OAX4A	Lima, Peru	750 to 1050
OAX4E	Lima, Peru	980 to 960
OAX4H	Lima, Peru	1150 to 1050
HJ1ABA	Barranquilla, Col.	1300 to 1330
TIEP	San Jose, C. R. (IDA)	850 to 880
ZJV	Suva, Fiji Islands	880 to 920

Power Increases

Call	*Frequency*	*Location*	*Power*
ZJV	880	Suva, Fiji (IDA)	400 to 7500 w.
....	886	Graz, Austria (IDA)	16000 to 7500 w
2ZM	1150	Gisborne, N. Z. (IDA)	30 to 250 w.
2ZJ	980	Gisborne, N. Z. (IDA)	300 to 500 w.
CT1GL	1030	Lisbon, Portugal (IDA)	5000 to 30000 w.

Broadcast-band veri from the Radio Club of Portugal. Back of card gives dope on the station and program schedules. Call in red.

In the United States a little action by the FCC has resulted in the changes which follow: KRGV (1260 kc) will increase to 1000 watts as will WMCA (570 kc) and KVOA (1260 kc). WLBL will step up their power to 5000 watts. The call letters of WSPG have been changed to WGAN (640 kc). True to our predictions in the last issue, there was gnashing of teeth at the Boston Broadcasting Houses over the WMEX increase in power—but more than that there were formal protests filed by WAAB, WNAC, and WCOP. Even WLAC did not like the idea of having another 5000 watter on its channel. Usually these protests would mean nothing, but it seems that WMEX's application was granted without hearing—and that, my fellow Night Owls, is a dif-

ferent story. So now the commission has revoked its grant to WMEX and set the application for hearing. "Aaaah" —imitation of other Hub broadcasters sighing in relief. Before we forget, let's remind you not to forget to insert KIEV, Glendale, Calif., on 850 kc, in the station list. Power is 250 watts. The omission was called to our attention by La Mar Adams of Montrose, California.

New U. S. Stations

Location	Frequency	Power
Pittsburg, Kansas	790	*1000*
St. Louis, Missouri	1250	1000
Sioux Falls, S. D.	1200	100
Watertown, N. Y.	1420	100
Cedar City, Utah	1310	100
Hammond, Indiana	1480	*5000*
Salina, Kansas	1500	100
Jefferson City, Mo.	1310	*100*
Eau Claire, Wis.	1050	*250*

Stations whose power is in italics operate daytime only.

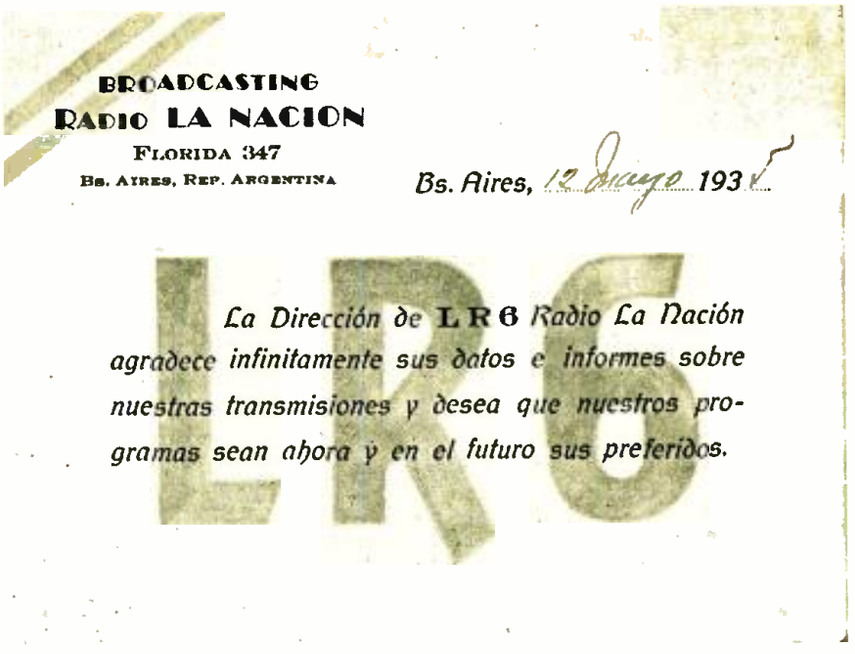
Contest News:

Due to the extremely large quantity of questions received regarding the rules of the contest and the last minute rush of entries, the tabulations for the September scoring will have to be withheld. It will be included together with the October scoring next month. Meanwhile, if you have not yet entered the contest let us advise you to get started at once. You still have time to win. There are still many months of DX activity before the closing date. Rules were printed in the October issue.

Many queries have been received regarding the rules, but the most prominent were: How many times can you report a station during one month, and is the closing date for each month's scoring determined by the postmark on the letter? In regard to the first question, we answer that there is no limit to the number of times which you may report one station during the month. However, the highest score possible is 100 regardless of the number of reports sent to us. To explain, let us suppose you entered four reports on XERA and no one else reported XERA. Your score would be 100—25 for each report. If you had only one report on XERA, with no one else reporting, your score would be the same 100. However, quantity reports will benefit you when other contestants also report on one of your stations. To give another example, let us again suppose you had four reports on XERA but two other DXer's had one each on the same station. That would make a total of six reports and dividing 100 points equally would constitute a total of 16 points for each report. Your score would then be 64 while the other two DXers would score 16 each. Let us hope that we have cleared up this point thoroughly. It is necessary that some limit be placed on the reports and that shall be not more than one report per day on any station!

Answering question No. 2; postmarks have no bearing in the contest. Only those reports which are in our hands by the first of each month at 12:01 A.M. are counted in the scoring for that particular month. All reports received after that time are included in the succeeding month's scoring.

The International DXer's Alliance announces the opening of its International DX Contests for the 1936-37 season. There will be separate awards for the winners of both the Broadcast Band and Short Wave Contests. The contests are open to anyone regardless of whether they are IDA members. For full rules and information write to IDA contest director James Dickenson, P. O. Box 95, Regina. Saskatchewan, Canada. For those who are interested in joining the IDA, a letter to Charles A. Morrison, President, Bloomington, Illinois, will bring details as well as a sample copy of the "Globe Circler."



Attractive veri from LR6, Buenos Aires, Argentina. Letters and stripes in baby blue; printing in black.

ALL-WAVE RADIO'S *Time Table of DX Programs*

(All time is given in Eastern Standard Time)

Specials

FRIDAY MORNING, Nov. 13
WJAG, Norfolk, Nebr., 1060 kc.
1:30-7:30

TUESDAY MORNING, Nov. 17
WHAZ, Troy, N. Y., 1300 kc.
12:30-1:30

SATURDAY MORNING, Nov. 28
WTRC, Elkhart, Ind., 1310 kc.
6:00-7:00

SUNDAY MORNING, Nov. 29
KWSC, Pullman, Wash., 1220 kc.
3:00-7:00

SUNDAY MORNING, Dec. 6
TINRH, Heredia, C. R., 920, 980, or 1450 kc.
2:00-3:00 A.M.
KGDY, Huron, S. D., 1340 kc.
4:00-4:30

Regulars

EVERY SUNDAY MORNING
TGW, Guatemala City, 1210 kc.
12:00-6:00
XEP, Juarez, Mexico, 1150 kc.
2:00-4:00

EVERY FRIDAY MORNING
CFCN, Calgary, Alberta, 1030 kc.
12:00-2:00

Kilocycling Around

In these days when you can't go around the corner without bumping into a S.W. fan and you can't pick up a club bulletin without finding it nearly three-quarters filled with short-wave news, it makes us feel like shouting from the rooftops when we get a letter like the one received from Night Owl Barney Ahman, of Baltimore. We quote part of the letter: "A contest like yours is what every DX'er should try. It should bring out the interest in BCB as it should be. Some guys get lazy and stick to short waves altogether. I do a lot of S.W. listening, but BCB is still the first love in my case."

Barney is Publicity Director for the NNRC. . . . From the NNRC official bulletin we glean the news that the new Mexican on 820 is XEBZ in Mexico City. They are at present remodeling their equipment for their new frequency of 1160 kc. . . . Another jotting from the Newark News Radio Club: "CRCK has bought CHWK and this month will see the end of the latter and I understand it will be dismantled. CRCK will then go on full time and will probably have a new transmitter, move out of the city and

[*Continued on page 590*]

"BARB" AND "ERNEST"—THEY NOSE INTO

"Let's Have Circuits"

Dear Gerald:

You'll have to excuse Barb this once for not replying to your last letter. She's been a bit under the weather and just hasn't felt up to digesting the dope you gave us on transformers and condensers—but she'll catch up before your next letter arrives.

As for me, I'm getting along swell. The more you write, the more I realize that you're talking right down my alley, but in terms of radio-frequency currents. Take your dope on transformers, for instance; I play with big fellows that handle plenty power at 60 cycles, but I never stopped to think that these "big berthas" might be sisters to the audio transformers and power transformers used in radio. Now I see that they are, and I feel closer to the situation than I did previously.

But I must admit that I'm still stuck on radio circuits. I think it would help both Barb and me if you would show us how a complete radio circuit works, and what all the trick lines mean. How about it? Won't we get closer to the truth if we understand more than we do about circuits.

I get your explanation of condensers and think I understand how they work, but I'm still in the dark on the type of tuned circuits used in radio sets. I suppose you'll "tell all" in your next letter. I hope so. Until then, 73.

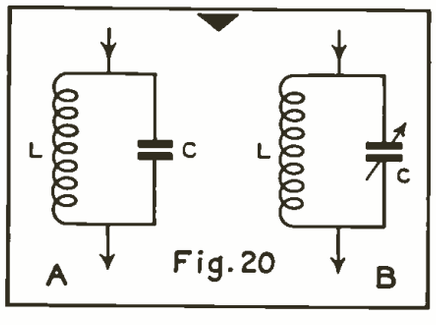
Ernest

◆

"Tuned Circuits Herewith"

Dear Barb and Ernest:

Sorry Barb is under the weather, but as soon as she feels up to it, ask her to go over my last letter. It hinges on what I will have to say now, and so it is rather important that she attempt to get the hang of transformers and condensers. We'll have all the pieces in our grasp right soon now, and from then on I believe Barb may find the sailing a bit easier.



Fixed- and variable-tuned parallel-resonant circuits.

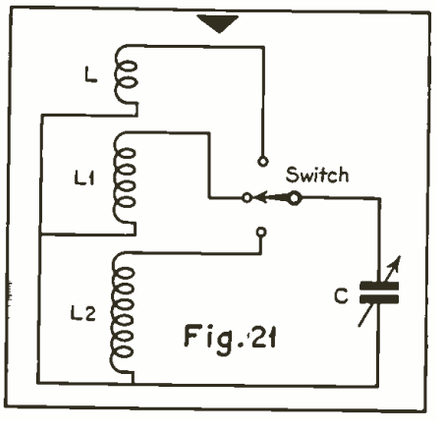
For that matter, we have now reached the point where we can tie in condensers and coils, since the general characteristics and functions of both have been covered. Therefore, we can get right down to the type of tuned circuit most commonly used in radio receivers and transmitters, and at the same time cast some light on by-pass, blocking and filter circuits. So, let's commence.

I pointed out in my last letter that coils and condensers are *opposite* in behavior under the influence of radio-frequency currents. The reactance or opposing force of a coil *increases* with an increase in frequency, whereas the reactance or opposing force of a condenser *decreases* under the same condition. Conversely, the reactance of a coil *decreases* with a decrease in frequency while that of the condenser *increases*. Let's see how this works out in the more common type of tuned circuit.

Parallel-Tuned Circuit

Such a circuit is shown at A in Fig. 20. It consists of the coil or inductance L and the condenser or capacity C. The condenser is connected directly across the coil or, in other words, is in parallel with it. The circuit is therefore parallel-tuned. If the frequency of the current fed to this circuit is such that the reactance value of the coil L is high, then the reactance value of the condenser will be low. The current flow through the coil will therefore be less than the current flow through the condenser. On the other hand, if the frequency of the current is such that the reactance of the condenser is high, then the reactance of the coil will be low, in which case the current flow through the condenser will be less than through the coil.

One or the other of these conditions will hold for all frequencies but one. There will always be one frequency at which the reactance of the coil and the condenser are *equal,* and this is known as the *resonant frequency*. Since a coil has *positive reactance,* which tends to make the current lag behind the voltage, and a condenser has *negative reactance,* which tends to make the current lead the voltage, the reactance of one will cancel that of the other. Therefore, at resonant



A multi-band tuned circuit, with wave-change switch.

frequency, when the reactances are equal, the total reactance of the parallel-tuned circuit is zero. Under such a condition the only opposition to the flow of the radio-frequency current is the direct-current resistance of the coil-condenser combination which is usually small.

Under the condition of resonance, maximum voltage is developed at the terminals of the circuit, or, more specifically, across the coil. At any frequency other than resonance, when the reactance value of the coil and condenser are not equal, the voltage developed will be small. As a matter of fact, the voltage developed will decrease rather rapidly either above or below the resonant point.

Variable-Tuned Circuit

The circuit of Fig. 20 can resonate at only one frequency, since both the coil and condenser have fixed values. If the condenser is made variable, however, its reactance may be adjusted to equal that of the coil over a wide range of frequencies, in which case the circuit may be made to resonate at any desired point within the frequency or wavelength range of the combination. This type of circuit is shown at B in Fig. 21, and we venture to say that you have seen it before.

Thus we arrive at the parallel-tuned circuit used extensively in radio receivers and transmitters. It is tuned or adjusted to the desired frequency or wavelength by the simple procedure of rotating the plates of a variable condenser similar to the one shown in Fig. 19 of my last letter. The wavelength or frequency range that can be covered by such a combination is dependent upon

EMBRYO RADIO HAMS

TUNED CIRCUITS

the inductance of the coil and the minimum-to-maximum capacity of the variable condenser. Since a single coil-condenser combination is not capable of covering all wavelengths or frequencies, a number of coils having increasingly larger inductance values or more turns are used in sequence in conjunction with a single variable condenser. The coils are connected to a multiple-contact switch, as shown in Fig. 21, so that any one of the coils can be connected across the variable condenser at will. In this manner any number of frequency ranges can be covered with a single variable condenser. Thus, with the variable condenser, C, used in conjunction with the coil, L, wavelengths from say 19 to 40 meters could be covered by rotating the plates of the condenser from minimum-to-maximum capacity, and with coil, L-1, wavelengths from 40 to 85 meters could be covered, etc. The switch places the desired coil in circuit with the variable condenser for a given wavelength range, the other coils remaining idle.

This is the type of band-selection system used in modern all-wave receivers, except that the coil-switching mechanisms are more elaborate than the one shown in Fig. 21.

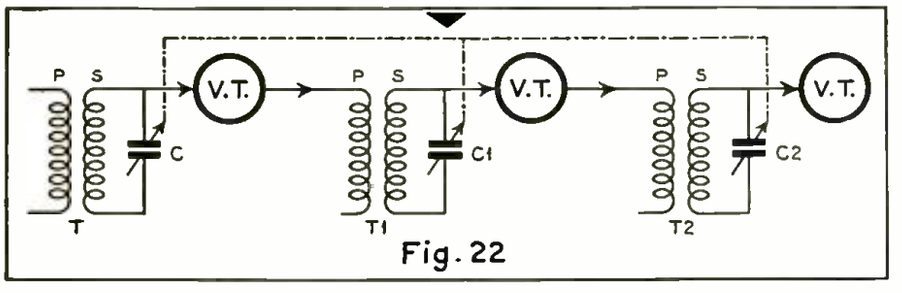
It is not necessary that you remember the exact functioning of a parallel-tuned circuit—you can get by on much less. But keep in mind that modern tuned circuits are composed of fixed coils or inductances and variable condensers. Also remember that maximum signal voltage is developed when such a tuned circuit is in exact resonance with the desired station. Signals above or below the resonant frequency will develop less voltage across the coil, the amount developed being increasingly less the further removed the signal is from the resonant frequency. In other words, the tuned circuit will respond particularly well to the signal to which it is tuned, and less effectively to signals of other frequency.

Cascade Selectivity

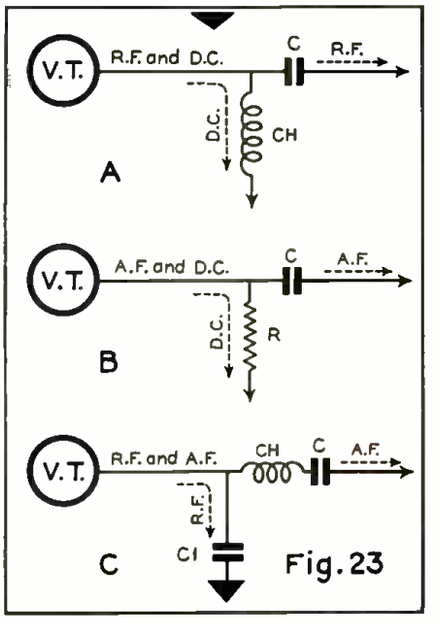
Relatively speaking, tuned circuits of the coil-condenser type are not very selective when used singly. They cannot be made "sharp" enough in tuning to eliminate signals close to the resonant frequency. When used singly they are comparatively "broad" in tuning, but when used in cascade the selectivity of the first circuit contributes to that of the second, and so on. This is evident when it is considered that each successive tuned circuit tends to promote the desired signal and retard undesired "off-frequency" signals, with the result that a second and third tuned circuit have less to contend with than the first tuned circuit.

The modern radio receiver, therefore, has a number of tuned circuits, as shown in Fig. 22. This consists of three radio-frequency transformers, T, T-1 and T-2, which are coupled together by the vacuum tubes, V.T. The primary winding, P, of transformer, T, connects to aerial and ground. The signal in the primary is induced into the secondary, S, which, with the variable condenser, C, forms the first parallel-tuned circuit. The signal voltage developed across the secondary, S, is impressed upon the first vacuum tube, V.T., where it is amplified and thence fed to the second vacuum tube through T-1 by an identical transformer action. The signal is further amplified and then fed to the third vacuum tube by the transformer action of T-2.

The circuits are tuned by means of the variable condensers, C, C-1 and C-2. These condensers are ganged together on a single shaft, as indicated by the dotted lines, so that they can be adjusted to the same frequency simultaneously. In this manner the radio-frequency amplifier shown in the diagram of Fig. 22 can be tuned to any frequency within the range of the coil-condenser combinations by means of a single knob on the condenser shaft.



Circuit of a cascade radio-frequency amplifier with ganged variable condensers.



Branch circuits using by-pass condensers and r-f chokes.

By-Passing and Blocking

So much for tuned circuits for the present, but while we are on the subject of the reactance of coils and condensers, let us see how these components may be used to direct and/or block currents in radio circuits.

We have learned that a condenser will not pass a direct current but will pass an alternating current. The ease with which it will pass an alternating current is dependent, of course, upon the frequency of the current and the capacity of the condenser. We also know that a coil or inductance will pass a direct current *and* an alternating current, but here again the ease with which the coil will pass the alternating current is dependent upon the frequency of the current and the inductance of the coil.

Now, let's pose a problem: We have a vacuum tube which has in its output both a direct current and a radio-frequency current. We want to connect this tube to a branch circuit, but in such a manner that *only* the radio-frequency cur-

[*Continued on page 589*]

MULTIPLE VOLTAGE POWER SUPPLIES

By J. B. CARTER*

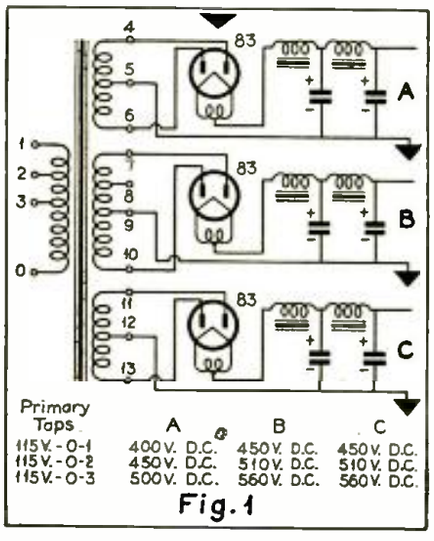
PROBABLY the biggest bug-a-boo in radio is the ever-existing menace of obsolescence. Of course, in such a modern industry new developments are constantly being born, and the older methods are soon discarded to make room for the later developments.

However, from the experimenter's point of view, obsolescence is quite expensive, especially when it involves the discarding of perfectly good equipment. New tubes are superior to existing types, but due to different load impedances, voltages and circuit applications, changes in associated equipment are often necessary. In many instances the changes in r.f. and audio circuits are inexpensive. Moreover, a change in these circuits usually necessitates a change in the power supply. This is often the most expensive unit in the entire circuit, regardless of the application.

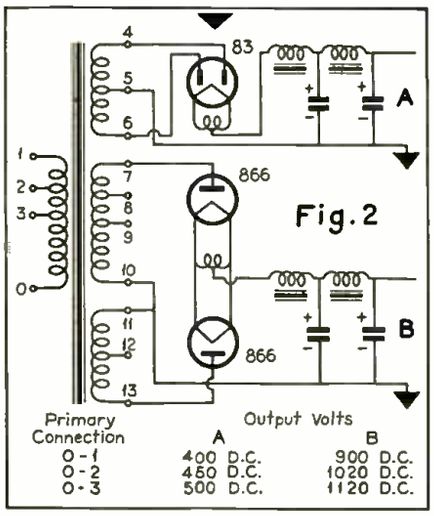
Universal Transformer

In transmitters or high-power public-address systems the low-power tubes require exceptionally good filtering to keep hum level as low as is consistent with good practice. If these low-level stages derive their voltage supply from the high-voltage system it is necessary to thoroughly filter the entire power supply, not only to eliminate hum but also to prevent feedback. Of course, this may be eliminated by filtering a small section that supplies only the lower level tubes. This method, however, jeopardizes condensers and resistors should the load be removed from this section.

* *840 Barry Street, New York, N. Y.*



Multiple-voltage power-supply circuits using type 83 rectifiers and operating from a single power transformer (filament transformer separate.)



High- and low-voltage power supply using a single 83 and two 866s in full-wave connection, both circuits supplied from a single power transformer (filament supplies separate).

Another method to eliminate this hazard is to use a separate transformer for the input or low-level stages. The drawback to this procedure is the excessive cost and is therefore not usually practical.

The answer lies in the use of a new type of transformer that permits any existing type of rectification in a practical and economical manner.

Voltages Available

The voltages available from this transformer range from 400 volts up to 3000 volts depending upon the type of circuit used. In the schematic (Fig. 1) three separate d.c. supplies ranging from 500 to 560 volts may be obtained. By means of a primary tap these voltages may be varied approximately 12 per cent. This circuit will supply adequate power to three separate audio or r.f. units.

In applications where it is necessary to have a separate low voltage and a high voltage, the circuit shown in Fig. 2, utilizing two 866 tubes and a type 83, is not only economical but very practical for many uses in amateur transmitters and experimental circuits.

Fig. 3 shows a similar application with the exception that the high-voltage supply is obtained from three low cost 83 type tubes in a bridge arrangement. The same voltages are also obtainable in Fig. 4. In this circuit the center tap of one of the high-voltage windings is connected to the filament of a type 83 tube, thereby forming a series connection.

By far the most versatile circuit is shown in Fig. 5. A single 83 is used for low voltage and two 866's connected for full-wave rectification supply the high voltage. Usually when this circuit is used in existing equipment two power transformers are required to accomplish what one will do with this new transformer.

Where higher voltages are desired the circuit of Fig. 6 may be used. This arrangement will supply a d.c. voltage as high as 1020 volts. In a circuit where such high voltages are used it is common practice to supply a lower power stage with a lower voltage. This is obtained from a separate winding using a type 83 full-wave rectifier.

High Voltages

For maximum volts per dollar expended the circuit of Fig. 7 is ideal for those whose pocketbooks are limited. A glance shows two of the high voltage windings connected in series. For rectification two type 83 tubes are connected in tandem. Low voltage is obtained from the other winding with another 83 tube. When it is not desired to utilize the low voltage the three windings may be connected in series. When used as shown in Fig. 8, with two 866 tubes, voltages ranging from 1300 to 1620 volts are procurable.

A still cheaper method of obtaining the same voltages is shown in Fig. 9. Here the outputs of three type 83 tubes are connected in series. In this circuit it is essential that the filament transformer supplying the 83 tubes be adequately insulated to withstand the high voltages.

Primary Connection	*Output Volts. D. C.*						
	X-12	X-11	X-9	X-8	X-7	X-5	X-4
O-1	450	900	1350	1750	1800	2250	2700
O-2	510	1020	1530	1990	2040	2550	3040
O-3	560	1120	1680	2180	2240	2800	3300

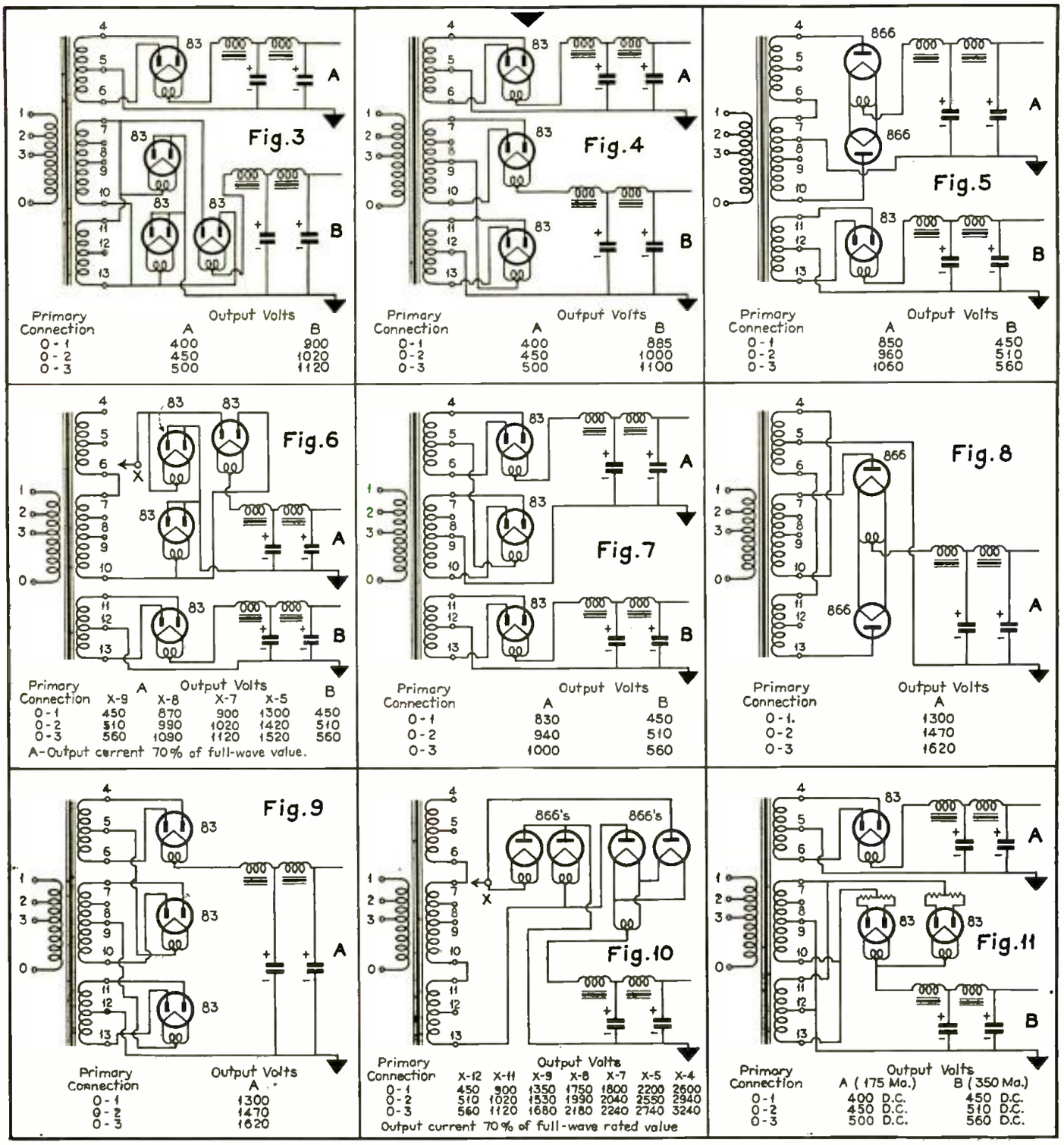
Perhaps surpassing all circuits shown is the application in Fig. 10. In this circuit 21 different voltages are available. In transmitter use there is sufficient power available to supply anything from a five-watter up to a 500-watt rig. In addition to this a separate low-voltage supply may be taken off of the secondary winding marked 4, 5 and 6, when the high-voltage requirements are not over 2240 volts. The tabulated voltages and circuit connections obtained from this circuit are given in the accompanying table.

For circuits requiring exceptionally high current where the voltage requirement does not exceed 560 volts, the circuit shown in Fig. 11 is admirably suited. By connecting two of the windings in parallel the current supply is doubled in the portion of the circuit marked "B." The usual low voltage is available from the third winding and will supply the full current ratings of the transformer.

Bridge Rectification

While this description only covers the more common types of rectification applications the amateur and experimenter will no doubt find other interesting applications. It should be noted in all applications where bridge rectification is used that the maximum output obtainable should never exceed 70 per cent of the rated output of the transformer.

The writer will be pleased to answer all inquiries relating to this transformer.



Group of circuits showing the many combinations that may be had with a single universal power transformer (minus filament supply) for the purpose of deriving separate voltages of different values for the various stages of a transmitter or high-power public-address system.

RADIO PROVING POST

THE SILVER MASTERPIECE V

THE principal technical aspects of the Silver Masterpiece V have been covered by its designer in his article appearing in the September issue of ALL-WAVE RADIO. Therefore in this review, with the exception of an occasional keyed (road map style) reference to the diagram of Fig. 1, we shall confine ourselves largely to the special considerations which justify the building and purchase of an expensive receiver. In other words, we shall focus the laboratory upon this receiver from the point-of-view of a prospective owner.

"Distance" and "Price"

It may seem inconsistent with this purpose to say little or nothing in reference to the stations logged during the three weeks this receiver has been under test. Ability to receive dx is no criterion of a set's excellence in price brackets above $75. There are other and equally important factors. As was pointed out in this department for November, the curve of merit as based on sensitivity and selectivity, rises very slowly as the number of tubes is increased above the reasonably efficient minimum of six. This is particularly true of sensitivity. While the sensitivity of the Masterpiece V may be described as more than adequate, its performance, as far as reaching out for stations is concerned, has been simultaneously duplicated in our laboratory with receivers costing considerably less. The only qualification here is the fact that the superior avc action of the set under consideration was evident on several occasions. These air tests were made under a variety of receiving conditions—good, bad and average. However, it is of course possible that under some circumstances the extreme sensitivity of this receiver might show to an advantage over a receiver having less tubes contributing to radio-frequency (r.f. and i.f.) amplification. But this difference definitely does not justify the cost of high price sets.

There are twenty tubes in the Masterpiece V. By investigating the functions of those tubes other than the fundamental six we shall go far toward understanding the type of superiority that can be engineered into a high priced receiver.

Showing the multiple-cone feature of the 18-inch dynamic speaker used with the Masterpiece V.

Sensitivity and Selectivity

The six essential tubes in any good superheterodyne comprise one stage of r-f amplification, detector-oscillator, one i-f tube, second detector, power amplifier and rectifier. Of the extra fourteen tubes in the Masterpiece V, only three contribute to sensitivity—the additional r-f tube (B6) and the two additional i-f tubes at B8 and B10 (which, incidentally, are cut out for local high-fidelity reception). The additional r-f stage increases the usable sensitivity of the receiver. However, its principal function is that of pre-selection with the virtual elimination of image frequency effects. With all three i-f stages functioning (sharp tuning) sensitivity is at maximum, and the receiver tunes very sharply. However, excellent quality may still be had by means of the treble control and by switch elimination of the 6000-cycle cut-off circuit in the speaker. These adjustments operate on the principle of the Stenode in which it is maintained (still a moot point in engineering) that sidebands can be cut and the high notes compensated without bringing up heterodyne

or side-band interference to the same degree. We have at this point done as much for sensitivity as the present stage of the art permits in a home receiver, and have, as it were, a nine-tube job.

A separate tube is used as an oscillator—a 6J7, located on the diagram at L6—rather than combining the functions of first detector and oscillator as is done in the fundamental six-tube super. This results in greater stability and a better conversion factor—and brings us to the ten-tube stage. There is nothing unusual about the second detector—the 6Q7 at B14—except that it performs the dual function of demodulating and acting as a beat-frequency oscillator when the control switch is so set. The 6A6 first audio tube (B16) also performs a double function by means of its two independent grids—that of straight audio-frequency amplification and as a volume-expansion control when the expander is cut into the circuit.

Volume Expansion

The theory and practice of volume expansion has been gone into rather thoroughly in the Queries Department of this issue and repetition is unnecessary here. The degree of expansion on the Silver Masterpiece V is completely controllable and can be used on both radio and record reproduction. It accounts for two additional tubes, bringing the total number so far to thirteen—that is, thirteen highly useful tubes as contrasted with the theoretical minimum of six. The reduction in background noise when volume expansion is employed is satisfactorily demonstrated on the Masterpiece V.

Automatic Volume Control

Amplified automatic volume control provides a consistency in signal level that demands two more tubes—and gets them in this set. They are the 6K7 avc amplifier (at E12) and the 6H6 avc rectifier (E13).

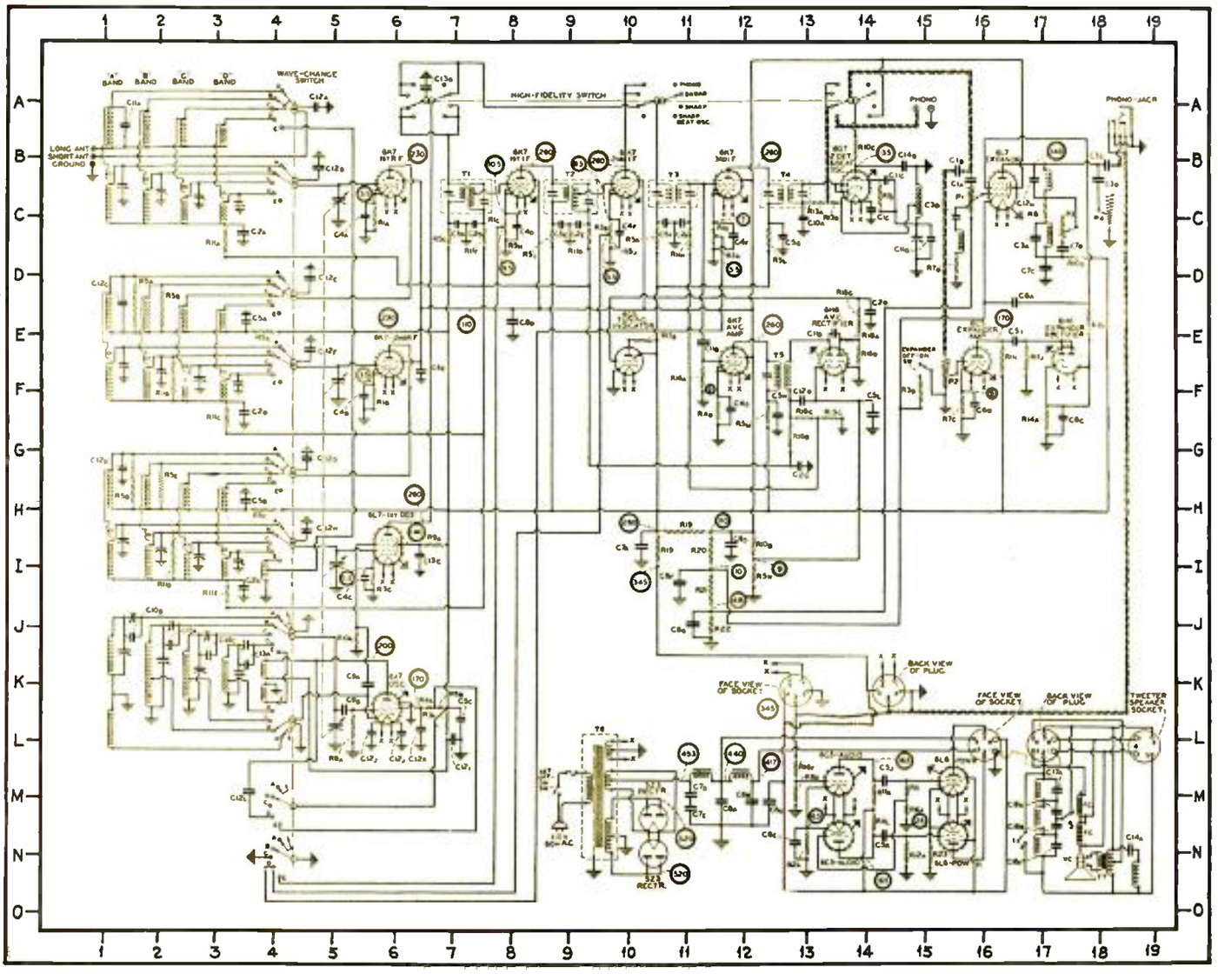
These plus the 6G5 tuning indicator justifies, at the present count, nine tubes more than the six with which we started. In passing, it might be mentioned that the 6G5 "magic eye" in the Masterpiece is particularly effective, and makes possible silent tuning even on very weak stations—merely by turning down the volume and tuning for the least iris angle.

The Audio Amplifying System

The 6L7 tube is resistance coupled to the two 6C5's (M and N14) which in turn are resistance coupled to the 6L6 power tubes (M and N16), the output of which is plugged into a super-dynamic speaker with a 16-inch cone (18 inches frame diameter). The speaker is a combination of bass and treble cones, which, in conjunction with the receiver controls, can be made to respond with any reasonable degree of frequency partiality from 20 to 10,000 cycles. Oscillator tests demonstrated an excellent 9000-cycle response.

Two full-wave rectifying tubes are employed in the power supply. Allowing for one rectifier and one power tube in our original and hypothetical six-tube receiver, we arrive at the full complement of twenty tubes in the Masterpiece V.—all performing definitely useful duties.

[*Continued on page 592*]



Road-map circuit diagram of the Silver Masterpiece V receiver.

Queries

volume expansion . . . crystal receivers . . . CircuiTest

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.

VOLUME EXPANSION

Question Number 19

"I am planning on buying a new receiver this fall, and have heard a bit about volume expansion, and read about it in ALL-WAVE RADIO. Is this necessary in a receiver?—*A. J. K., New Paltz, N. Y.*"

Answer:

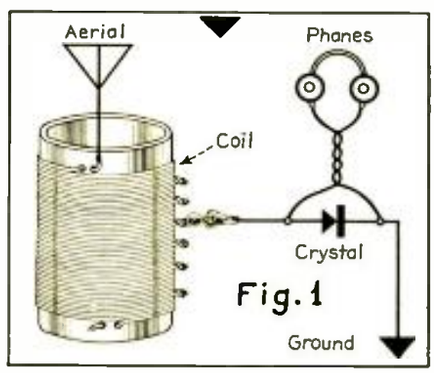
This question is somewhat like asking is tone control *necessary*. Or a high-fidelity adjustment. These features are weighed as a matter of desirability rather than necessity.

The degree of justification for volume expansion on radio reception is a moot point. However, before advancing any arguments, pro or con, it will be a good idea to consider just what volume expansion does. A volume expander is designed to compensate a form of amplitude distortion. There is a great difference in sound intensity between the pianissimo (soft) and fortissimo (loud) passages of an orchestra. However, this difference is minimized in transmission, and in the ordinary radio the loud tones are nowhere nearby as much louder than the soft measures as they actually are in the studio. This is due partially to the natural limitations of the equipment and to deliberate "compression" (the opposite of expansion) in order to keep the power variations within safe limits.

In other words, a person might snap their fingers in front of the microphone, and you might hear the sound with the exact intensity of the original. However, if a pistol were fired in the studio, the sound emanating from your speaker would be considerably less than that in the studio. Which brings us to the perfectly natural question of who wants a pistol fired off in their living room?

The degree of compression in average broadcasting is not serious. There is a sufficient difference between pianissimo and fortissimo to create the illusion of naturalness. Volume expansion is definitely not a "necessity" and completely satisfactory high-fidelity reception can be enjoyed without it. On the other hand, it is a refinement, and makes its contribution to radio entertainment. It is effective only on stations of relatively high signal strength, and on such stations, with adequate music, it *does* enhance realism—*particularly when a comparison is made with reception without expansion.* (Thus, volume expansion or no volume expansion becomes somewhat a matter of where ignorance is bliss, 'tis folly to be wise!)

Volume expansion operates on the simple principle of amplifying loud sounds more than weak sounds, thus restoring the original difference between pianissimo and fortissimo. A secondary effect in radio reception is therefore that of silent tuning. In the absence of a modulated carrier, amplification is at a minimum, and, with the exception of very heavy static, the loudspeaker will be virtually dead between stations.



Picture diagram of simple crystal radio set satisfactory for reception of local broadcasters.

A volume expander is of still greater importance on phonograph record reproduction where further compression is imposed by the mechanical—physical—limitations of recording sound on a disk. It is here that volume expansion really comes into its own. Also, in a manner similar to achieving silent tuning, the effect of needle scratch is practically eliminated. Ordinarily, needle scratch is only noticeable on soft passages which, if loud tones are to be satisfactorily reproduced, are amplified beyond their natural level. With volume expansion in, the pianissimo measures are correctly soft—amplification is cut down—and the needle scratch is practically inaudible. Of course it is present on fortissimo, but here it cannot be heard above the music. Net result—no needle scratch.

We realize that we really haven't answered A. J. K.'s question. Perhaps it is best replied to in another way. If you have your eye and desires set on some particular receiver that seems to fill the bill, but lacks volume expansion, by all means buy that receiver—and forget volume expansion. On the other hand, if you have the money to spend, and are shopping, with other things being equal, volume expansion is certainly worth considering—particularly if you go in for phonograph reproduction. However, it is well to bear in mind that volume expansion alone will not give you faithful music from records, and this feature should be supplemented with independent bass and treble controls.

If possible, have volume expansion demonstrated to you—and be your own judge. A fundamentally good receiver—without volume expansion—is a much better buy than another set sold on the basis of new features and gadgets poorly engineered into it.

SIMPLE CRYSTAL SET

Question Number 20

"I know a certain party who claims that he can receive stations in the broadcast band without batteries, power of any kind, or a loudspeaker. He says he uses some sort of a crystal, a few pieces of wire, and that is all. Is this possible?—*C. G., Dalhousie, N. B., Canada.*"

[*Continued on page 587*]

In Writing For Veries...

ADDRESSES OF PRINCIPAL SHORT-WAVE STATIONS BY COUNTRY

AFRICA

CNR	Director General des Postes, Rabat, Morocco.
CT2AJ	Radio Station CT2AJ, Ponta Delgada, Azores.
CR6AA	Estacao Radio Difusora, Caixa Postal 103, Lobito, Angola, Portuguese West Africa.
CR7AA	Radio Station CR7AA, P. O. Box 594, Lourenco Marques, Africa.
EA9AH	"Radio Tetuan," Tetuan, Spanish Morocco, Africa.
IUA-IUB et al	Minister of Marine, Addis Ababa, Ethiopia, Africa.
F3ICD	Radio Saigon, P. O. Box 295, Saigon, French Indo-China.
OPL-OPM	Radio Leopoldville, Congo Belge, Africa.
SUV-SUX	P. O. Box 795, Cairo, Egypt.
VQ7LO	Cable and Wireless Ltd., P. O. Box 777, Nairobi, Kenya Colony, Africa.
ZSS	Overseas Communications, Kodak House, Shortmarket St., P. O. Box 962, Capetown, So. Africa.
ZTJ	African Broadcasting Co., Ltd., P. O. Box 4559, Johannesburg, Transvaal, South Africa.

ASIA, OCEANIA AND FAR EAST

CQN	Government Broadcasting Station CQN, Chief of Radio Station, Post Office Bldg., Macoa (Portuguese), China.
XGOX	The Central Broadcasting Administration — Central Broadcasting Committee of Kuomintang, Nanking, China.
FZS	Postale Boite 238, Saigon, Indo-China.
HSI-HSP HS8PJ	Superintending Engineer, Post and Telegraph Dept., Radio Technical Section, Bangkok, Siam.
Java Stations	J. Sanders, Chief Engineer, Java Wireless Stations, Bandoeng, Java.
"JV" & "JZ" Stations	International Wireless Telephone Company of Japan, Osaka Bldg., Kojimachiku, Tokyo, Japan.
"JY" Stations	Radio JYR, Kemikawa-Cho-Chiba, Ken, Japan.
KAY et al.	Philippine Long Distance Telephone Co., Manila, P. I.
PMY	Radio Station PMY, Nillmy Bldg., Bandoeng, Java, Netherland Indies.
RV15	Radio Committee, Radio Station RV15, Khabarovsk, USSR.
VK2ME	Amalgamated Wireless, Ltd., Wireless House, 47 York St., Sidney, N.S.W., Australia.
VK3LR	Australian Broadcasting Commission, G.P.O. Box 1686, Melbourne, C. I., Australia.
VK3ME	Amalgamated Wireless, Ltd., 167-9 Queen St., Melbourne, Australia.
VPD-2	Amalgamated Wireless, Ltd., Suva, Fiji Islands.
VUC	Indian State Broadcasting Service, 1 Garstin Place, Calcutta, India.
VUY-VUB	C. B. Sethna, Esq., OBE., JP., Director, All India Radio, Irwin House, Ballard Estate, Bombay, India.
XGW	Radio Administration, Sassoon House, Shanghai, China.
YBG	Radio Service, Serdangweg 2, Sumatra, Dutch East Indies.
YDA-YDB YDE2	Mr. A. H. K. Mulder, Genl. Mgr., The Netherlands Indies Broadcasting Co., Ltd. (N.I.R.O.M.), Batavia, Java.
ZBW	Station ZBW, Hong Kong Broadcasting Committee, P. O. Box 200, Hong Kong, China.
ZGE	Radio ZGE, Kuala Lumpur, Malaya States.
ZHI	Radio Service Company, Broadcast House, 2 Orchard Road, Singapore, Malaya.
ZHJ	Radio Station ZHJ, Radio Society of Penang, Penang, Malay Straits.
ZLT-ZLW ZLR	Supt. Post & Telegraph, G.P.O., Wellington, New Zealand.

CANADA

CGA-CJA, et al	Marconi Station, Drummondville, Quebec, Canada.
CJRX-CJRO	Royal Alexander Hotel, Winnipeg, Manitoba, Canada.
VE9BK	Radio Sales Service, Ltd., 780 Beatty St., A. M. Jagoe, Mng'r, Vancouver, B. C., Canada.
VE9CS	743 Davie St., Vancouver, B. C., Canada.
VE9DN-CFCX	Canadian Marconi Co., Box 1690, Montreal, Quebec, Can.
VE9CA	Toronto General Trusts Building, Calgary, Alberta, Canada.
CRCX	Rural Route No. 4, Bowmanville, Ontario, Canada.
VE9HX	P. O. Box 998, Halifax, N. S., Canada.
CFU	Radio Station CFU, Rossland, B.C., Canada.

CUBA, MEXICO, CENTRAL AMERICA AND WEST INDIES

CMA-3 CMB-2 COKG	Cuba Transatlantic Radio Corp., Apartado No. 65, Havana, Cuba. Laboratorio Radio-Electrico, Grau y Caminero, Apartado 137, Santiago, Cuba.
CO9JQ	Estacion Experimental de Onda Corta-CO9JQ, Calle del General Gomez, No. 4, Camaguey, Cuba.
CO9WR	P. O. Box 85, Sancti-Spiritus, Santa Clara, Cuba.
COCO	P. O. Box 98, Havana, Cuba.
COCD	"La Vox del Aire, S. A.," P. O. Box 2294, 25 y. g. Vedado, Havana, Cuba.
COCH	Estacion COCH, Calle B, No. 2 Vedado, Havana, Cuba.
COCQ	Sr. Miguel Gabriel, Administrador Gerente, Calle 25, No. 445, Havana, Cuba.
COCX	La Voz del Radio Philco, P. O. Box 32, Havana, Cuba.
HI1A	Radiodifusora HI1A, P. O. Box 423, Santiago de los Caballeros, R. D.
HI1S	Radiodifusora HI1S, Santiago de los Caballeros, R. D.
HI2D	Radiodifusora HI2D, Association C'ca Dominicana, Ciudad, Trujillo, R. D.
HI3C	Radiodifusora HI3C, Sr. Roberto Palli B, Prop., La Ramona, R. D.
HI3U	Radiodifusora HI3U, Apartado 23, Santiago de los Caballeros, R. D.
HI4D	Radiodifusora HI4D, "La Voz de Quisqueya," Ciudad Trujillo, R. D.
HI4V	Radio HI4V, La Voz de la Marina, P. O. Box 824, Ciudad Trujillo, R. D.
HI5E	Radiodifusora Ozama, Ciudad Trujillo, R. D.
HI5N	Radio HI5N, La Voz del Almacen Dominicano, Santiago de los Caballeros, R. D.
HI7P	Sr. J. M. Roques, R. Director, Ciudad Trujillo, R. D.
HI8A	Mayor E. Valverde, Director, Ciudad Trujillo, R. D.
HI8Q	Abbes and Garcia, Owners, Ciudad Trujillo, R. D.
HI9B	Sr. J. L. Sanchez, Director, Apartado 95, Santiago de los Caballeros, R. D.
HH2T HH2R HH2S	Societe Haitienne de Radiodiffusion, P. O. Box 103, Port-au-Prince, Haiti.
HH3W HH3NW	Radiodifusora HH3W, P. O. Box A117, Port-au-Prince, Haiti.
HIG	Sr. A. Cordero, P. Director, Radiodifusora HIG, Av. Jose Trujillo, No. 20, Ciudad Trujillo, R. D.
HIH	Radio HIH, "Las Voz del Higuamo," San Pedro de Macoris, R. D.
HIL	Radio HIL, Apartado 623, Ciudad Trujillo, R. D.
HIN	Radiodifusora HIN, Ciudad Trujillo, R. D.
HIX	Radio HIX, J. R. Saladin, Director of Radio Communication, Ciudad Trujillo, R. D.
HI1J	Radiodifusora HI1J, Apartado 204, San Pedro de Macoris, R. D.
HIT	La Voz de la RCA-Victor, Apartado 1105, Ciudad Trujillo, R. D.
HIZ	Radiodifusora HIZ, Calle Duarte No. 68, Ciudad Trujillo, R. D.
HP5B	Radio HP5B, P. O. Box 910, Panama City, Panama.
HP5F	La Voz de Colon, Hotel Carlton, Colon, Panama.
HP5J	La Voz de Panama, Apartado 867, Panama City, Panama.
HP5K	Radiodifusora HP5K, La Voz de la Victor, P. O. Box 33, Colon, Panama.
TGS	Radio TGS, Casa de Presidencial, Guatemala City, Guatemala.
TGX	Radiodifusora TGX, Director M. A. Mejicano Novales, 11 Avenue N. 45, Guatemala City, Guatemala.
TGW-TGWA	Radiodifusora Nacional TGW, Republic de Guatemala.
TG2X	Direccion general de la Polica Nacional, Guatemala City, Guatemala.
TIPG	Radio TIPG, Perry Girton, Prop., Apartado 225, San Jose, Costa Rica, C. A.
TI4NRH	Estacion TI4NRH, Apartado 40, Costa Rica, C. A.
TI8WS	Radio TI8WS, "Ecos de Pacifico," Sr. Abel Salazar F, Apartado 75, Puntarenas, Costa Rica.
TIEP	"La Voz del Tropico," Apartado 257, San Jose, Costa Rica, C. A.
TIGPH	Radiodifusora TIGPH, "Alma Tica," Apartado 800, San Jose, Costa Rica.
TIRCC	Radioemisora Catolica Costaricense, Apartado 1064, San Jose, Costa Rica, C. A.
TI5HH	Sr. R. Herrera, Manager, Radiodifusora, TI5HH, San Ramon, Costa Rica, C. A.
HRD	Radiodifusora HRD, La Voz de Atlantida, La Ceiba, Honduras, C. A.
HRN	Radio HRN, La Voz de Honduras, Tegucigalpa, Honduras.
HRP1	Manuel Escota, Director y Gerente, San Pedro, Sula, Honduras.
VPN	Station VPN, Nassau, Bahama Islands.
WTDV-WTDX	Donald S. Boreham, Supt. of Public Works, St. Thomas, Virgin Islands.
WTDW	H. N. McKenzie, Supt. of Public Works, Christiansted, St, Croix, Virgin Islands.
ZFB-ZFD	Engineer-In-Charge, Wireless Receiving Station, Devonshire, Bermuda.
XAM	Director General de Correos, Merida, Yucatan, Mexico.
XBJQ	Radiodifusora XBJQ, P. O. Box 2825, Mexico D. F., Mexico.
XDA-XDC	Secretaria de Communicaciones, Mexico, D. F.
XEBT	El Buen Tono, S. A., Apartado 79-44, Mexico, D. F.
XECR	Estacion XECR, Departamento de Publicidad de la Secretaria de Relaciones Exteriores, Mexico, D. F.
XEFT	Radio XEFT, La Voz de Vera Cruz, Av. Independencia 28, Vera Cruz, Mexico.
XEUW	Radiodifusora XEUW, Av. Independencia 98, Vera Cruz, Mexico.
XEME	Radiodifusora XEME, Calle 59, Num. 517, Merida, Yucatan, Mexico.
XEWI	Estacion Difusora XEWI, P. O. Box 2874, Mexico, D. F.
XEXA	Secretaria de Educacion Publica, Mexico, D. F.
YNA	Tropical Radio Telegraph, Managua, Nicaragua, C. A.
YNLF	Radiodifusora YNLF, c/o Ing, Moises Le Franc Calle 15 de Set No. 206, Managua, Nicaragua.
YNVA	Radiodifusora YNVA, Managua, Nicaragua.

EUROPE

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

[*Continued on page 572*]

In Writing For Veries

[Continued from page 571]

2RO	5 Via Montello, Rome, Italy.
CSW	Radio Nacional, Lisbon, Portugal.
CT1AA	Antonio Augusto de Aguair, 144, Lisbon, Portugal.
SPW	Polskie Radio, 5, Mazowiecka St., Warsaw, Poland.
DAN	Hauptfunkstelle Nordeich, Norden-Land, Germany.
DJA, et al.	German Short Wave Station, Broadcasting House, Berlin, Ger.
Dutch Phones	Parkstaat 29, S'Gravenhage, Holland.
EAQ	Transradio Espanola, P. O. Box 951, Madrid, Spain.
EA8AB	Radio Club Tenerife, Alvarez de Lugo 1, Apartado 225, Santa Cruz de Tenerife, Canary Islands.
EHY-EDM	Piy Margall 2, Madrid, Spain.
English Phones	Engineer-in-Chief's Office (Radio Branch), G.P.O. Armour House, London, E. C. 1.
English Ships	Connaught House, 63, Aldwych, London, W. C. 2, England.
TFJ	Icelandic State Broadcasting Service, P. O. Box 547, Reykjavik, Iceland.
French Phones	166 Rue de Montmartre, Paris, France.
G6RX	Rugby Radio, Hillmorton, Warwickshire, England.
GSA-GSH, et al.	British Broadcasting Corporation, Broadcasting House, London, W. 1, England.
HAS-HAT	Director Radio, Hungarian Post, Gyali St. 22, Budapest, Hungary.
HB9B	Radio Club, Box 1, Basle, Switzerland.
HBL-HBP et al.	Information Section, League of Nations, Geneva, Switzerland.
HVJ	Stazione Radio HVJ, Citta del Vaticano, Vatican City.
IAC	Director, Centro di Coltano Radio, Pisa, Italy.
IRM-IRW IRG-IQA	Italo Radio, Via Calabria N. 46/48, Rome, Italy.
LZA	Radio Station LZA, Director General, Telegraphs and Telephones, Sofia, Bulgaria.
LCJ1	Ministere Du Commerce, Administrator des Telegraphes, Oslo, Norway.
OER2	Radio OER2, Vienna, Austria.
ORK-ORG	Director de Communications, Bruxelles, Belgium.
OXY	Statsradiofonien Heibergsgade 7, Copenhagen, Denmark.
PCJ	Philips Radio PCJ, Eindhoven, Holland.
PHI	Phillips Radio PHI, Huizen, Holland.
PI1J	Radio Station PI1J, Dr. M. Hellingman, Owner and Operator, Dordrecht, Holland.
Prague	Ministry of Posts and Telegraphs, Prague (Praha), Czechoslovakia.
SM5SX	Royal Technical University, Stockholm, Sweden.
TPA2-3-4	Minister des Postes, Boulevard Haussman, 98 Bis., Paris, France.
RNE-RKI RAN-RV96	Radio Centre, Solianka 12, Moscow, USSR.

SOUTH AMERICA

CEC-CED	Cia Internacional de Radio, Casilla 16-D, Santiago, Chile.
CB615	Radiodifusora CB615, Santiago, Chile.
CB960	Radiodifusora CB960, Casilla 1342, Santiago, Chile.
CP5	Radio CP5, Casilla 637, La Paz, Bolivia.
El Prado	Apartado 98, Riobamba, Ecuador.
HC1PM	Estacion "El Palomar" HC1PM, P. O. Box 664, Quito, Ecuador.
HC2ET	Estacion Radiodifusora del Diario El Telegrafo HC2ET, P. O. Box 824, Guayaquil, Ecuador.
HCETC	Director, Manuel Mantilla, Apartado 134, Quito, Ecuador.
HC2CW	Radiodifusora HC2CW, Casilla 1166, Guayaquil, Ecuador.
HC2JSB	Ecuador Radio Station HC2JSB, Juan S. Behr, Prop., Guayaquil, Ecuador.
HC2RL	Estacion HC2RL, P. O. Box 759, Guayaquil, Ecuador.
HCJB	Director, Clarence W. Jones, Casilla 691, Quito, Ecuador.
HCK	Radiodifusora Del Estado, HCK, Quito, Ecuador.
HJ1ABB	Radio HJ1ABB, Apartado 715, Barranquilla, Colombia.
HJ1ABC	Radiodifusora HJ1ABC, La Voz de Quibdo, Quibdo, Colombia.
HJ1ABE	Radio HJ1ABE, Apartado 31, Cartagena, Colombia.
HJ1ABG	Radio HJ1ABG, Apartado 674, Barranquilla, Colombia.
HJ1ABJ	"La Voz de Santa Marta," Radio HJ1ABJ, Santa Marta, Colombia.
HJ1ABP	Radiodifusora Cartagena, P. O. Box 37, Cartagena, Colombia.
HJ2ABC	Pompilio Sanchez, Cucuta, Colombia.
HJ2ABD	Hector McCormick, Prop., Radiodifusora HJ2ABD, Calle 2A, No. 1205, Bucaramanga, Colombia.
HJ3ABD	Colombia Broadcasting, Apartado 509, Bogota, Colombia.
HJ3ABF	Radio HJ3ABF, Apartado 317, Bogota, Colombia.
HJ3ABH	"La Voz de La Victor," Apartado 565, Bogota, Colombia.
HJ3ABX	La Voz de Colombia, Radiodifusora HJ3ABX, Bogota, Colombia.
HJ4ABB	Radio Manizales, Apartado 175, Manizales, Colombia.
HJ4ABD	Radiodifusora HJ4ABD, La Voz de Citia, Medellin, Colombia.
HJ4ABE	Radiodifusora de Medellin, Medellin, Colombia.
HJ4ABP	Radiodifusora Philco, Medellin, Colombia.
HJ4ABU	Radiodifusora "La Voz de Pereira," Pereira, Caldas, Colombia.
HJ5ABC	"La Voz de Colombia," Radiodifusora HJ5ABC, Cali, Colombia.
HJ5ABD	"La Voz del Valle," Cali, Colombia.
HJB	Marconi Telegraph Co., Apartado 1591, Bogota, Colombia.
HJN	Estacion Radiodifusora HJN, Ministerio de Educacion Nacional, Teatro de Colon No. 5-28, Bogota, Colombia.
HJU	La Voz del Pacifico, Buenaventura, Colombia.
HJY	All-American Cables, Inc., Bogota, Colombia.
HKE	Observatoria Nacional de San Bartolome, Bogota, Colombia.
HKV	Radiodifusora HKV, Ministerio de Guerra, Military Service, Bogota, Colombia.
LSN-LSL, et al. LSX	Compania Internacional, 143 Defensa, Buenos Aires, Argentina. Transradio Internacional, San Martin 329, Buenos Aires, Argentina.
LRU-LRX	Radio El Mundo, Calle Maipu 555, Buenos Aires, Argentina.
OAX4D	Radiodifusora OAX4D, All-American Cables, Inc. (L. N. Anderson, Mgr.), Calle de San Antonio 677; Casilla 2336, Lima, Peru.
OAX4G	Radiodifusora OAX4G, Roberto Grellaud, Avda. Abancay 915-923, Lima, Peru.
OCI-OCJ	All-America Cables, Inc., Lima, Peru.
PPU-PPQ, et al.	Companhia Radiotelegraphica Brasileira, Caixa Postal 500, Rio de Janeiro, Brazil.
PZH	Radio Station PZH, Paramaribo, Surinam, Dutch Guiana.
PRA8	Radio Station PRA8, Radio Club of Pernambuco; "The Voice of the North," Pernambuco, Brazil.
PRF5-PSK	Comp. Radio Internacional Do Brazil, P. O. Box 709, Rio de Janeiro, Brazil.
VP3BG	Radio Station VP3BG, Georgetown, British Guiana.
VP3MR	The British Guiana Broadcasting Co., No. 1 Wellington St., Georgetown, British Guiana.
YV1RH	Radiodifusora YV1RH, P. O. Box 261, Maracaibo, Venezuela.
YV2RC	Radio Caracas, P. O. Box 2009, Caracas, Venezuela.
YV3RC	Radiodifusora Venezuela YV3RC, Caracas, Venezuela.
YV4RC	Estacion S.A.R., Apartado 983, Caracas, Venezuela.
YV5RMO	Radio YV5RMO, P. O. Box 37, Maracaibo, Venezuela.
YV6RV	"La Voz de Carabobo," Radio YV6RV, Valencia, Venezuela.
YV7RMO	Radiodifusora Maracaibo, P. O. Box 100, Maracaibo, Venezuela.
YV8RB	Radiodifusora YV8RB, "La Voz de Lara," Barquisimeto, Venezuela
YV9RC	Radiodifusora YV9RC, Apartado 1931, Caracas, Venezuela.
YV10RSC	Radiodifusora YV10RSC, "La Voz del Tachira," San Cristobal, Venezuela.
YV11RB	Radiodifusora YV11RB, Apartado 34, Ciudad Bolivar, Venezuela.
YV12RM	Radiodifusora YV12RM, La Voz de Aragua, Maracay, Venezuela.
YVQ-YVR	Servicio Radiotelegraphico, Maracay, Venezuela.
ZP10	Radio Prieto ZP10, Asuncion, Paraguay.

UNITED STATES

Dixon Stations	140 Montgomery St., San Francisco, Cal.
W1XAL	World-Wide Broadcasting Corp., University Club, Boston, Mass.
W1XK	Westinghouse Electric & Mfg. Co.,
W1XKA	Springfield, Mass.
W2XAD	General Electric Co., 1 River Rd.,
W2XAF	Schenectady, N. Y.
W2XE	485 Madison Ave., New York, N. Y.
W3XAU	1622 Chestnut St., Philadelphia,
W3XKA	Pa.
W3XAL	30 Rockefeller Plaza, New York, N. Y.
W4XB	Isle of Dreams Broadcasting Corp., Radio W4XB, Herald Bldg., Miami, Florida.
W8XWJ	4465 Penobscot Building, Detroit, Mich.
W8XAL	Crosley Radio Corp., Cincinnati, Ohio.
W8XK	Grant Bldg., Pittsburgh, Pa.
W8XKA	
W9XAA	Navy Pier, Chicago, Ill.
W9XF	20 N Wacker Drive, Chicago, Ill.
WVD	Radio WVD, 517 Federal Office Bldg., Seattle, Wash.

a high-fidelity B.C. station. He checked and double-checked to no avail—he could neither hear nor detect any trace of hum. One day he finally tumbled to the fact that the junior op's (Herb, Jr.) cat had a habit of curling up on the operating table near the mike when 9DRD was on the air. This feline quadruped had a perfect 60-cycle purr!! Mikes with long radii pickup are ofttimes dangerous!

◆

ONE OF THE sweetest loop set-ups on the air is that of VE3AIW, W8OTE and W8EAA on 1812 kc. Lloyd at Toronto, and Mac and Ed in Detroit are pushing through the QRM and enjoying Ham radio to the utmost. Friendship is a great thing.

THE HAM BANDS

[Continued from page 561]

BELIEVE IT OR not, the O. W. is learning the code. We caught her looking through catalogs the other day; says she: "Don't you think one of these rack-and-panel rigs would be nice to have here? Nice? Gosh, we've started it already!

◆

DID YOU EVER hear the one about the sweet young thing who wondered what station presented the Amateur Bands. Please . . . page Major Bowes.

Backwash

Special "Listening Rig"

Editor, ALL-WAVE RADIO:

After reading your editorial in the October issue of ALL-WAVE RADIO, I am writing this letter to let you know that I would be very interested in helping to carry on some investigation into the reception of radio signals. I am only an SWL, but an interested one, and would be very willing to spend what little time I have to listen to my radio in such a manner.

If this idea goes through, I think it would be an excellent thing if ALL-WAVE RADIO were to give us the latest dope on directional antennas, and some constructional articles on a good listening rig—including a frequency meter, antenna tuner, and some sort of an R meter so that we could really get some results that would be valuable.

More power to you and keep AWR as it is—a magazine that has something to interest everyone.

E. G. COLLISTER,
EAST NORTHPORT, N. Y.

Thanks for the offer of assistance. Articles of the nature you mention are in preparation for future issues—Ed.

◆

Field Managers for League

Editor, ALL-WAVE RADIO:

In "Editorial Quotes" of your Anniversary Issue you mentioned the possibilities of a club which would be organized to further radio. I believe this club would be the first of its kind in this country and also the first in the world. I would like to help organize a club of this kind and I can assure you that I will do everything in my power to keep the club going and make it a success.

I collect data on every station that I receive now and file it away for future use. I think that every member could do as much. I think that your idea is an excellent one indeed. I want to be the first one in Massachusetts to offer my services to the club and its purposes.

If the licensed amateurs can get up an organization to collect data and bring it to a good cause, I can't see why we can't do the same.

I think that we should have a field manager in every state to carry on the formative work. All mail in this state could be sent to him and he could sort out the good material and throw out the useless matter.

DIXON C. GREENWOOD,
EAST LONGMEADOW, MASS.

Right you are—the listener is in a position to offer a definite service. Your idea regarding the appointment of field managers is an excellent one. Watch for complete dope next month.—Ed.

◆

Standardized Measurements

Editor, ALL-WAVE RADIO:

The premise of Editorial Quotes in ALL-WAVE RADIO for October is worthy of all the consideration that serious-minded short-wave listeners can give it.

A properly organized association would certainly return dividends to its membership. A clearing house function would be essential to assemble and correlate data.

Broadcasters should ultimately be familiarized with the association and its activities—possibly invited to participate in associate memberships.

You have covered the proposition thoroughly so why should I tender suggestions? If anything, however, standardized means for measuring carrier field strengths should be adopted at the outset.

You may count on my cooperation to the extent that time and convenience will permit.

L. M. CLARK,
SNYDER, N. Y.

Many thanks. It is difficult to standardize means for measuring field strength, except through the use of arbitrary units, such as the "R" system. Special receivers can be employed, but not everyone is in a position to invest in new equipment. But, we'll see.—Ed.

◆

Standard Listener Report

Editor, ALL-WAVE RADIO:

I purchased my copy of October ALL-WAVE RADIO today and must say that it certainly is the best issue so far. I came across my first copy of AWR quite by accident and was enthused to find at last a radio magazine that told me things I wanted to know in a way I could understand.

My purpose in writing is to air my thoughts on the proposed radio listeners' research league. I am for the idea 100 percent, and have long been hoping just such a movement would be started. Also, no better organ, in my opinion, could be found than AWR.

My career as a SWL began only last Spring when I purchased a Browning 35 Metal Tube kit with Tobe Tuner. My father is a Radio Serviceman and I saw the first model of the Browning demonstrated to him the year before and finally scraped enough cash together to buy a kit. I had to try the new metal tubes!

However, this has been a fatal step as I am now hopelessly sunk in radio and the Browning has started an endless chain of "gadgets". (Don't get me wrong, I don't want to spoil a good set but I *do* like to try new things).

By endless chain I mean, first, I put on a 6E5 Magic Eye (not much good on short waves and more than closes on a strong signal—have to try a 6G5) and put the works in a cabinet. I bought one of their cabinets, but what changes I had to make! Change two controls up to the top of the chassis on brackets, speaker hole just large enough for the speaker to fit in! The outside looks nice, though, so it was worth the work.

Now I intend dragging the chassis out, cutting in a phone jack for a pair of Brush phones, and a stand-by switch. Then I'll line her up with the oscillograph and get all set for winter DX.

This is only the beginning, however, as I am making up an antenna tuner now, and hope to build your last month's Preselector and then a Preamplifier; the last two I would like to rig up so as to cut in first one then the other to find the features of each. My idea is to make up these units along with a standard receiver, a weather receiver and have all on rack-and-panel and control each from switches on a control board on my desk. Sounds good!

Here are a couple of points in regard to the listeners' league: make up a standardized form of listener report which could perhaps be made up in pad form and the leaves torn off and sent to you when each is filled. I have a general idea of what points to cover but these could probably be worked out better by you. I think the boys would be willing to pay the cost of printing these blanks, and believe there would be a market for such outside of the league. Wish I had some right now!

Then I would like to see the signal strength given from a normally calibrated milliammeter scale rather than in the rather arbitrary "R" scale.

That's all, I guess, for now until you see if the idea takes hold, and I, for one, sure hope that it does.

Now I would like to make a couple of suggestions for your magazine. "The X Band" is an article I have been waiting some time to see. Now, I am an aircraft mechanic by trade at the local airport, and a Weather receiver would be very useful to me. The commercial set prices are prohibitive, (and I like to roll my own, anyhow) so how about a circuit to cover two bands, 220-450 kc and 2600-4700 kc approximately. I think many fellows would be interested in a set of this type and perhaps it could be made compact enough to install in a plane, using standard remote controls. I understand that commercial coils for these bands will be on the market in a couple of months, so how about looking into it? At least broach the subject and see what the boys think of it.

I won't comment on the rest of the book 'cause I haven't that much paper and you haven't the time. Suffice it to say that you're doing a swell job

HARVEY A. SENIOR,
DANBURY, CONN.

Thanks for the suggestion. Yes, a standardized report form will be necessary. We will have them printed up once the nature of the form has been definitely established. A few suggested types of forms will appear in the next issue. How many readers would be interested in a WX receiver?—Ed.

◆

More Regarding League

Editor, ALL-WAVE RADIO:

I, too, have just celebrated my "First Anniversary" of enjoying your fine magazine. I haven't missed a single copy.

Indeed the future looks promising, the proposed radio listeners' research league being a very worthwhile project.

From past experience in DX work I feel interested in trying to assist in this new effort. Nearly every morning I spend at last an hour DXing. (Between 5 and 6 A. M.)

GEORGE LEWIS BRODE,
PHILADELPHIA, PA.

Well, we've started the wheels turning. Full dope next month.

SHORT-WAVE STATION LIST

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

KC	Meters	Call	Location	Time
31600	9.4	W1XKA	• Boston, Mass.	Daily 9 A.M.-12 A.M.
31600	9.4	W8XKA	• Pittsburgh, Pa.	3-11 P.M. daily
31600	9.4	W3XKA	• Philadelphia, Pa.	Daily 12-10 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
21530	13.93	GSJ	• Daventry, England	Not in use.
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.-12 noon 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	HS8PJ	• Bangkok, Siam	8-10 A.M. Mondays
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	WQD	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 Ahaba, 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	Not in use.
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
16305	18.39	PCL	Kootwijk, Holland	(P) Special relays and phones irreg.
16300	18.44	WLK	Lawrenceville, N. J.	(P) Phones England irreg.

Short-Wave Station List

KC	Meters	Call	Location	Time
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 Ahaba, 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	DIT	● Zeesen, Germany	Irregular
15355	19.54	KWU	Dixon, Calif.	(P) Phones Japan, Manila and Java evenings
15340	19.56	DJR	● Zeesen, Germany	8-9 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.-3:30 P.M. daily
15280	19.63	DJQ	● Zeesen, Germany	6-8 A.M., 8:15-11 A.M. daily. Sun., 11:10 A.M.-12:20 P.M.
15270	19.64	W2XE	● Wayne, N. J.	1-6 P.M. daily
15260	19.66	GSI	● Daventry, England	12:15-4 P.M. daily
15252	19.67	RIM	Tashkent, USSR.	(P) Phones RKI early mornings
15243	19.68	TPA2	● Pontoise, France	2-2:55 A.M., 5:55-11 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	● Pittshurgh, Pa.	9 A.M.-7 P.M. daily
15200	19.74	DJB	● Zeesen, Germany	12:05-11:00 A.M. daily. Sun., 11:10-12:25 P.M.
15183	19.76	RV96	● Moscow, USSR.	1:30-2 P.M. Sunday
15180	19.76	GSO	● Daventry, England	3-5 A.M. daily
15145	19.81	RKI	● Moscow, USSR.	Broadcasts 10-11 A.M. Sun. Phones RIM A.M.
15140	19.82	GSF	● Daventry, England	6-8:45 A.M., 9 A.M.-12 noon, 4-5:45 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., 8-9 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 - TYB 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.
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	Rugby, 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
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	WQO	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
12830	23.38	CNR	Rahat, 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.

KC	Meters	Call	Location	Time
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	2-5 A.M., 12:15 A.M.-6 P.M. daily
11870	25.26	W8XK	● Pittsburgh, Pa.	7-9 P.M. daily
11860	25.29	GSE	● Daventry, England	Not in use
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.
11820	25.38	GSN	● Daventry, England	Not in use
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.
11795	25.43	DJO	● Zeesen, Germany	Irregular
11790	25.43	W1XAL	● Boston, Mass.	News Mon. to Fri. inc., 6-6:30 P.M.; Sat., 5-7 P.M.; Sun., 10:15 A.M.-12:30 P.M., 5-7 P.M.
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	12:15-5:45 P.M., 6-8 P.M., 9-11 P.M. daily
11730	25.58	F3ICD	● Saigon, Indo-China	7:30-9:30 A.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	6:15 P.M.-1 A.M. daily
11705	25.63	SM5SX	● Stockholm, Sweden	Weekdays 6:25-7 A.M., 11 A.M.-4 P.M. Sun., 3 A.M.-4 P.M.
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.
11435	26.24	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	Rugby, 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 - OCT 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
10250	29.27	LSK3	Buenos Aires, Arg.	(P) Afternoons

KC	Meters	Call	Location	Time
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 after noons
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	CSW	● Lisbon, Portugal	4-7 P.M. daily
9870	30.40	JYS	● Kemikawa-Cho, Japan	4-7 A.M. irregular
9860	30.43	EAQ	● Madrid, Spain	Saturday 1-3:30 P.M.; daily 5:15-9:30 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.	5-9 P.M. daily, experimentally
9660	31.06	PSJ	Rio de Janeiro, Brazil	(P) Irreg., Argentina
9650	31.09	CT1AA	● Lisbon, Portugal	Tues., Thurs., Sat., 3-6 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 1-3 A.M., 4:30-8:30 A.M., 9-11 A.M.
9590	31.28	HP5J	● Panama City, Panama	Week days 12-1:30 P.M., 6-10:30 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	31.32	GSC	● Daventry, England	6-8 P.M., 9-11 P.M. daily
9580	31.32	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.	Weekdays 6:30 A.M.-1 A.M. Sundays, 8 A.M.-1 A.M.
9565	31.36	VUY VUB	● Bombay, India	Thurs. and Fri., 11 P.M.-12:30 A.M.; Sun., 1:30-3:30 A.M.
9560	31.38	DJA	● Zeesen, Germany	12:05-5:15 A.M., 5:55-11 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	5:30-7 A.M. daily
9530	31.48	W2XAF	● Schenectady, N. Y.	4 P.M.-12 A.M. daily
9530	31.48	LCJ1	● Jeloy, Norway	5-8 A.M., 11 A.M.-5 P.M. daily
9520	31.51	XEME	● Merida, Yucatan, Mex.	10 A.M.-3:30 P.M., 5:30-11 P.M.
9510	31.55	GSB	● Daventry, England	3-5 A.M., 9 A.M.-12 noon, 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	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	7:30-8 A.M., 11:30 A.M.-1 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
8948	33.53	HCJB	● Quito, Ecuador	12-2 P.M., 6-10 P.M. daily except Monday (see 4107 KC.)
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
8795	34.13	HKV	● Bogota, Colombia	(E) Tests early evenings and nights; broadcasts news Mon. and Thurs. 7-7:30 P.M.

KC	Meters	Call	Location	Time
8790	34.13	TIR	Cartago, Costa Rica	(P) Phones Cent. America daytime
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	11:30 P.M.-1:15 A.M., 4-10 A.M. daily
8740	34.35	WXV	Fairbanks, Alaska	(P) Phones WXH nights
8730	34.36	GCI	Rugby, England	(P) Phones VWY afternoons
8710	34.44	KBB	Manila, P. I.	(E) 6-8 A.M. special broadcast
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	Daily 11:30 A.M.-12:30 P.M., 7-11 P.M. Sundays 3-5 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.
7030	42.67	EA9AH	● Tetuan, Spanish Morocco, Africa	4-4:25 P.M. daily
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
6977	43.00	XBA	Tacubaya, D. F., Mex.	(E) 6-8 P.M. daily
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 Ahaba, 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.
6850	43.80	XGOX	● Nanking, China	Weekdays 6:30-8:30 A.M. Sundays, 7:30-9:30 A.M.
6845	43.83	KEN	Bolinas, Calif.	(P) Used irregularly
6830	43.92	CFA	Drummondville, Que.	(P) Phones N. America nights
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	WOO	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.
6668	44.99	HC2RL	● Guayaquil, Ecuador	Sun., 5:30-7:30 P.M. Tues., 9-11 P.M.
6650	45.11	GBY	Rugby, England	(P) Phones U.S.A. irreg.
6650	45.11	IAC	Pisa, Italy	(P) Phones ships irreg.
6630	45.25	HIT	● Ciudad Trujillo, R. D.	12:10-1:40 P.M., 6:10-8:40 P.M. ex. Sun. 1st Sat., DX 11:10 P.M.-1:10 A.M.
6618	45.33	Prado	● Riobamba, Ecuador	Thursday 9-11 P.M.
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.
6548	45.82	XBC	Vera Cruz, Mexico	(E) 7-8 P.M. irreg.
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
6500	46.15	HIL	● Ciudad Trujillo, R. D.	12-2 P.M., 6-8 P.M.

KC	Meters	Call	Location	Time
6482	46.28	HI4D	●Ciudad Trujillo, R. D.	Mon. & Sat., 11:55 A.M.-1:40 P.M., 4:40-7:40 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.
6450	46.51	HI4V	●Ciudad Trujillo, R. D.	11:40 A.M.-1:40 P.M., 5:10-6:40 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
6350	47.24	YV1RH	●Maracaibo, Venezuela	6-11 P.M. daily
6340	47.32	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. & Fri., 8:10-9:10 P.M.
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.
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	HJ4ABU	●Pereira, Colombia	Daily 9:30 A.M.-12 Noon. 6:30-10 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
6138	48.88	HJ4ABD	●Medellin, Colombia	Weekdays 10 A.M.-2 P.M., 4-11 P.M. Sun., 11 A.M.-3 P.M., 7-11 P.M. (see 5900 and 5780 KC.)
6137	48.88	CR7AA	●Lourenco Marques, Africa	12:45-3 P.M. daily; 8-10:30 A.M. Sundays
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	Sun., 3-11 P.M. Mon. to Thurs., 7:30 A.M.-12:30 P.M., 4:30-11 P.M. Fri., 7:30 A.M.-3 P.M., 4:30-11 P.M. Sat., 4-11 P.M.
6130	48.94	LCJ1	●Jeloy, Norway	10 A.M.-6 P.M.
6128	48.96	HJ1ABB	●Barranquilla, Colombia	11:45 A.M.-1 P.M., 5:30-10 P.M. daily
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	GSL	●Daventry, England	Not in use
6110	49.10	VUC	●Calcutta, India	Mon., 8-9 A.M. Wed., 10:30-11:30 A.M.
6100	49.18	Belgrade	●Belgrade, Yugoslavia	1 A.M.-6 P.M. 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.
6097	49.20	HJ4ABE	●Medellin, Colombia	11 A.M.-12 noon, 6-10:30 P.M. daily
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.
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	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.
6060	49.50	W8XAL	●Cincinnati, Ohio	Daily 6:30-7 P.M., 10 P.M.-2 A.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	Not in use
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.	Mon. & Fri., 7-9 P.M. Sundays 7:15-9 P.M.
6030	49.75	HP5B	●Panama City, Panama	12 noon-1 P.M., 6-10 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	11:35 A.M.-4:30 P.M., 4:50-10:45 P.M. daily
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	COCO	●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.	Weekdays 7:45 A.M.-1 A.M. Sundays, 9 A.M.-11:15 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.
5955	50.35	HJN	●Bogota, Colombia	Daily 11 A.M.-2 P.M.,, 5-10:30 P.M.
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.

Short-Wave Station List

KC	Meters	Call	Location	Time
5900	50.85	HJ4ABD	● Medellin, Colombia	Weekdays 10 A.M.-2 P. M., 4-11 P.M. Sundays 11 A.M.-3 P.M., 7-11 P.M. (see 6138 & 5780 KC.)
5880	51.02	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
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.
58.0	51.28	GBT	Rugby, England	(P) Phones U.S.A. irreg.
5843	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.
5780	51.90	HJ4ABD	● Medellin, Colombia	Weekdays 10 A.M.-2 P. M., 4-11 P.M. Sunday 11 A.M.-3 P.M., 7-11 P.M. (see 6138 & 5900 KC.)
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	11:30 P.M.-1:15 A.M., 4-10 A.M. daily
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
4107	73.05	HCJB	● Quito, Ecuador	12-2 P.M., 6-10 P.M. daily except Monday (see 8948 KC.)
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.

nel can be fed through at the same time, when desired.

It is possible to mix the phonograph input, or whatever signal is coming through the external 200-ohm line, by placing the plug for this line only part way in jack "B" while the output of the two receivers is still being piped through. As the microphone is on a different input channel, four different inputs may thus be transmitted. The inputs to the lower channel may at the same time be monitored with the phones without the operator's own voice disturbing the monitoring. This is made possible by virtue of the electronic mixing between the two channels, the input to one channel being isolated from the input to the other. By placing the plug all the way in jack "B" the inputs to jacks "A" and "B" may be mixed while still listening to the two receivers through the headphones. Many other mixing combinations are possible.

Transformers T and T-1 are the LS type, which are quite expensive. Practically the same frequency range may be had by using the less expensive PA type of transformer. Transformer T-2 is a type which is no longer manufactured, to our knowledge. The parts list gives the numbers for both the LS and PA types for all three audio transformers in the amplifier.

Alternate Circuits

A three-stage amplifier, minus the mixing equipment, is shown in Fig. 2. This is suitable for input from either a receiver or crystal pickup. The pickup may be plugged directly into the grid circuit without using an input transformer. It will probably be necessary to use an input transformer when using the receiver, a "plate-to-push-pull grids" type being suitable. A phase inverter stage ahead of the amplifier will obviate the use of this input transformer if the constructor feels ambitious.

For an amateur who wants a straight job for use as a speech amplifier with crystal microphone input, the upper channel in the diagram of Fig. 1, minus the extra input stage and speaker connections, will be suitable. An 800-ohm resistor of 25 or 50-watt rating should be connected in place of the speaker field to keep the voltage on the low-level stages and 6L6 screens at the proper value. The amateur with a carbon microphone needs only the three-stage amplifier, using a push-pull input transformer.

6L6 AMPLIFIER

[*Continued from page 559*]

On the Market

Inductor Sweep Oscillator

FROM THE LABORATORIES of Kendall Clough comes another development in test oscillator design. The Clough-Brengle Model OM-A Frequency Modulated R.F. Signal Generator is the instrument embodying this new frequency sweep principle.

After two years of research—in which time every known method of frequency sweep, such as the rotating condenser, vacuum tube discharge (electronic), and magnetic flux was tried and found to have shortcomings that made it impractical for general application—this extremely simple method was evolved.

In place of complicated moving parts or involved tube circuits with consequent instability, the "Inductor Sweep" simply employs a small copper vane which is rotated in the magnetic field of the oscillator coil. As this vane rotates, it causes the inductance of the coil to vary sufficiently to cause a plus and minus 20-kc. "wobble" of the oscillator output frequency. Rotation is secured by a synchronous motor, operating at what is practically zero load.

The entire "Inductor Sweep" assembly, with the exception of the motor, is enclosed in a cast aluminum sealed housing to eliminate all effects of temperature, atmosphere, and other factors that cause oscillator frequency drift.

The Model OM-A employs metal tubes throughout, since tests in the Clough-Brengle laboratory show that in some instances metal tubes offer characteristics better suited to the needs of oscillation generating circuits. In addition, their improved mechanical structure assures a higher uniformity of characteristics.

This instrument may be used with the Clough-Brengle Model CRA Oscillograph or any other standard oscillograph for visual alignment or radio receivers, covering a range of 100 kc. to 30 mc, all on fundamentals. By means of the "Fixed-Sweep" principle, originated in the C-B Model OM, a uniform sweep or "wobble" is secured at all test frequencies.

The new "Inductor Sweep" principle is also employed in the Model 81-A Frequency Modulator that can be employed to convert any test oscillator for oscillograph use, without any changes in wiring, installation of jacks, or effect upon the calibration of the oscillator.

A new bulletin, describing in detail the operation of this new principle, may be secured by writing to the manufacturer, the Clough-Brengle Co., 1134 W. Austin Ave., Chicago, U. S. A. ALL-WAVE RADIO

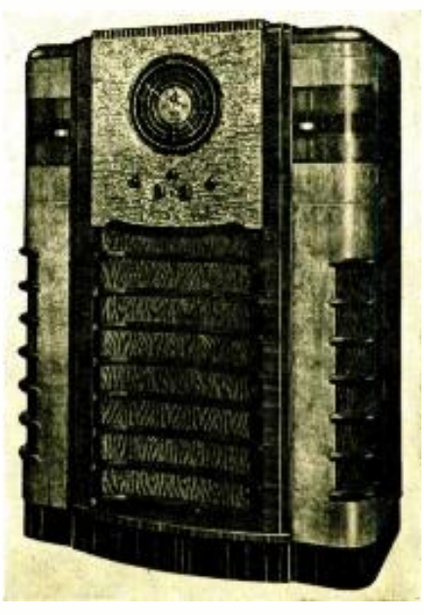
Crosley 37-Tube Receiver

THE "TOPS" IN radio receivers has just been introduced by the Crosley Radio Corporation, Cincinnati. It is a 37-tube radio, equipped with six speakers and other features that place radio reception on a plane hitherto unattained. Its coverage is continuous from 540 kc. to 18,300 kc., divided into three bands. Its power output is from 50 to 75 watts. Because of its great size and power, it has been named the WLW Super-Power Model, by Powel Crosley, Jr., president, Crosley Radio Corporation, symbolical of the great 500,000-watt broadcasting station which is the most powerful in the world.

One speaker is 18 inches in diameter and is used for the bass or low frequencies. There are two 12-inch speakers for the mezzo or middle musical range. Three smaller high-frequency speakers of the high-frequency diaphragm type receive the treble or high-frequency range of the higher notes and overtones. All tubes are metal with the exception of the one for the tuning light and the Auto-Expressionator tube.

Four chasses are required for the arrangement of the equipment. The first is devoted to the tuning or selection of the station desired and pre-audio amplification. The second chassis embodies the audio power amplifier. The third chassis furnishes the power supply to the audio power amplifier and the fourth provides the power supply for the speaker fields.

The superlative performance of this super-power radio is said to be the result of a circuit that is capable of being tuned to 20,000 cycles audio frequency, and has been tuned to as high as 25,000 cycles. However, for practical reasons the top range has been restricted to 12,000 cycles, which is above the range of present broadcasting facilities and enables it to receive the higher overtones of the musical instruments and all the components of music and sound. Ordinarily the human ear is incapable of hearing above an audio frequency of 16,000 cycles. The receiver has a low range of 20 cycles, which reproduces the lowest notes of a pipe organ, which are the lowest in the musical scale.



The set is replete with the Auto-Expressionator, bass compensation, six-step tone control, in addition to volume control for each different audio range—bass, mezzo and treble, the Mystic Hand for automatic tuning and other features developed by Crosley engineers. In addition to the radio receiver proper, it is provided with a public-address system which has separate controls of its own.

An idea of its size may be had from its dimensions. The cabinet stands four feet ten inches high, is 42 inches wide and 22 inches deep. The complete radio weighs 475 pounds. It has a 12-inch airplane-type dial, with time-logging and other features in addition to the Mystic Hand that makes tuning simple and easy. ALL-WAVE RADIO.

✦

Tobe Windo-Pole Antenna

THE "WINDO-POLE" AERIAL is a new patented product recently announced by the Tobe Deutschmann Corporation, Canton,

Mass., as being of particular interest to the radio serviceman and dealer. It is a pole type antenna and can be readily mounted at 45 degrees, or horizontal, to any window sash or sill. Its length extended is eight feet, and is said to provide ample pickup with a modern receiver. While not primarily a noise reduction antenna, it is claimed that its use results in a superior signal-to-noise ratio in many instances, due to the fact that it can be located in a noise-free area, while some portion of other antenna almost invariably projects into a noise field.

The Windo-Pole is recommended as a permanent installation and for demonstration purposes. Collapsed, it is readily portable by the serviceman, and its use insures against demontrating a receiver with a possibly defective antenna system. The antenna is inconspicuous and is approved by landlords where other antennas are forbidden. The Tobe Windo-Pole is supplied complete with insulted mounting bracket and lead-in strip. It actually takes but ten seconds to install the Windo-Pole. No tools required—simply slip the clamp over the side window-casing, and tighten thumb screw. ALL-WAVE RADIO.

Eilen RX-14 S.W. Receiver

EILEN RADIO LABORATORIES, 136 Liberty Street, New York, N. Y., have placed on the market their Model RX-14 Short-Wave Receiver. This is a tuned radio-frequency set having a stage of r.f., a regenerative detector and a three-stage audio-frequency amplifier.

As shown in the accompanying illustration, the receiver is completely self-contained in a metal cabinet. A type 6D6 tube is used in the r-f amplifier and the gain of this stage is controlled by a variable resistance in the cathode lead. A 6D6 is also used in the regenerative detector circuit. Regeneration is controlled by a potentiometer which varies the screen voltage on the tube. The regenerative circuit is of the electron-coupled type which has a high degree of stability.

The regenerative detector feeds a two-stage resistance-coupled audio amplifier employing type 76 tubes. A type 42 pentode is used in the output stage, capable of delivering approximately 3 watts to the electro-dynamic speaker mounted in the cabinet.

A type 5Y3 full-wave rectifier is used in the power-supply circuit which has a filter network composed of two 16-mfd condensers and the field winding of the dynamic speaker.

The receiver covers a wavelength range of 8.5 to 600 meters through the use of plug-in coils.

The Model RX-14-AB is supplied with bandspread coils covering the amateur 20, 40, 80 and 160 meter bands. This model is also equipped with a switch to cut off plate voltage during transmissions.

ALL-WAVE RADIO.

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Sound Engineering Manual

AFTER MANY DELAYS and corrections due to rapid advances in sound engineering, Webster-Chicago has announced that the first completed copies of the Sound Engineering Manual are expected off the press within a few days.

Every dealer who has previously requested one of these manuals will receive it free of charge, although due to the magnitude of the book and consequent expense, it has been found necessary to establish a 10c price to help defray some of the cost.

As originally contemplated, it was not considered necessary to go very deep into the engineering story either from the standpoint of installation or from the standpoint of design. In feeling out the requirements of the trade in these particulars, there seemed to be such an insistent demand for full particulars on the subject that the entire contents were revised.

As edited, this manual now contains eighteen diagrams covering different phases of sound engineering from details of microphone construction to complete installations.

ALL-WAVE RADIO

Operadio Mike Preamplifier

THIS IS A HIGH-GRADE instrument made to mix microphones of either the velocity or grille type crystal. It has an overall gain of 65 db, incorporates electronic mixer and also tone control for "shading." The hum level is exceptionally low.

Two of these may be used together to form a four-position electronic mixer and preamplifier. This is a two stage amplifier with first stage tubes mounted on cushioned mountings to decrease microphonics. A beautiful steel carrying case with provision for plug-in connections at input and output is provided.

If you wish a complete description, write Operadio Manufacturing Company, St. Charles, Illinois, for Catalog 10-B.

ALL-WAVE RADIO

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New Brush Microphone

A NEW public-address microphone known as the B-1 has been placed on the market by The Brush Development Company, Cleveland, Ohio. It offers at a lower price, though somewhat lower output, many of the operating features found in the Brush Sound Cell microphones.

Internal spring mounting, eliminating external shock absorbers and other makeshift attempts at external cushioning, and permitting the stand or even the microphone itself to be handled while it is in use . . . non-directional pickup . . . and the ability to run long leads with only slight loss—are some of the features built into this new model. Thoroughly modern and attrac-

tive appearing wire mesh cases that permit the sound to pass through, eliminating the heavy bass and distortion of pressure doubling and permitting close speaking . . . small size . . . and Brush's rugged construction are others.

Size of the Brush B-1 microphone, 3½" long, 1⅞" wide, ¾" thick. Weight, complete with the locking type plug and socket, 11 ounces. Output level minus 72 db. Full details, prices, etc., can be secured from The Brush Development Company, Cleveland, Ohio.

ALL-WAVE RADIO.

Wet Electrolytic Condensers

THE LEAKAGE CURRENT of electrolytic condensers has been put to work as a regulating influence. In fact, a new type wet electrolytic is now available, with such leakage properties that it can be employed to prevent undesirable rises in voltage when the radio set is first turned on. Yet at other times this electrolytic operates as a normal condenser, with a power factor less than 10% and a very low leakage, according to the Engineering Department of Aerovox Corporation.

Few users are familiar with the leakage characteristics of the ordinary wet electrolytics. Under normal operation at rated voltage, leakage is very low. However, as voltage increases beyond the normal peak voltage, current rises too, first slowly and then faster, until a point is reached where the condenser "scintillates." By "scintillation" is meant the repeated breakdown of the insulating film formed on the positive foil. After the breakdown, the film is reformed, only to break down again, followed by reforming, etc. This scintillation does not ruin the condenser, for when the voltage is lowered again and the normal operating voltage applied, the condenser performs as well as ever.

Hence the new Aerovox wet electrolytics especially designed for desired regulating characteristics. It is highly important that such regulating condensers be connected across the output of the filter, and not immediately after the rectifier. In the latter position the regulating condenser would cause an enormous peak current at the start, which would have to pass through the rectifier. The regulator condenser can be placed after the first choke or after the second one, if there are that many.

The regulating feature is utilized only during the interval when tubes are heating up, since a prolonged heavy current through the condenser would result in too great a temperature rise. When a set is first turned on, the rectifier tube heats considerably faster than the other tubes. During this period the tubes are drawing no plate current, and there may be no drain on the power supply save that for the filaments and the voltage divider. Many of the newer sets, if they have a voltage divider at all, have one of the low drain type, because it has been found that the receiver can be made to operate even when voltages vary widely. The omission of the voltage divider is purely a matter of economy.

During the interval of heating up tube filaments or cathodes, the large condensers in the power pack are charged to peak voltage of the transformer secondary, and since there is no current drain, there is no voltage drop in the filter and the speaker field. Hence the same peak voltage is applied to all the smaller condensers, such as tubulars, as well as other equipment. These peak voltages are apt to raise havoc with small condensers not intended for such surges.

Aerovox engineers have developed wet electrolytics for given regulation voltage. Properly applied, these units prevent voltage rise above a given point, and consequently protect other condensers and components. Their use is rapidly growing, and many of the current sets are provided with this important safeguard.

ALL-WAVE RADIO

Readers' Data Bureau

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.

[*Continued on page 584*]

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

AR-1236

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.

READERS' DATA

[*Continued from page 583*]

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.

◆

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.

STATION CALLS

[*Continued from page 543*]

Then in honor of the Oklahoma Bixbys, there is Station KBIX in Muskogee . . . the Moody Bible Institute's WMBI in Chicago . . . WAVE for quick, easy assimilation in Louisville, Ky. . . . and there's a church station in California called KPPC for the Pasadena Presbyterian Church.

"Of no significance," say Station WHAM, WBAP, WJAR, WHDH, WLAC, WOV, WAAB, WNAC, KFUO, KGGF, KFOC, KOL, KOMO, WHN. Perhaps not, but many of these stations are veterans in the field who have ridden the air-waves through sunshine and storm.

Graybeards

Probably one of the oldest stations in the United States is KLZ, whose call letters were assigned by the old Federal Radio Commission. It was established as a commercial station in June, 1920, just about 16 years ago. Another sixteen-year-old is Station WWJ, in Detroit, which has been on the air ever since August 20, 1920. Its first call letters were 8MK, indicating, of course, it was operated under an amateur license.

Station KIEM of Eureka in California, has no significance—except, perhaps, to the regular advertisers who regard it in the light of a doleful dirge, for they are urged to *"Kick In Every Month."* It may be a dirge to the advertisers but it's certainly sweet music to the station owners. Outside of that, KIEM came into being without benefit of baptism.

KGMB in far-off Honolulu, Hawaii, is a gentle reminder to the station's staff to *Keep Getting More Business,* not at all a bad idea—and the land of the quins, Station CFAC, *Calgary's Friendly Air Contact,* deserves a palm for an original touch. It combines a verbal and musical station identification, using the notes of the scale corresponding to their call—CFAC. Bet it sounds pretty.

GLOBE GIRDLING

[*Continued from page 554*]

Sectional Reports

From the lists of West Coast listeners we have taken the following stations received which have not been previously reported: *Broadcast*—19200, HS8PJ; 11730, F3ICD; 9590, HP5J; 9540, VPD2; 9530, ZBW; 9350, HS8PJ. *Others*—18450, HBF; 15860, JVD; 15450, IUG; 11402, HBO; 11050, ZLT; 10160, RIO; 6750, JVT. And below is the best list of stations received from George L. Bird, Pawhuska, Oklahoma, which is from the territory known as the "Middle West" and which some Easterners may think it strictly West, but to appreciate the dividing line between the Middle West and West you must live in the Middle West.

Here is the list:— VK2ME, VK3ME, VK3LR, Australia; PRF5, PRA8, Brazil; COCH, CO9WR, COCD, COCQ, COCO, Cuba; HJU, HJN, HJ1ABE, HJ1ABP, HJ1ABB, HJ3ABD, HJ4ABB, HJ4ABE, HJ4ABD, HJ4ABP, Colombia; TIEP. TIPG, TI4NRH, TIPGH, Costa Rica; CJRO, CRCX, CJRX, Canada; Prague, Czechoslovakia; CB960, Chile; HIT, HIN, HI5N, HI3C, Dom. Rep.; GSB, GSH, GSG, GSP, GSO, GSF, GSD, GSC, England; HCJB, HC2CW, HC2JSB, HCETC, HC2RL, HCK, Ecuador; TPA2-3-4, France; DJA, DJB, DJD, DJE, DJL, DJP, DJQ, DJO, DJN, DZC, Germany; TGWA, TG2X, Guatemala; HAS3, HAT4, Hungary; HRN, Honduras; HH3W, Haiti; PHI, PCJ, Holland; TFJ, Iceland; 2RO, Italy; JVN, Japan; PLP, Java; XEME, XECR, XEXA, XEFT, XEWI, XEUW, XEBT, Mexico; HP5F, HP5J, HP5B, HP5K, Panama; HBO, Switzerland; EAQ, Spain, RAN, U.S.S.R.; WIXK, W2XAF, W8XK, W2XE, W9XF, W3XAL, W9XAA, W8XAL, W3XAU, W1XAL, W2XAD, United States; HVJ, Vatican, YV2RC, YV4RC,YV5RMO, Venezuela.

We are also grateful for reports in this connection from Mr. A. P. Bauernfeind, Green Bay, Wisc.; S. P. Herren, Jr., Haskell, Texas; A. S. Spuhler, Cleveland, Ohio; John Sluckis, Leicester, Mass.; Lyle Nelson, Yamhill, Oregon, Richard Verbrugghe, Detroit, Mich., and others.

Special Broadcast

Bernard L. Ahman, Jr., Baltimore, Md., reports that HC2CW, Guayaquil, Ecuador, will broadcast a special program for Newark News Radio Club on 8404 kc, November 21st from 7:16 to 10:46 P.M. which is getting it down pretty fine, so tune in on the dot and add this one to your collection, as it is possible to secure a verification, as the writer was agreeably surprised recently upon receiving one after much elapsed time. HC2CW works with 30 watts power.

In place of the list of 20-meter phones heard by listeners this past month which have not been reported before, we are quoting from a report received from amateur station W8BKP, operated by Mr. George Morrow of Washingtonville, Ohio, as follows:

"Below is a list of amateur phone stations heard recently:
KA1BH—P. I.—14040—8:30-10:00 A.M.
LU4BH—Argentina—14385—10-11. P.M.
VS2AK—Australia—14090—8:30-9:30 A.M.
VS6AQ—China—14100—8-10 A.M.
VU7FY—India—14390—7:30-8:30 A.M.
ZE1JS—So. Rhodesia—14375—7-9 A.M.
PK1MX—Java—14120—8-9:30 A.M.
"On CW I have had 2 way contacts with 151 countries, with QSL verifications from 136.
"On CW 68 countries heard in September, 43 of them have been worked. Best DX for September worked is J8CA in Korea, and XOZ5UB, a ship in the Indian Ocean near the Gulf of Oman."

We are, however, grateful to the following who forwarded reports in con-

nection with the 20-meter block:—Howard Wilson, Jr., Ithaca, N. Y.; LeRoy Waite, Ballston Spa, N. Y.; W. H. Stark, Wauwatosa, Wisc.; Eileen Hofmaster, Sandusky, Ohio; E. H. Clark, Hollister, Calif.; Galen Balfe, Lowell, Mass.; R. E. G. Langton, Port Hammond, B.C., Canada; Arthur Bickhart, West Reading, Pa.; A. L. Beaty, Tampa, Florida; R. Carek, Lorain, Ohio; J. F. Satterthwaite, Toledo, Ohio; Winfield Darr, Kansas City, Mo.; G. T. Beyer, Chicago, Ill.; Fred Atherton, Rutland, Vt.; Creston Hanshaw, Redding, Calif.; Werner Howald, Los Angeles, Calif.; and L. R. McPherson, Chicago, Ill.

Your reaction to this change in publishing the most interesting report instead of listing the stations not previously heard and reported would be appreciated.

Backward Stations

The following stations are still backward in forwarding verification of reception reports:—HJN, HKV, HJ1ABB, HJ3ABF, HJ4ABD, HJ4ABB, Colombia; HC2CW, HC2TC, Ecuador; XBJQ, Mexico; HRN, Honduras; YNVA, Nicaragua; CB960, Chile; H12D, H14V, H15N, H17P, H19B, Dominican Republic.

The writer has, however, received verification cards from HJN, HKV and HC2CW included above. If others have also received them please be kind enough to write us.

In Appreciation

We are again afforded much pleasure in acknowledging letters and interesting reports from Mr. Fred Atherton, Rutland, Vt.; Harold W. Bower, Sunbury, Pa.; Robert G. Billinghurst, Toronto, Canada; G. T. Beyer, Chicago, Ill.; E. R. Champagne, Springfield, Mass.; Alden Cranmer, Mayette, N. J.; Wm. Angus Corley, Washington, D. C.; Winfield Darr, Kansas City, Mo.; Frank Harris, Montebello, Calif.; Creston Hanshaw, Redding, Calif.; Werner Howald, Los Angeles, Calif.; Thomas P. Jordan, Scranton, Pa.; Ted Kislap, West New York, N. J.; R. E. G. Langton, Port Hammond, B.C., Canada; George Morrow, Washingtonville, Ohio; J. R. Mappin, Avalon, Calif.; Meredith M. Stroh, Kitchener, Ont., Canada; Albert S. Spuhler, Cleveland, Ohio; George C. Sholin, San Francisco, Calif.; John Sluckis, Leicester, Mass.; Gerald Toth, Phoenixville, Pa.; Kendall Walker, Yamhill, Oregon, and many others and to extend to them the thanks of ALL-WAVE RADIO and the writer of this department for their kindly assistance and sincere comments.

Your comments and criticisms solicited. Information as to changes in time schedules and frequencies, new stations heard, or any information of interest to the readers will be gratefully received.

You will please continue to address me at 85 St. Andrews Place, Yonkers, New York, enclosing self addressed stamped envelope in case reply is desired. All questions pertaining to reception, stations unknown, or station matters in general will be cheerfully answered by the writer. All questions of a technical nature should be forwarded to Queries Editor, All Wave Radio, 16 East 43rd Street, New York, N. Y.

EXPERIMENTAL SUPER

[*Continued from page 549*]

a trial, especially when it is considered that this conductor is the nearest possible thing to bare, air-supported material.

The photograph of the completed laboratory model shows the 20-meter coils, wound with this r-f wire.

A word about this wire. It is pushback, yes. But not ordinary pushback. In the first place, it is insulated with

a textile material which has been both washed and treated. (The washing removes chemical impurities which, when moisture is absorbed, cause electrolytic action and decreased insulation resistance in most wire coverings). In the second, it is carefully impregnated to prevent any possibility of moisture absorption. It can be considered truly no-loss and perfectly adaptable to short wave service—though unfortunately, as we have form factor to consider, it cannot be used in building coils for the lower frequency ranges.

Adjustments

Put one set of coils in place, so that all tubes are drawing power. Check and recheck for opens, shorts, continuity and so on. Turn off the bfo and avc switches. Set the crystal selectivity control at mid-way position, the crystal switch at the off position, and all potentiometer controls except audio and tone at the proper positions for maximum gain. Keep the audio gain low. Set up an external oscillator tuned to 465 kilocycles and line up the i-f as closely as possible. Now remove the crystal, set it up in an external oscillating circuit, and realign the i-f to exactly crystal frequency.

Plug a milliammeter into the second detector cathode circuit, as shown in accompanying test diagram, and with the avc switch still off and one set of coils in place (coils fairly well adjusted), tune in a signal. Now adjust the manual volume control until the second detector current reads a desired current—say 1 m.a. This becomes our operating current, and the strength of the signal at this point of control is the level at which we desire all signals tuned to. Turn on the avc switch and adjust R-33 until the original 1-m.a. reading in the detector cathode circuit is again obtained. Readjust the volume control (disregarding the signal) for proper background level and then tune across the band. You will be surprised at the effectiveness with which the system is now operating to keep all stations at roughly the same level.

Some builders may not like the idea of a 1-m.a. operating current and will prefer another value. Here the characteristic curve for the 6C5 as a detector should be consulted for proper grid and plate voltages at alternative operating currents. Some resistor values will have to be changed, of course.

Select voltages, current and values which provide for a reasonably high grid bias, however. This bias should be around 17 volts.

At this point it might be wise to adjust the detector and oscillator coils for exact tracking over a selected bandwidth. Spotting must be done by adding or subtracting extremely short lengths of wire and by adjusting the spacing of turns. Tracking and band spread are accomplished simultaneously by trial and error tuning of the padders within the coil forms.

Now turn up the audio to high gain. The devil himself may break loose with a tremendous screeching, but work at the end until hum, regeneration, and misplaced r-f are ironed out. Don't try to achieve economy, by the way, by eliminating a.f. decoupling resistors and bypass condensers. It probably won't work.

Plug in the crystal and switch it to series connection. Turn on the bfo and adjust it for a strong beat on some carrier. Now adjust C-20 carefully until the signal completely disappears. At this point the capacity of the crystal holder is balanced out, and the crystal represents a pure series circuit presenting little or no impedance to 465 kc "on the nose" signals and practically infinite impedance to signals of any other frequency. Tuning should now be extremely sharp, with a single signal or one side of zero beat effect, and with little or no loss in carrier strength as compared to the level with crystal off.

If difficulty is experienced in getting the crystal to "perk," it is possible that the signal is feeding directly from the first detector grid lead into the grid leads of the i.f. Try shielding the latter leads with *low capacity shield tubing,* and if that doesn't work effectively, isolate the stage completely in a shield compartment.

As a last refinement — suggested whether necessary or no——box shield all high-frequency stages and set up a partition between the two sections of the main tuning condenser.

Performance

The laboratory set has been in operation here on the West Coast for a number of weeks, both for the general service for which it was originally designed, and as a communications receiver.

Its selectivity and sensitivity are a revelation. The amateur 20-meter phones (First, Second, and Third district boys) pile in R9 when many other receivers bring in nothing much more exciting than a thick, impenetrable blanket of mush, and the signal strength on European broadcast is nothing short of miraculous.

Of course there isn't a radio in the world that can't be improved upon. The author doesn't claim that this job is the

perfected instrument for which amateur and DX fans have hunted high and low these many many years. But he does insist that properly constructed it will perform and outperform like nobody's business.

Parts for Receiver

AEROVOX
5 — Type 284, .05 mfd., C3, C21, C17, C25, C11
9 — Type 284, .1 mfd., C2, C5, C8, C9, C22, C23, C31, C34, C37
8 — Type 484, .1 mfd., C4, C10, C24, C27, C33, C16, C46, C47
2 — Type 1084, .002 mfd., C44, C45
2 — Type 1468, .0001 mfd., C12, C15
2 — Type 1460 mica, .00025, mfd., C28, C29
2 — Type PB-25, 5 mfd., C32, C26
1 — Type PB-25, 25 mfd., C35
3 — Type 15 electrolytics (or GGL5), 16 mfd., C40, C41, C42
1 — Type PBS-2, electrolytic, 16 mfd., C43
3 — Type 484, .05 mfd., C30, C36, C48

ALADDIN
1 — A-100-C xtal input, TR-4
1 — A-100 interstage, TR-5
1 — C-350 beat oscillator, TR-7

AMPHENOL
1 — Type S5 chassis receptacle, PC-1
1 — Type CP5 chassis receptacle, PC-2
1 — Type PM5 cable connector
1 — Type PF5 cable connector
4 — Type RSS8 steatite sockets
7 — Type S8 moulded sockets
1 — Type S5 moulded socket for xtal

BLILEY
1 — Crystal, filter type, 465 kc.

CONTINENTAL
3 — ½ watt, 100,000 ohms, R1, R15, R45
2 — ¼ watt, 1 megohm, R46, R47
4 — ½ watt, 50,000 ohms, R12, R48, R21, R26
4 — 1 watt, 2,000 ohms, R6, R9, R16, R10
4 — 1 watt, 50,000 ohms, R18, R23, R19, R11
1 — 1 watt, 100,000 ohms, R29 (or ½ watt)
1 — 1 watt, 250,000 ohms, R30 (or ½ watt)
3 — 1 watt, 5,000 ohms, R26, R2, R22
1 — 1 watt, 40,000 ohms, R4
1 — 3 watt, 30,000 ohms, R5
1 — 1 watt, 50,000 ohms, R7
1 — 3 watt, 15,000 ohms, R13
1 — 3 watt, 600 ohms, R27

CROWE
10 — Type 284 knobs
1 — Type 280 tuning knob
1 — Type 526 Front-O-Panel tuning unit

EBY
3 — Three-point terminal strips
1 — Four-point terminal strip
1 — Type 21-S twin post assembly
3 — SPST rotary switches, SW1, SW2, SW3

ELECTRAD
1 — Type 997 potentiometer, R3
1 — Type 203 potentiometer, R20
1 — Type 573 potentiometer, R49
1 — Type 242 potentiometer, R31
1 — Truvolt, with additional slider, 10,000 ohms, R31

HAMMARLUND
1 — XP-53 coil form, 5-prong for no regeneration or 6-prong with, TR1
1 — XP-53 coil form, 5-prong for no regeneration, 6-prong with, TR2
1 — XP-53 coil form, 4-prong, TR3
1 — Pie-wound r.f. choke, 2.5 m.h., RFC
1 — R.F. choke, 16 or 20 m.h., RFC2
1 — Type MC-75 variable condenser, C1
2 — Type MC-100-S variable condensers, C6, C13
2 — Type APC-50 trimmers (2 for each set of coils) (APC-25s for general coverage, C7, C14
1 — Type MC-20-S, C20
1 — Type MC-50-S, C18
1 — Type MC-50-S or SM-50, C39
1 — Trimmer, 3-20 mmfd., C19
1 — Type FC coupling
2 — Isolantite sockets, 5 or 6-prong
1 — Isolantite socket, 4-prong

INSULINE
1 — Panel, crackle finish, 9" x 17"
1 — Chassis, Electraloy, 10" x 3" x 17"
1 — Chassis crackle finish, for power unit, 6" x 14" x 3"
8 — Small grid clips
2 — Flexible couplings
6 — Standoff insulators 1 9/16" high
2 feet Fenoline rod

JEFFERSON
1 — Type 467-171 output transformer, TR8
1 — Type 463-461 power transformer, TR9 (or Type 465-151, with separate filament supply, for higher voltage)
1 — Type 466-125 filter choke, CH1
1 — Single fuse block and 2-amp. fuse

LENZ
Five-wire shielded cable
50 ft. special r.f. wire
50 ft. colored pushback, No. 20
25 feet black pushback, No. 18

OXFORD
Model 11R speaker with 300-T-1800-ohm field, CH2

RAYTHEON
1 — 6F6
1 — 5Z4
3 — 6L7
2 — 6C5
2 — 6K7
3 — 6J7

TRIPLETT
1 — Milliammeter, 0-5 m.a., M

YAXLEY
1 — Type 1316 switch, SW4
1 — Type 703 jack, J1
1 — Type 703-C jack, J2
1 — Pilot light, 6.3-volt
Insulating washers

MISCELLANEOUS
2 — Black knobs, small
1 — Coupling, ¼-inch shaft to ⅜-inch dial hub
1 — Coupling, brass, ½-inch to ½-inch shafts
Rubber grommets, nuts, machine screws.

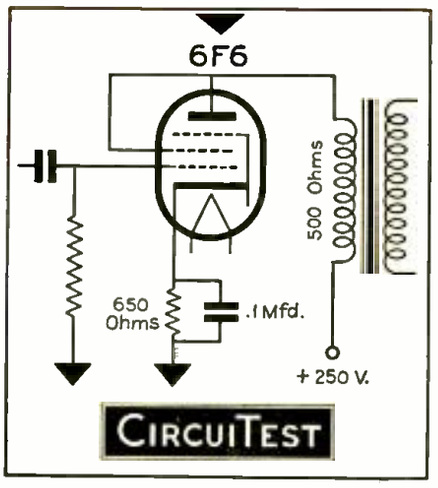
QUERIES

[*Continued from page 570*]

Answer:

Yes—this is quite posisble. In these days of line power radios, few persons have occasion to learn that such things as crystal sets exist. However, they are more widely used than might be supposed, and, as in bygone days, they still provide an excellent introduction into experimental radio.

Crystal sets can be obtained from most of the mail-order houses for from around 58c up—complete except for telephone receivers! These last can be purchased for about one dollar. Considering the cost of the crystal set, it is hardly



worth-while building one—except for the fun of it. In any event, it will be necessary to buy the 'phones and a crystal detector. A crystal detector costs around 12c, which is also the approximate price of a half-pound of bell wire needed for the tuning coil. Wind as much of this wire as you can on any convenient cardboard tube between three and six inches in diameter. (A Quaker Oats box is about right, and has started many a radio fan!) Punch a hole every two or three turns, make a loop in the wire, and force it through this hole, and then continue winding. The loops should be long enough to come out of one end of the box. When the coil is complete, connect it as shown in Fig. 1. That is—

The antenna (as long as possible) is connected to one end of the coil. The crystal detector is connected to the ground and the receivers connected *across* the detector terminals. Scrape the ends of the loops on the coil so that contact can be made to the bare wire. Run a wire from the side of the detector not connected to ground to one of the loops. The crystal is adjusted by moving the spring or cat-whisker from one part of the surface of the crystal to another, and by varying the pressure. The stations are tuned by connecting (tapping) to different loops.

As the crystal receiver operates solely from the current picked up from the radio wave, it is effective only on strong signals, and it is not suitable for distant reception. It is most satisfactory within a few miles of the broadcasting station. However, with a modern super-power transmitter, its range is often extended to well over a hundred miles.

The function of the crystal is similar to that of the vacuum tube. A radio wave consists of high-frequency oscillations which vibrate so fast, that they could have no effect on telephone receivers or loudspeaker, even if they could be forced through the circuit. The crystal by allowing passage to vibrations only in one direction, changes the current to direct current (a one direction current), which passes readily through the 'phones and varies only in strength with the vpice or music.

◆

CIRCUITEST

WHAT IS WRONG with the above diagram? The tube is a 6F6 being used as a Class A triode amplifier for maximum safe output. Impedances and load assumed correct. The tube is rated at 250 volts, 31 milliamperes and a grid bias of 20 volts negative.

How good is your guess—or better yet your insight into radio circuits? Turn to page 591 for the answer.

CHANNEL ECHOES

[*Continued from page 555*]

F. Lindsay, Louis Mayer, Jr., Dick Wright, B. H. Blatchley, Roy E. De-Ment, John Ladue, Robert Schmarder, G. E. Butts, George Diamond, Kenneth Dressler, Ray LeDuc, Merritt Macknight.

◆

THIS MONTH'S teaser is going to be a bit harder, and a free subscription goes to the best and most complete description of the accompanying photograph. This is a picture of a radio's most famous landmark in the early twenties—just before and as the commercial idea began to take hold. About the only person who should be ruled out of this month's contest is Professor Edwin H. Armstrong of Columbia University and of superheterodyne, super-regenerator and frequency modulation fame. Professor Armstrong will probably recall these towers. He ought to. If our memory serves us right, one dark night, well over a decade ago, the professor—then Major Armstrong to the world—climbed one of the towers and posed for a flash-light photograph while standing on his head atop the ball.

The building has long since been demolished.

◆

DR. LOGAN CLENDENNING, physician, surgeon and writer, recently described advertising as "the most stupendous, gorgeous, unbelievable conglomeration of bunk in the world today!" He declared that he had listened to a two-hour commercial radio program without hearing

one statement "which was not, to put it mildly, a gross misstatement."

Dr. Clendenning does not mention which one of the cigarette, cosmetic, soap, soap powder, breakfast food, gelatin, gasoline, tooth powder, tooth paste, anti-pain pills, liniment, coffee, yeast, canned goods, auto tires, alkaline fizzes, beer, drugs, furniture polish, bread, dog food, mouth wash, laxative programs it was.

✦

THE FORD MOTOR COMPANY, after cornering the market (NBC, CBS and Mutual) did an excellent job of the World Series broadcasts. The advertising plugs were short—almost sweet—and certainly objectionable to no one. Ford is consistently the most satisfactory advertiser on the air from the points of view of Brevity and Dignity.

We hereby nominate Franz Lucks as the world's premier sports announcer. It was he who handled the CBS mike for Ford during a large portion of the World Series broadcasts. Certain test conditions made it essential for us to operate two receivers simultaneously during the Giants-Yankees fracas—one of which was tuned to the NBC version and the other to Lucks on the Columbia chain. His description was on the average two seconds ahead of the other announcer who, on one or two occasions, lagged as much as eight seconds behind Lucks.

It was Lucks, who, during the deluge of the opening game, pulled that one about one of the players needing a panoe (3:05 and 50 seconds P. M., Eastern Standard Time). He's heard that story too.

But with all the palms to Lucks, there is no doubt that the virile art of sports announcing has deteriorated. When a perfectly good spit ball has to be described over the air as a saliva ball, Gabriel Heater and the rest had better stick to ping pong.

✦

FOR THOSE WHO like long periods of good music without announceruptions, we recommend an evening with W2XR, New York's high-fidelity station on 1550 kilocycles. While most of the music is canned, you'd never suspect it, as both treble and bass is compensated in the process of transmission.

EMBRYO HAMS

[*Continued from page 565*]

rent will pass through one wire and *only* the direct current through the other wire.

"Routing" Currents

The solution of the problem is shown at A in Fig. 23. The condenser, C, is placed in series with the wire that is to carry only the radio-frequency current (r.f.) and it is given a value of capacity having low reactance to the flow of r.f. current. The r.f. will therefore pass through the condenser with ease (almost as if the condenser weren't there) but the direct current (d.c.) will be effectively blocked since a direct current cannot flow through a condenser. Now in the other wire, through which we wish the d.c. to flow, we have placed a coil having a large number of turns or high inductance value. This type of coil is known as a "radio-frequency choke" and is marked "CH" in the diagram. This coil or choke will effectively pass the direct current but will present a high impedance (reactance plus resistance) to the flow of a radio-frequency current. Therefore the d.c. flows with ease through the lower wire but the r.f. is blocked or "choked" so that it cannot flow through this circuit. The total result is that the d.c. is forced to flow through one circuit and the r.f. through the other circuit.

Now let's assume the same circumstances but in a case where there is a direct current and an audio-frequency current (a.f.) in the output of the vacuum tube. The solution is shown at B in Fig. 23. Since the reactance of a condenser increases with a decrease in frequency (but likewise decreases with an increase in capacity value) the condenser, C, must be of large capacity to permit ease in passage of the a.f. into the branch circuit. Also since the reactance of a coil decreases with a decrease in frequency, a coil having exceptionally high inductance (one with an iron core) would be required in the lower branch circuit to effectively block the flow of a.f. Such a coil (known as an "audio-frequency choke") could be used for this purpose, but a straight resistance, R, of high value, would be sufficient to permit the flow of direct current and yet effectively retard the flow of a.f. for the simple reason that an electrical current will take the path of least resistance, and in the example shown, the path of least resistance (capacitive reactance) for the a.f. is through the condenser, C. Consequently the a.f. will flow through the upper wire and the d.c. through the lower wire, since the d.c. can't get past the condenser.

Division of R.F. and A.F.

Now let us assume that the output of the vacuum tube contains r.f. and a.f. The solution is shown at C in Fig. 23. We know from the previous examples that an a.f. current will have no difficulty flowing through a condenser of high capacity, but neither will an r.f. current. However,an a.f. current will flow readily

enough through an r.f. choke, which has comparatively low reactance at this frequency, but an r.f. current will not. Therefore, if we connect an r.f choke, CH, in series with the high-capacity condenser, C, as shown at C in Fig. 23, the a.f. will flow through the upper circuit but the r.f. will not.

But, the r.f will flow readily enough through the lower circuit to ground because the condenser, C-1, introduced into this circuit has low capacity (reactance of condenser decreases with increase in frequency). But this condenser has a high reactance at low or audio frequencies and in consequence the a.f. current is effectively blocked from this circuit. The result is that only the a.f. flows through the upper circuit and only the r.f. through the lower circuit.

It should not be inferred from what I have said that blocking action is complete. In example C, for instance, some r.f. will get through into the upper circuit and some a.f. will get through into the lower circuit, but the degree in either case would be small if the values of capacity and inductance were correct to satisfy the conditions.

When a coil or inductance is used to retard the flow of an alternating current of low or high frequency, it is referred to as a "choke." When a condenser is used to retard the flow of a direct current or an alternating current of low frequency, it is referred to as a "blocking condenser." When it is used to pass an alternating current of high or low frequency it is referred to as a "coupling condenser" when applied to a circuit such as A in Fig. 23, or a "by-pass condenser" when applied such as C-1 is in the circuit C of Fig. 23.

Well, let me know how this went over. Any points you wish cleared up? I'll take up vacuum tubes in my next letter, and after that we'll get around to complete circuits. We're getting places—or aren't we?

Gerald

NIGHT-OWL HOOTS

[*Continued from page 563*]

increase to 1000 watts. . . . KYW is certain that their application for increase to 50 kw will be granted. When Westinghouse moved the station from the Windy City to Philadelphia a modern 50,000-watt transmitter was designed and manufactured for installation on the new location. Since that time. KYW has been operating with a reduced power of 10 kw. So, if the application is granted, the change can easily be accomplished. . . . C. H. W. Nason of TGW informs us that the Sunday morning programs will continue indefinitely. . . . One of our lady Night Owls, Mrs. A. C. Johnson of Henry, South Dakota "hoots" the following: "KGDY is on the first Sunday of each month from 4-4:30 A.M. . . ." Judging from a report from E. L. Peters of Westport, Nova Scotia, a DXer whose record establishes him as an authority on trans-Atlantic reception, the season this

year ought to be a "humdinger." Night Owl Peters says that his first TA reception this season came a week earlier than any season on record and that Radio Normandie has shown almost incredible strength for so early in the season—in fact the first report contained information on reception for a full hour including time and name of every selection played. This good news coupled with the fact that most TA's will be operating with increased power ought to be some kind of a criterion as to what is to be expected during the next two or three months. . . .

Cheers and Jeers

Three cheers this month go to the Canadian DX Relay for being the only club with sufficient will power to adopt a policy of strictly broadcast band news—and believe the Chief Night Owl, it takes will power or sumpin' to withstand the temptation to sweeten the treasury with dues from the many S.W. fans by enticing them with half or more of a bulletin full of short-wave news. The CDXR will cater only to BCB fans and DXers who join will not have to worry about some day finding the bulletin full of S.W. news—for which we report, *three cheers.*

Three more lusty cheers for the Newark News Radio Club which celebrates its 10th season of activity this winter. Any club which can serve the DX fraternity over such a period and still remain on top is worthy of three of our lustiest cheers.

We have only three jeers this month, but they are loud and juicy and are awarded to station WAAB for its new policy of broadcasting 24 hours a day. They claim the rather doubtful honor of being "New England's *first* 24 hour station." Let's hope this does not mean more are expected to follow suit. If so we'll have to put in an advance order for another carload of jeers!

Illustrations

Verifications illustrated this month are the property of Night Owl Ed Hatch of Philadelphia.

Address all correspondence intended for this column to Ray La Rocque, 135 Highland St., Worcester, Mass.

ANSWER TO CIRCUITEST

FOR MAXIMUM SAFE output the 6F6 should be operated at 250 volts—measured from plate to cathode, not from high voltage source to ground. The drop across the primary of the amplifying transformer, and across the bias resistor will lower the voltage applied to the tube. The indicated voltage should be 285 (285.6 to be exact), not 250 volts. The IR drop across the bias resistor and transformer primary at 31 milliamperes will be 35.6 volts.

MASTERPIECE V

[*Continued from page 569*]

Controls

The controls from left to right are: Volume—Beat-oscillator, sharp, high-fidelity and phono—Volume Expansion—Tuning—Bass Compensation—Band Change (five bands—140 to 70,000 kc)—Treble Compensation.

The tuning control is of the dual-ratio, single-knob type, supplying a very smooth vernier action for one turn in a direction reverse from that in which the knob is moved in rough tuning. The scale is easily read and the pointer set with reasonable accuracy. The receiver is accurately calibrated. A small micrometer dial is mounted behind the tuning knob for precise logging—an arrangement that works beautifully. The approximate megacycle reading is noted on the main dial, and the reading on the small dial added—such as 15.5 plus 22. This setting can be returned to at any time—precisely on the button—greatly facilitating the identification of foreign stations once a creditable list has been logged.

In the opinion of the present reviewer, the splitting up of the conventional tone control into two *independent* bass and treble compensators represents a most noteworthy advance in tonal practice. Only by separate variation of low and high characteristics is it possible to bring in all radio programs and reproduce every record with the highest possible fidelity or with the desired tonal effect. No two programs and no two records have identical audio characteristics, and only by individual bass and treble compensation can these differences be corrected.

Mechanical Characteristics

In justifying the purchase of a receiver in the higher price range, the mechanical construction of the set cannot be overlooked. Certainly it will not be overlooked in the Masterpiece V, as one's first impression of the set is invariably of clean-cut chassis work. As far as the eye can judge (and the ear for that matter) there has been no compromise with quality. The controls work smoothly, without binding, and with adequate leverage.

Summation

Three weeks of experimentation with the Masterpiece V have amply demonstrated that value well in excess of that measured in terms of ordinarily satisfactory performance, can be engineered and built into a receiver. In the tests mentioned, the speaker was mounted behind a four-foot square baffle. (The independent bass and treble controls make it possible to correct the speaker response for any cabinet or any size baffle. Excellent quality can be obtained without baffle of any kind, though there is a danger of overloading the speaker when so operated). The output of the 6L6s is rated practically distortionless at 30 watts—which represents the power of a good public-address system. (Incidentally, the set can be so used in conjunction with a crystal microphone and crystal pick-up. No additional amplifier necessary.)

Our complaints are minor ones. We'd prefer larger lettering on the small control dials, and a more easily read micrometer dial behind the main tuning knob.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of ALL-WAVE RADIO Magazine, published monthly at New York, N. Y., for Oct. 1, 1936.

State of New York, } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Edwin W. Lederman, who, having been duly sworn according to law, deposes and says that he is the Business Manager of ALL-WAVE RADIO Magazine and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Manson Publications Corp., 16 E. 43 St., New York, N. Y.; Editor, Maurice L. Muhleman, 300 Gramatan Ave., Mt. Vernon, N. Y.; Managing Editor, Maurice L. Muhleman, 300 Gramatan Ave., Mt. Vernon, N. Y.; Business Manager, Edwin W. Lederman, 12 East 86 St., New York, N. Y.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given). Manson Publications Corp., 16 East 43 St., New York, N. Y.; Edwin W. Lederman, 12 East 86 St., New York, N. Y.; Maurice L. Muhleman, 300 Gramatan Ave., Mt. Vernon, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state). None.

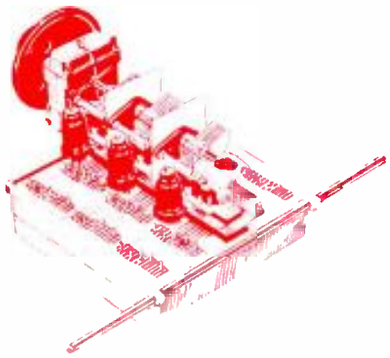
4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

EDWIN W. LEDERMAN,
Business Manager.

Sworn to and subscribed before me this 28th day of Sept., 1936.

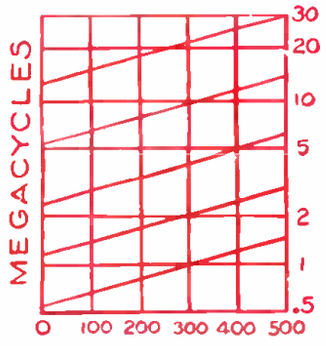
(Seal.) EDWARD H. SNYDER,
(My commission expires March 30, 1938.)

NEW AS TOMORROW!



The Movable-coil Tuning Unit, heart of the NC-100, is an invention that makes it possible to shift plug-in coils by the twist of a knob on the front panel. The illustration above shows the heavy cast aluminum shield containing the fifteen HF coils, each in its own shielded compartment. The turn of a knob slides this shield along its smooth-running track, and locks the desired set of coils into exact position directly below the tuning condenser.

Each of the fifteen HF coils is in its own shielded compartment, and idle coils are completely out of the way. Rugged, silver-plated, side-wipe contacts provide dependable circuit connections of low resistance. Leads are short. Calibration is permanent. For high signal-to-noise ratio, low-loss construction is used throughout. Air dielectric condensers are used for trimming circuits and R-39 is used for insulation.



The calibration of the NC-100 is permanent and precise. The accurate construction of the range-changing mechanism gives validity to the exactness of the Micrometer Dial. Readings are direct to one part in five hundred. The tuning range for any given set of coils is only about 2.4 to one, so that stations are well spread out. Five ranges in all are provided, giving overlapping coverage from 540 KC to 30 MC.

NATIONAL NC-100

12 TUBE SUPERHETERODYNE

There is no need to print testimonial letters on the NC-100, for its design and its performance speak for themselves. It is powerful. It is precise. It is amazingly effective in bringing in weak signals. It is *quality*.

Typical of its advanced design is the Movable-Coil Tuning Unit, which combines the convenient range-changing of the coil switch with the uncompromised efficiency of the plug-in coil. Each of the fifteen HF coil assemblies is a self-contained unit, complete with air-dielectric trimming condenser and low-loss R-39 mounting. Each is mounted in its own shielded compartment; and each, when in use, is brought close to the tuning condenser and the tubes where it is plugged into the circuit by rugged, positive contacts. Idle coils are moved entirely out of the way, completely isolated and thoroughly shielded. There are no dead spots in the NC-100.

Vital to the precision of the tuning system are the geared tuning condenser and the Micrometer dial, with readings, direct to one part in five hundred. Tuning is smooth and logging is accurate. Condenser stators have four-point mounting on bars of low-loss Isolantite, rotors are individually insulated from the condenser frame. Important connections are made with heavy bus wire. Every detail contributes to the constancy of circuit characteristics so essential to permanently reliable calibration.

The circuit also has received its share of attention. For example, separate tubes, electron coupled, are used for high frequency oscillator and first detector. A bias-type power detector and a separate tube for amplified and delayed AVC relieve the second IF stage of the undesirable loading caused by diode rectifiers. From preselector to push-pull output, no pains have been spared to make the NC-100 as outstanding in performance as it is in precision.

Convenient and complete control is an important feature of the NC-100 receiver. Separate Audio and RF Gain Controls, Tone Control, and Crystal Filter controls for Phasing and Selectivity are all brought out to the front panel, as is also the tuning adjustment for the CW oscillator. Switches are provided for cutting plate voltage during transmission, and for rejecting the AVC. But most important of all to the dyed-in-the-wool DX fan are the smooth tuning and precise logging contributed by the Micrometer Dial and the Movable-coil Range Changing.

Drop in at your dealer's and study this unusual receiver. He will be proud to explain its many features to you. Or if more convenient, write for a copy of the illustrated folder describing the NC-100. It is free for the asking, and no coupon is needed. Just send a postcard, saying you are an ALL-WAVE RADIO reader and would like a copy of the NC-100 folder. Be sure to write your name and address clearly.

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