ALL-WAVE RADIO

JANUARY
1936
Vol. 2
No. 1

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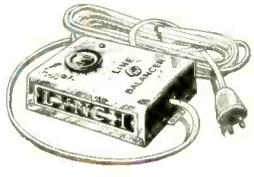

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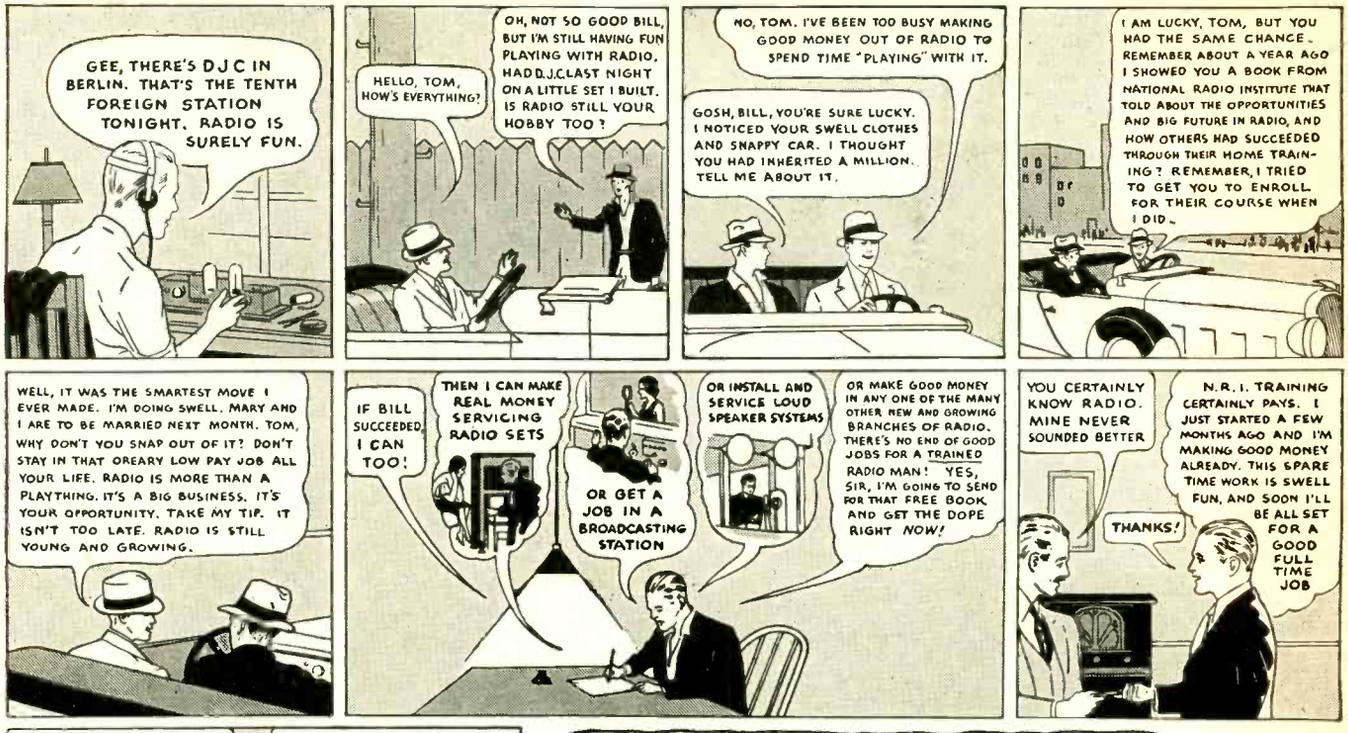

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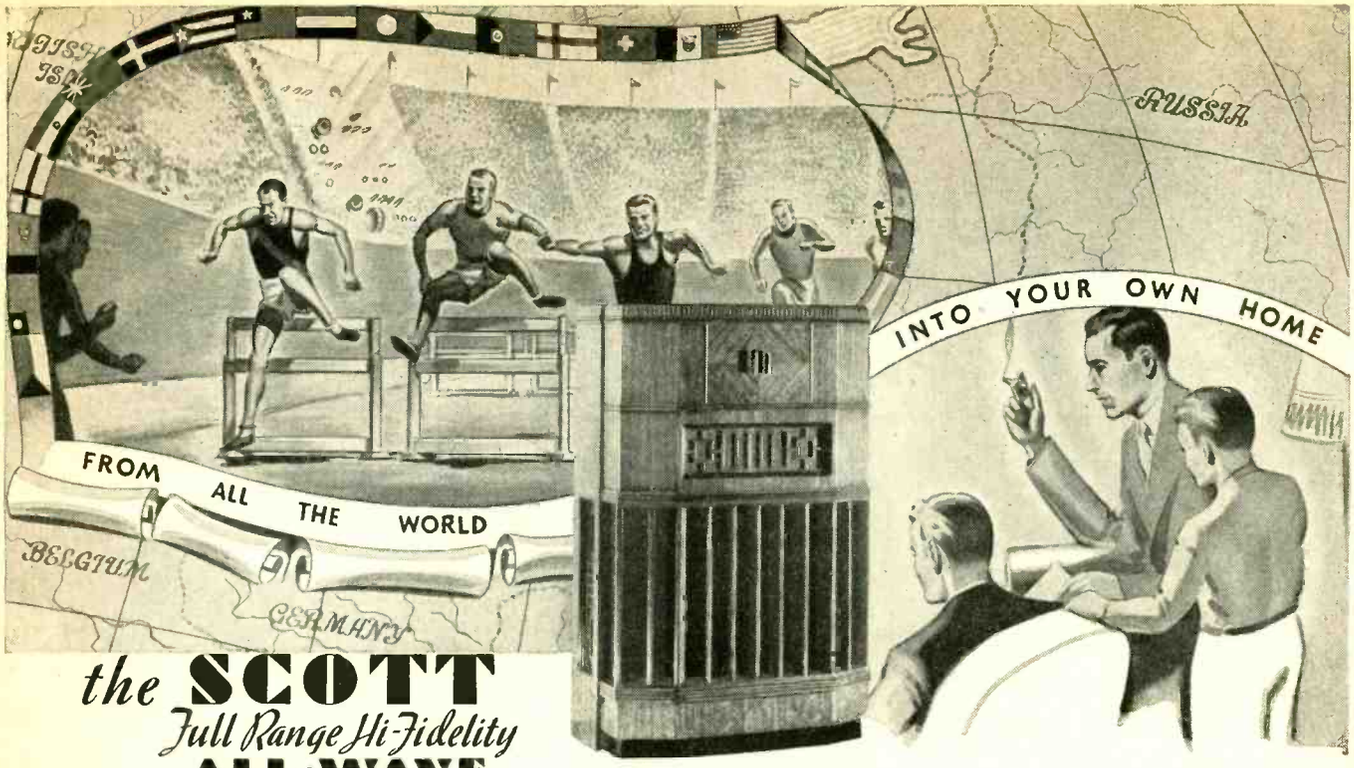

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ALL-WAVE RADIO

VOL. 2 NO. 1

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Cover Illustration

Producing A Radio Play At The Dramatic Control Panel In The Studios of "Broadcasting House," London

(See Page 15)

Features

Departments

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Octal Sockets—All MASTERPIECE IVs are now equipped with the new eight-pin sockets which take either the new Octal-based glass tubes or (still inferior) metal tubes. This change does not mean, in any sense, that we recommend or accept present metal tubes. What it does mean is that if metal tubes later prove successful, your MASTERPIECE IV is ready for immediate change, simply by replacing tubes. Either way, you are assured that the MASTERPIECE IV which you buy now offers you the best in radio . . . today . . . tomorrow . . . next year.

New Detector and Power Tubes—The new 6L7, a better, quieter, more efficient and more selective tube, is now used as first detector. The result is even greater sensitivity, selectivity and freedom from noise. In the power output stages are four 6B5s, increasing undistorted power output from 36 to 40 watts. This increase, in itself, means little . . . the real advantage is a tremendous improvement in already exceptional high-fidelity tone quality.

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+Metal tube merit on short wave is indicated by a measurement made at 10 megacycles, or 30 meters.

Three MASTERPIECE IV tuned circuits alone showed an excellence of 220. Glass tubes connected to them dropped merit to 215—2.3% less. A large number of brand-new and good metal tubes connected across the circuits cut Q or merit to 185—a net loss of 16%! Time, with dirt and moisture would give an even greater loss for metal, but not for glass. 16% loss seems a lot to pay only for metal envelopes on vacuum tubes on short waves!

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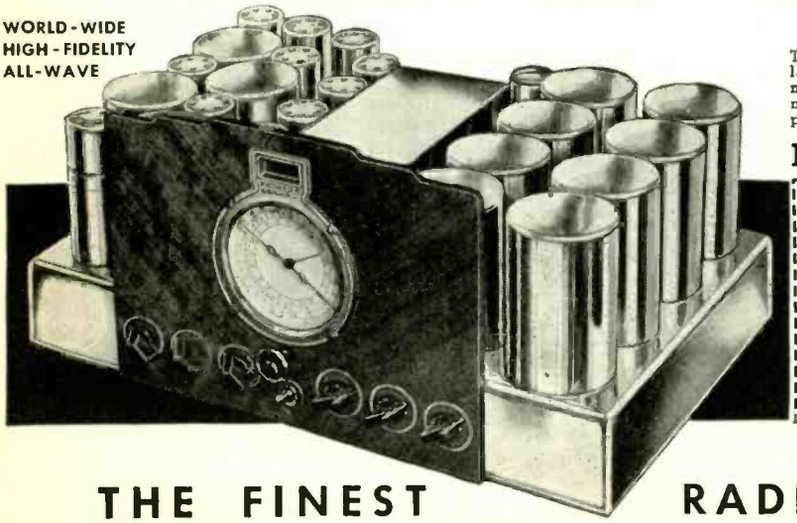

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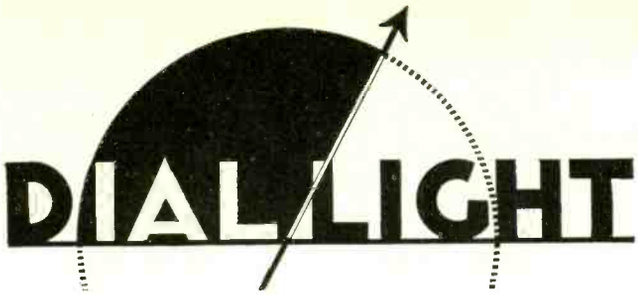


AS THIS ISSUE is going to press, we learn that "The Shadow" has finally been tracked down. According to the reports, this odd form of interference is due to radiation from high-frequency "fever machines" used in hospitals.

We understand that the U. S. Navy radio engineers have experimented with one of these machines, and have found that the radiations from a single machine can cover a radius of 500 miles!

Steps are being taken to place filters in the power lines to these machines. Therefore, it may be assumed that "The Shadow" will soon cease to plague the short-wave bands.

Thus, the belief that "The Shadow" is a foreign government trying out a new form of death ray or radio interference device is knocked into a cocked hat.

❖ ❖ ❖

AMATEURS AND SHORT-WAVE listeners will be pleased to know that the Cuban Government has opened up the 40-meter band to Cuban 'phone amateurs. As of January 1st, this band may be employed by the "CO" fellows as well as the "CM" code boys.

The 40-meter band is not the ideal place for 'phone transmissions, but many foreign amateurs have been using it for some time, and presumably find it satisfactory in spite of the thousands of code stations in this channel.

Keep an ear open on "40" for the Cubans—no doubt a lot of the 'phone boys will take advantage of this band.

❖ ❖ ❖

YOU ARE MISSING a lot if you have ignored the "5-and-10" bands. Five meters has been hot for some time, but it is a short-haul band at best. Moreover, a separate receiver is required to pick up signals in this band (two RCA and G.E. receivers are exceptions) as the average set does not have sufficient gain to operate satisfactorily at 5 meters.

Ten meters is a different story. Though there are few sets, with the exception of late amateur receivers, that will reach this band, most any good superheterodyne of the all-wave type can be redesigned so as to reach 28 megacycles by the addition of the necessary coils for this frequency.

Ten meters is a "borderland" band; that is, it lies between those frequencies particularly advantageous for long-distance transmission and the "optical" frequencies that are theoretically limited to use for transmissions within the optical horizon.

Ten meters is therefore an unpredictable band, although recent experiments on this frequency would lead one to believe that it is similar in characteristics to those of the 20-meter band. In any event, it is quite sensational when in a good mood, and both 'phone and CW amateurs are covering breath-taking distances with low power.

Six months ago, ten meters was almost a dead band; today there are hundreds of amateurs all over the world who are using it consistently, and other amateurs from the 20-, 40- and 80-meter bands are losing no time in priming their rigs for operation on 28 megacycles.

If you pass up ten meters, you are missing a lot of thrills. It is now passing through its worst period, but by spring it will be wide open and working like a charm. Start planning now to get down there as soon as possible.

We would welcome your reports on this band.

❖ ❖ ❖

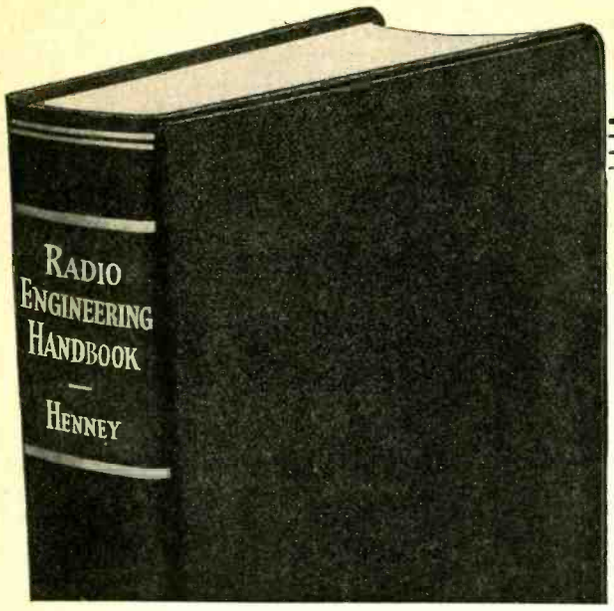
NEXT MONTH WE will publish the complete details of a special variable-selectivity, high-fidelity, all-wave superheterodyne. The receiver is completed and is now under test. Watch for this.

❖ ❖ ❖

WE ALSO HAVE the pleasure of announcing that "The Story of Amateur Radio" will commence in the February issue. This will run to about five installments, and will cover the history, present set-up, operating technique, technicalities of equipment used and, finally, the details of easily-constructd "rigs" that will meet all present-day requirements.

This series is not to be a course in amateur radio, but it will be of special value to the fellow who wishes to break into the game and is now preparing himself for the license examination. We believe that the series will also be of considerable interest to the all-wave listener, as there will be many points in the articles that will be of value to the fellow who listens only.

We believe further that the series will be of immense interest and value to many amateurs who are comparatively new to the field—Hams who have not as yet managed to get the complete "feel" of the game, and who have had some difficulty in shaping their 'phone or CW rigs to their entire satisfaction.



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ALL-WAVE RADIO
FOR JANUARY, 1936

METAL TUBES

ARE METAL TUBES good? How do they compare with glass-type tubes? Have the metal tubes any specific advantages? These questions cannot be satisfactorily answered unless the reader has a clear understanding of the reasons why the metal tube was developed in the first place.

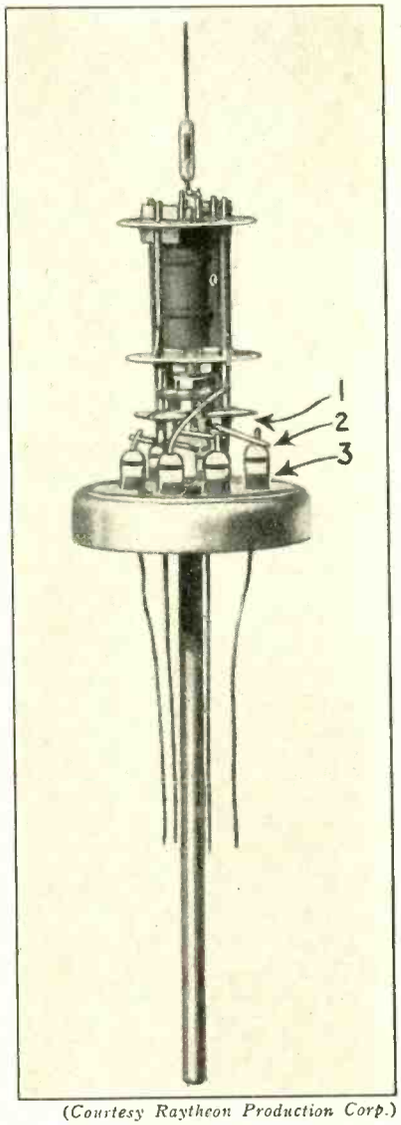
Why the Metal Tube?

Suppose we put the metal tube "on paper" so that we may have a general picture of its mechanical and electrical design, and forget the characteristics of the tube for the time being.

First of all, by replacing the glass envelope of the usual tube with a metal shell, the casing is made to serve two purposes; it is the air-tight enclosure by which the vacuum is maintained, and it is the electrical shield. By virtue of this construction, the tube-and-shield, now combined, occupy less space in the radio chassis. But of more importance is the fact that, instead of permitting the metal shell of the tube to make contact with the chassis in the manner of the glass-tube shield, it is insulated therefrom by the molded base in which the tube prongs are embedded. Thus, the usual multiplicity of high-resistance contacts between tube shield and chassis which create noise, are eliminated. One good, low-resistance contact is provided by connecting the metal shell to one of the tube prongs, inside the tube, and in turn grounding the prong to the chassis through the tube-socket contact. No amount of mechanical vibration of the chassis can cause noise when this arrangement is used.

Static Charges

The metal shell has one other advantage: In a glass tube, the envelope is inclined to collect static charges which in turn create tube noise; in the metal tube, the shell or envelope is a perfect conductor, and being grounded through a prong of the tube, no static charges can build up inside the tube. Stray electrons are carried directly to ground and cannot interfere with the functioning of the tube.



(Courtesy Raytheon Production Corp.)

Structure of the 6Q7. The mica spacer (1) which supports the diodes, is sprayed with liquid ceramic for the purpose of improving insulation. The beads (2) are also sprayed with a liquid ceramic. Small rings of copper (3) are brazed on to the Fernico eyelets to prevent leakage.

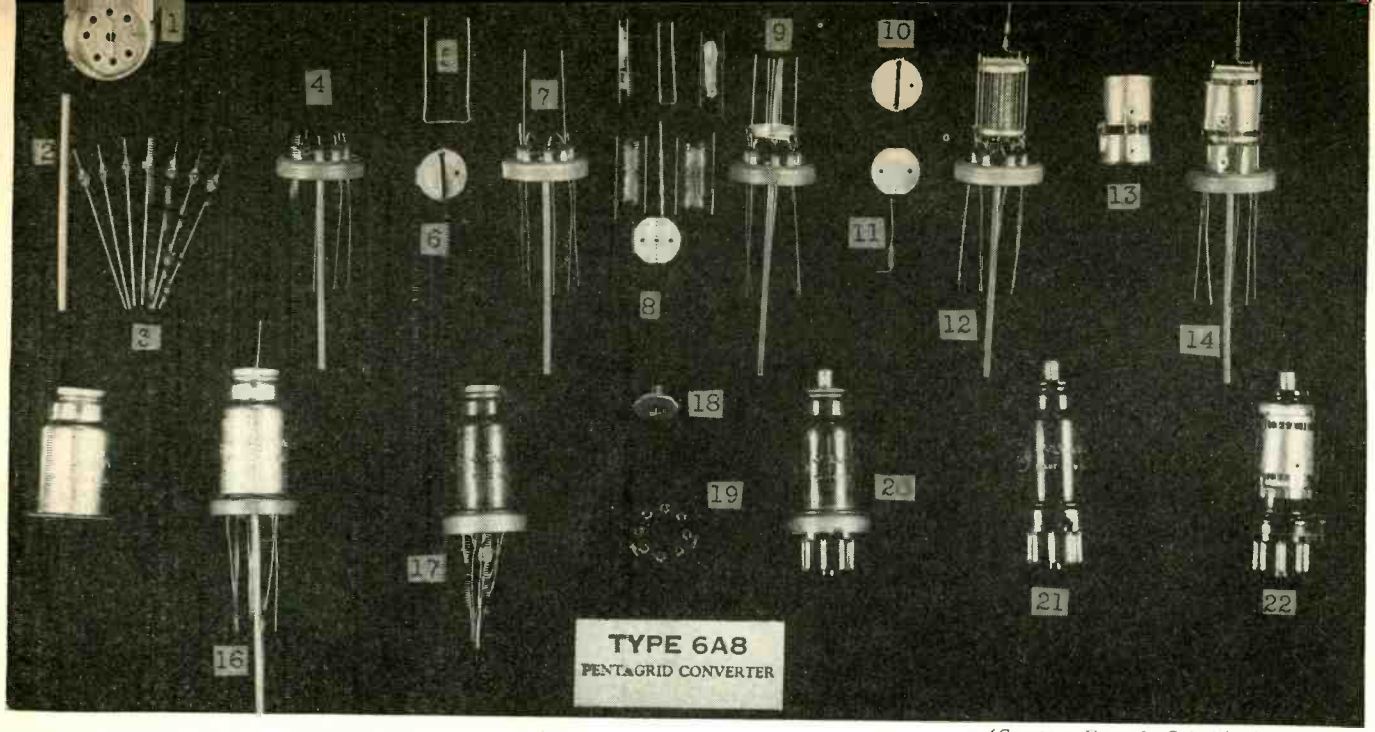
So much for the shell. The next point to consider is the internal construction of the metal tube. It should be observed that the various elements are smaller and that the connecting leads from these elements are not bunched together and led through a glass press, but are run directly from each element down through small glass beads and to the tube prongs. The leads are therefore well spaced, and also very short, because the elements are grouped together near the base of the tube. This arrangement is not possible in the glass-type tube because the elements are supported by the glass press which extends quite a distance up into the envelope.

Less Vibration

By using smaller elements—plate, grids, etc.—the weight of the total structure is less. By mounting the entire structure near to the base or "header" of the tube, there is less leverage, with the result that the structure is less apt to swing or vibrate than if it were located a greater distance from the center of gravity of the tube, as it is in the glass types. Moreover, because the elements are less subject to vibration, closer tolerances may be adhered to and there need not be any heavy or bulky supporting structures.

The use of smaller elements and well-spaced connecting leads in the metal tube has brought about a marked decrease in the inter-electrode capacities. The use of short leads obviously reduces radio-frequency losses and this feature is of particular importance in short-wave reception.

So much for the tube as it is on paper. Now we come to the tube as it is in "real life"—as it is in operation. And this is the point where the reader should have it made clear to him that the metal tube was made to have *approximately the same electrical characteristics as com-*



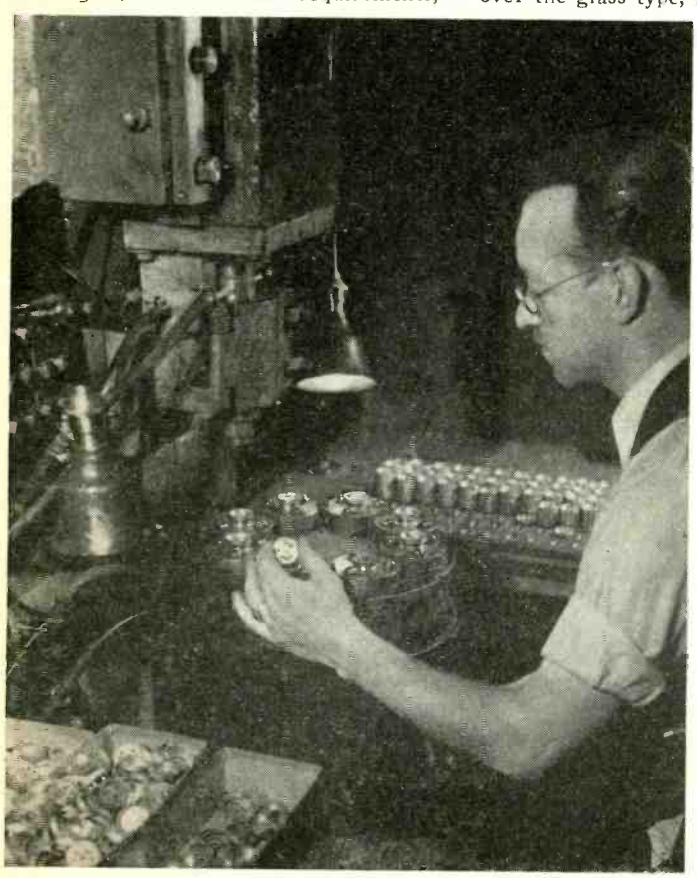
(Courtesy Hygrade Sylvania Corporation)

1. Stem head. 2. Exhaust tube. 3. Stem leads with glass insulating beads. 4. Completed stem. 5. Mount support. 6. Bottom collar. 7. Stem with mount support. 8. Group of 5 grids, cathode assembly and mica spacer. 9. A progressive stage. 10. Top collar. 11. Mica spacer, top cap lead with glass bead. 12. Mount assembled less plate and getter shield. 13. Plate and getter shield assembly. 14. Complete mount. 15. Metal bulb with top cap shield. 16. Metal bulb welded over complete mount. 17. Sealed-in and exhausted tube. 18. Top cap assembly. 19. Octal type base. 20. Completed tube (unpainted). 21. Completed tube (painted). 22. Cut-away view.

parable glass types so that it would not be necessary for receiver design engineers to start designing all over from the ground up. This can be better appreciated when it is understood that tubes with greater amplification factors than the present glass types cannot be effectively used with the state of the art as it is at present. It was only required of the metal tube that it have about the same gain, same heater requirements, etc., as the glass tube; any decrease in tube losses is, of course, so much gravy; any decrease in tube noise is all to the good—but tubes with more amplification than can be effectively used are distinctly not required.

Where Advantages Lie

It is important to remember, then, that the advantages of the metal tube over the glass type, are to be looked for in the *secondary* and not the *primary* characteristics of the tubes. For instance, if a metal tube designed for r-f amplification—such as the 6K7—is compared with a glass-type r-f tube, it will be found that heater requirements, amplification factor, etc., are much the same. But it will also be found that the metal tube has lower inter-electrode capacity, shorter connecting leads and—in the latest types—equivalent input capacity, with the result that though the *amplification factor* of the two tubes may be almost identical, the metal tube may actually provide more *gain* at the higher frequencies or shorter wavelengths—and with less noise, due to its mechanical construction.



Operator welding the Fernico eyelets to the "headers" or bases of metal tubes. This operation takes but a fraction of a second.

(Courtesy RCA Radiotron)

Tube-for-Tube Comparisons

There is one other point to consider in this respect: A metal-tube receiver cannot be compared tube-for-tube with a glass-tube set, for in the latter type the functions of detection, avc and a-f voltage amplification are assumed by a single, multi-purpose tube, while in all metal-tube sets so far produced, a separate tube is used for detection and avc. Therefore, a set having 7 metal tubes is equivalent to a glass-tube set having 6 tubes. In one instance, therefore, it is not correct to assume that a metal-tube set having 7 tubes is better than a glass-tube set having 6 tubes, nor in the other instance to assume that the 6-tube set with 6 glass-type tubes is superior because it has one less tube and yet operates just as well as the receiver with 7 metal tubes.

As a matter of fact, direct comparisons between metal- and glass-tube receivers can be made only where the

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THE RADIO YOU BUY

By G. S. GRANGER

Radio is no longer the haphazard business it was some years ago. Standardization and syndicated engineering have brought about stability and greater "dollar value"

Sound pressure room utilized by the Hazeltine Service Corporation for measuring the output characteristics of loudspeakers and complete radio receivers.

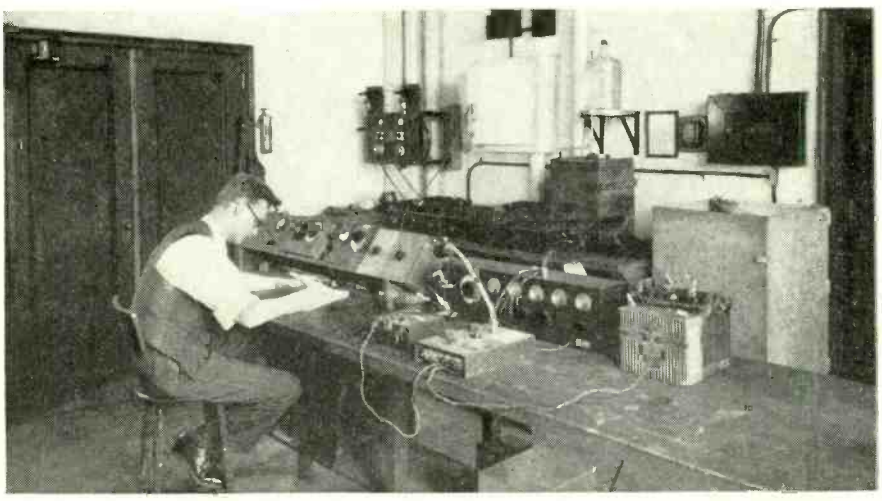
JUST HOW GOOD is the radio you buy? Is it as good as a competitive make—is it as modern in design? Is it as sensitive, as selective, as pure of tone? How may one know?

The answers to these questions are the basis of a most interesting story of an industry that has risen full-grown from the small, haphazard business it was some ten years ago, to one that is, today, so well organized that it is in a class with the automobile industry.

When I say that the radio-and automobile industries are in the same class, I am not referring to size, but rather to the fact that both businesses have resorted to well-defined engineering standards in the manufacturing or fabrication of their products.

Specification Levels

No doubt you have observed that in the automobile industry, there is a level of engineering excellence below which no manufacturer goes. The low-priced car of today has the acceleration, the braking power, the silent gears and the engine efficiency of the higher-priced car, and it is obvious to the interested buyer that no matter how little or how much he pays, there are certain specifications guaranteed him.



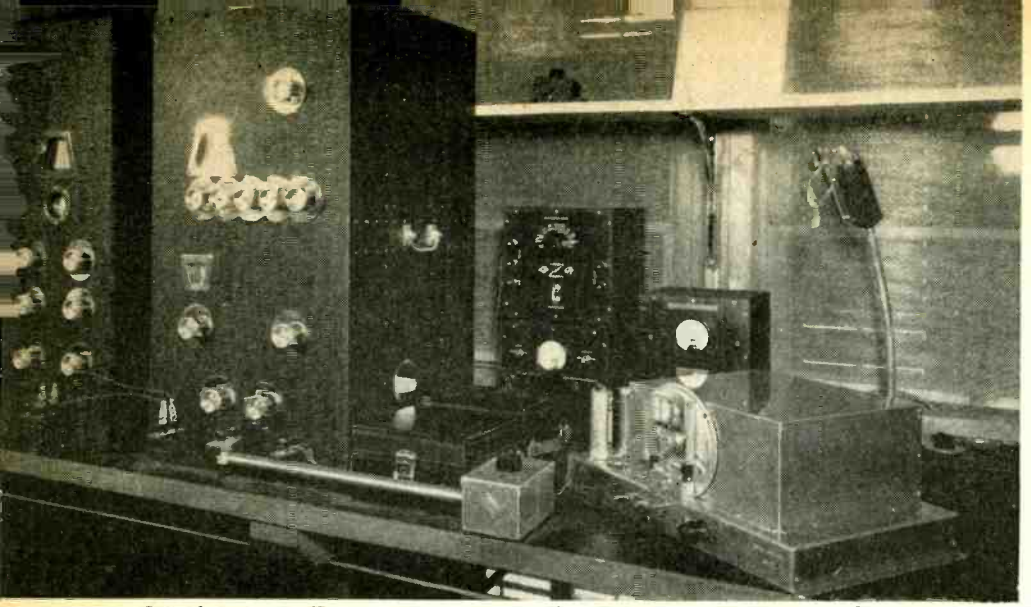
The "Superheterodyne Room" in the Hazeltine Laboratories, where studies are made of intermediate-frequency transformer designs, oscillator systems, etc.

Somewhat the same principle is followed in the radio field, and here again the interested buyer soon learns that even the midget receiver is capable of supplying a whale of a lot for the money.

And though both industries have set certain standard specifications for their products, it is true in both cases that you get just what you pay for—no more, no less.

In the automobile, superior operation is gained through the addition of weight; that is, the chassis is heavier, the engine has greater horse power, the wheelbase is greater, the wheels larger, and so on. Then, there may be added to this "superior operation," the advantages of long life, fool-proof operation and greater precision, gained by the addition of quality and superior workmanship to the materials or "weight." And, so, for each additional advantage over and above the lowest level of specifications, the buyer pays just a bit more.

The same principle is applied to the fabrication of radio receivers, but superior operation is gained in other ways. Weight, of course, is one rule by which to go, although it is not as satisfactory a gauge as it is in the automobile. This is



Complete over-all measuring room in the Hazeltine Laboratories. The room is completely shielded.

so because all radio receivers are not designed to serve identical purposes, and a really superior receiver of the "commercial" type may weigh less than a much cheaper set designed for general broadcast reception.

Tubes As Gauge

The primary gauge in the determination of the excellence or value of a radio receiver is the number of tubes employed. The cheapest set may have but four tubes; another set hardly larger or weighing much more than the four-tube set, may have six tubes, and because there are six tubes used, the set will have better tone, and possibly greater power output, but if not greater power, a higher degree of sensitivity and selectivity.

Then, as the tubes increase above five or six, weight becomes a factor, and also the diameter of the loudspeaker.

And so it goes, the greater the number of tubes and the larger the speaker, the more the set will accomplish—and the more it costs. But do not forget that the little set can accomplish a great deal—probably more than the larger set if the characteristics of the two are plotted against cost.

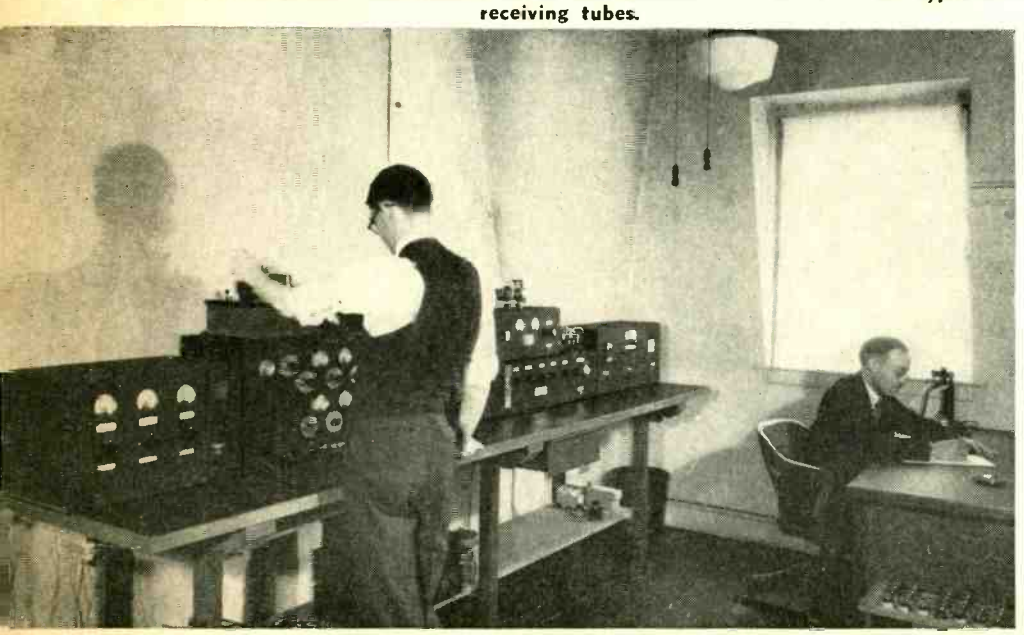
I shall return to this point later in the article, but, for the present let us turn to the engineering and manufacturing set-up in the radio industry.

Syndicated Engineering

Some years ago, radio manufacturers employed engineers to do practically all their design work. The result was, of course, that there were wide differences in receiver design, and wide differences in operation as well. That condition no longer prevails; manufacturers still employ receiver-design engineers who contribute materially to the excellence of the receivers produced, but practically every bit of the basic circuit design in modern receivers is the result of syndicated engineering.

This condition has come about through the formation of patent-holding organizations and the institution of large research laboratories. The latter have been set up specifically for the purpose of developing the various phases of radio and selling the improvements to radio-receiver manufacturers. The charge for these services must naturally be within reason if the cost of the radio receivers to the public is to be kept at a point where the buyer gets exactly what he pays for. Consequently, the charges are made low and spread over wide territory by the simple and highly advantageous expedient of syndicating the engineering developments of the organizations.

Room in the Hazeltine Laboratories where measurements are made on all types of receiving tubes.



Engineering Services

After a time, these research laboratories naturally become patent-holding companies as well, and the usual procedure then is to license radio manufacturers to use the patents, the fee for the license also providing the licensee with the privileges of complete testing of equipment before it is placed on the production line.

These practices are highly satisfactory in every respect. Many of the major advances in receiver design have come from these laboratories, and because they are syndicated in the manner outlined, they are made available to the public in practically every receiver of reputable manufacture. Moreover, were it not for the activities of these organizations, whose engineers are not hampered by commercial considerations, it is doubtful if receiver design would have reached the high point it has in the past few years.

The most notable organizations in this highly specialized field are, the RCA Licensing Laboratories; the Hazeltine Service Corporation; Amy, Aceves & King, and the Revelation Patents Corporation. These organizations serve the majority of radio-receiver manufacturers in the United States, and many foreign radio corporations as well.

The Tube Companies

There may be added to this list of organizations serving the radio receiver manufacturers the names of the larger radio tube companies. The tube companies employ corps of engineers who do nothing but develop circuits for the different types of tubes and study the characteristics of the tubes with a view to having them applied in a manner whereby the greatest efficiency may be obtained. These engineers may find, for instance, that a new tube, such as the 6L7 pentagrid converter, will operate more efficiently at the shorter wavelengths if the bias on the tube is reduced from the normal value. When data of this sort is coordinated, it is forwarded to the receiver design engineers employed by the receiver manufacturers who are free to apply the data.

The independent research organizations work in much the same manner, but

engineering reports on new circuit and tube developments are supplied only to licensees who are, of course, free to apply the information to their own set designs.

It is interesting to observe what this form of syndicated engineering has done for the home radio receiver. Out of 300 circuit diagrams reviewed by the author, the basic circuit design was almost identical in each and every one. Out of 1400 diagrams reviewed, basic circuit design was the same, but many of the circuits contained additional features, most of which were the developments of design engineers in the manufacturing plants. Yet, of all 1400 reviewed, every one had the stamp of engineering syndication.

design engineers employed by the manufacturers.

What Dollars Buy

Now I shall return to that interesting subject, "What the manufacturer puts in the receiver you buy." Does he overstep the mark and give you more sensitivity or selectivity or tone or power than your dollars should buy? Or less? Not by a long shot! The manufacturer operates on such a small margin of profit —as do the manufacturers of autos and other quantity-production products—that he cannot afford to give you more than your money's worth, but he will see to it that you get what you pay for if he is a reputable manufacturer.

and for $100 an attenuation of around 40 db.

When it comes to total audio output, $20 will buy about 2.5 watts; $50 will buy about 5 watts, and $100 will buy from 8 to 11 watts, depending upon the type of power amplification employed.

You won't start getting any great improvement in audio-frequency range until you hit the $100 mark, and if you want the very best in this respect, the price would be nearer $200. This is due to the fact that in order to obtain a wide audible frequency coverage, it is necessary to design the complete receiver to meet that purpose—not just the audio-frequency amplifier, but everything from the antenna transformer right through

Testing radio receivers for distortion at the RCA License Laboratory. Special equipment for checking tonal fidelity is used.

Peas In a Pod?

It might be presumed that this form of syndication would make radio receivers like so many peas in a pod but, odd as it may seem, it doesn't. There is still sufficient engineering individuality in the plants of the manufacturers to make a large difference in receiver characteristics. For instance, one of the large research organizations developed a particular type of high-fidelity circuit and supplied the information to its licensees. Practically every one of the licensees came out with high-fidelity sets having as a basis the germ of the idea provided them, but each licensee obtained the desired result in a different manner! Thus demonstrating not only the value behind the syndication of engineering data, but also the individuality expressed by the

Each manufacturer will have his own standards, but on the whole these standards are on about the same level. If a set is to retail for $20, the manufacturer can put into the set just so much sensitivity, just so much power and so on. He may skimp on sensitivity if the set is to be sold in metropolitan areas, but he will use the extra pennies for boosting power or improving tone. It all depends . . .

Take sensitivity as a beginner: For $20 you will probably get sensitivity in the neighborhood of 300 microvolts; for $50, about 90 microvolts; for $100, about 5 microvolts.

As for selectivity, $20 may bring you an attenuation of 10 to 15 db; $50 an attenuation of 30 db (twice as good for slightly more than double the cost in a receiver that has other improvements);

to the special loudspeaker or loudspeakers, as the case may be.

Band Coverage

Band coverage is another item that costs money. A twenty-dollar bill won't buy an all-wave receiver, but it will buy a two-band receiver or one of the extended band type. A fifty-dollar bill will provide you with a set of the three- or four-band type, covering everything from about 16 meters up through the broadcast band. If you want more than this—though few people do—the price will obviously be proportionately higher, or some other service the set renders will have been reduced in its efficiency to make up the difference. It may only be the power amplifier and the loudspeaker,

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A PRE-TUNED HIGH-FIDELITY

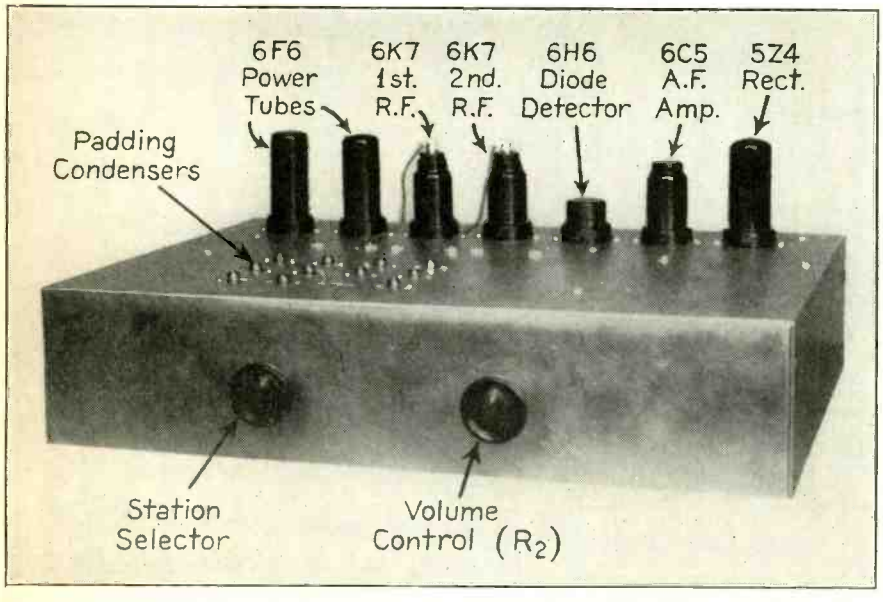
A SET FOR QUALITY RECEPTION OF LOCAL BROADCASTING STATIONS

By J. A. WORCESTER, Jr.

THIS RECEIVER was developed for the average listener in or near large metropolitan centers where three or four stations furnish most of the program material. High fidelity is stressed by eliminating the main sources of distortion present in the customary receiver, and by using a high-quality loudspeaker in conjunction with a good push-pull, Class A, audio amplifying system. The tuning circuits are pre-tuned so that any one of four local stations may be automatically selected by merely rotating a selector switch. This, of course, not only results in greater convenience, but prevents the common practice of inaccurate tuning when stations are hurriedly tuned with the usual gang tuning condenser system found in ordinarily available receivers. This latter maladjustment results in serious cutting of the sidebands of the received signal with a consequent loss of high audio-frequency response. This fact —that the average listener frequently does not take the pains to accurately tune in a station—is a major drawback to the successful introduction of the high-fidelity receiver.

Tuned R-F Circuit Used

Since reception is to be confined to powerful local stations, sensitivity and selectivity are of secondary importance, thus making practical the use of the simple tuned r-f circuit. This greatly simplifies the construction and eliminates the distortion introduced by the usual superheterodyne receiving system. This distortion takes the form of sideband cutting in the i-f amplifier which can only be eliminated by the use of carefully adjusted overcoupled transformers. These, unfortunately, require equipment for their proper adjustment quite beyond the financial capabilities of the average constructor. Automatic volume control introduces several possible pitfalls for the lay constructor and hence was eliminated in this receiver. At best it would prove an unnecessary refinement, as fading caused by Heaviside layer variations would, of course, be absent in this type of receiver which is designed for stations sufficiently close to provide a strong ground wave only.



The completed Pre-Tuned High-Fidelity Receiver. The loudspeaker may be mounted on the chassis. Note the adjusting screws for the padding condensers.

The "Pre-Tuned" System

Before considering the constructional details of the receiver, it may be advisable to discuss briefly the design principles incorporated. From a casual inspection of the schematic diagram, it is evident that the four stations are selected by varying the capacity in the circuits. It will further be noted that the r-f portion of the receiver consists of two stages of iron-core, transformer-coupled amplification. The output of the r-f amplifier feeds a diode detector. Although one stage of r-f amplification would probably have sufficed for this purpose, it would be necessary to work the amplifier at maximum possible gain, which would undoubtedly introduce instability difficulties to the inexperienced constructor. The use of two stages operated at somewhat less than full gain results in substantially greater overall amplification and at the same time provides stable operation. Volume is controlled by means of the variable resistor, R2, which effectively varies the bias on the grids of the two 6K7 r-f tubes.

The R-F Transformers

Iron-core antenna and r-f transformers were employed to provide greater selectivity than could be obtained by the use of conventional air-core designs. However, if iron-core transformers are not available, ordinary air-core types may be substituted and will be entirely adequate if interference difficulties are not serious. It is best to employ transformers having primaries resonating below the lowest frequency covered in order to provide substantially constant amplification over the broadcast band.

The Padding Condensers

It will be noted that station selection is effected by switching suitable capacity sections across the transformer secondaries. Each section is made up of a fixed and a variable unit. The variable units consist of 50-mmfd air-tuned variable padding condensers mounted as shown in the photographs. If necessary economies prevent the use of air-tuned condensers, mica ones may be substituted. In this connection, however, it is necessary to point out that variable mica trimmers do vary somewhat with temperature and humidity and consequently may drift out of adjustment, causing loss of gain and some distortion. In view of this, it is evident that the air-tuned variety should be used if at all possible.

RECEIVER

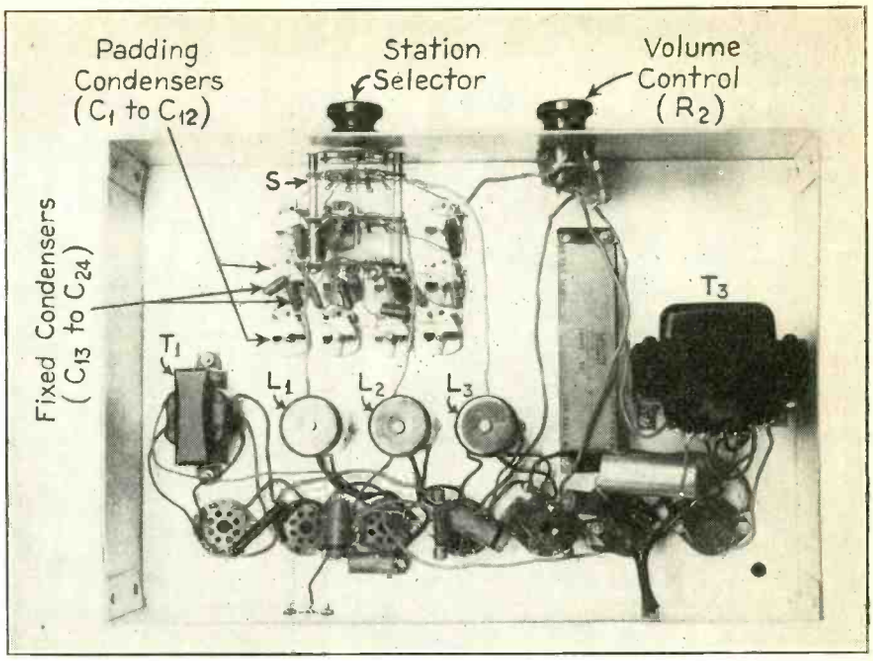
Likewise, it is essential that the fixed trimmers be of low power factor design. The best way of insuring this requirement is to use condensers of known quality. The value of the fixed units will, of course, depend on the frequency of the stations it is desired to receive. Below is a table for determining the correct value of fixed capacitor for any station in the broadcast spectrum:

Fixed Trimmer	*Frequency Range (KC)*
None	1060-1500
50 mmfd	870-1060
100 mmfd	760- 870
150 mmfd	680- 760
200 mmfd	620- 680
250 mmfd	580- 620
300 mmfd	540- 580

It is obvious, of course, that if the desired station is near the extremities of the above ranges, it may be necessary to employ the next value due to manufacturing tolerances in the condensers as well as variations in the stray capacity of individual layouts. The selector switch employed with this switching system is of the non-shorting type.

Alternative

Although the writer does not generally favor the discussion of alternative arrangements, he feels that another almost similar switching system is worthy of some comment as it has the advantage of eliminating the necessity of employing fixed trimmers in conjunction with the variable elements. This alternative system essentially comprises the use of 100-mmfd variable air trimmers, instead of the 50-mmfd variety, and the shorting type of switch. In adjusting this system the highest frequency station to be received is tuned in with the first section. Rotating the switch one step tunes in the next to the highest frequency station it is desired to receive by adding the correct amount of capacity to that used in the first position. In some locations the stations received may be spaced so that this system will not work. This will only be the case when two or three of the stations are bunched closely together and the other remotely separated. If the stations are rather evenly separated this system should work very satisfactorily.

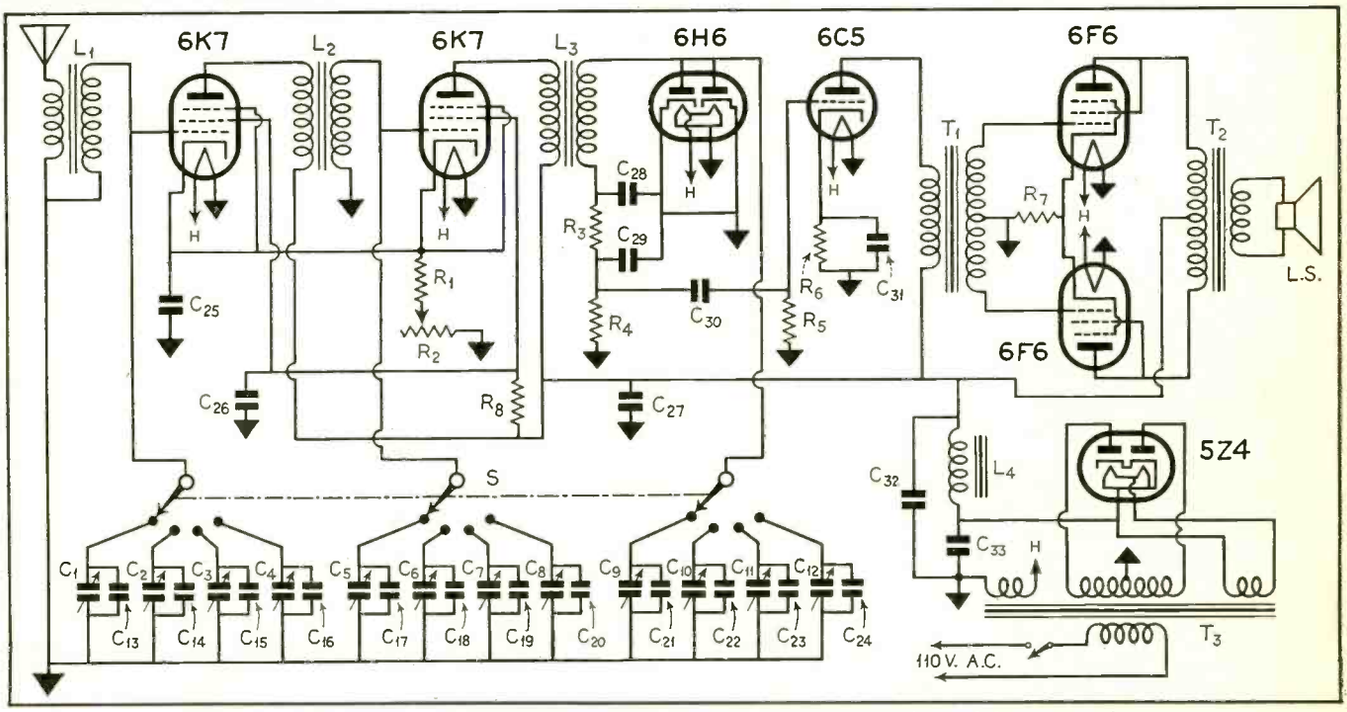


Bottom view of the chassis, showing locations of padding condensers, r-f transformers, power transformer, etc.

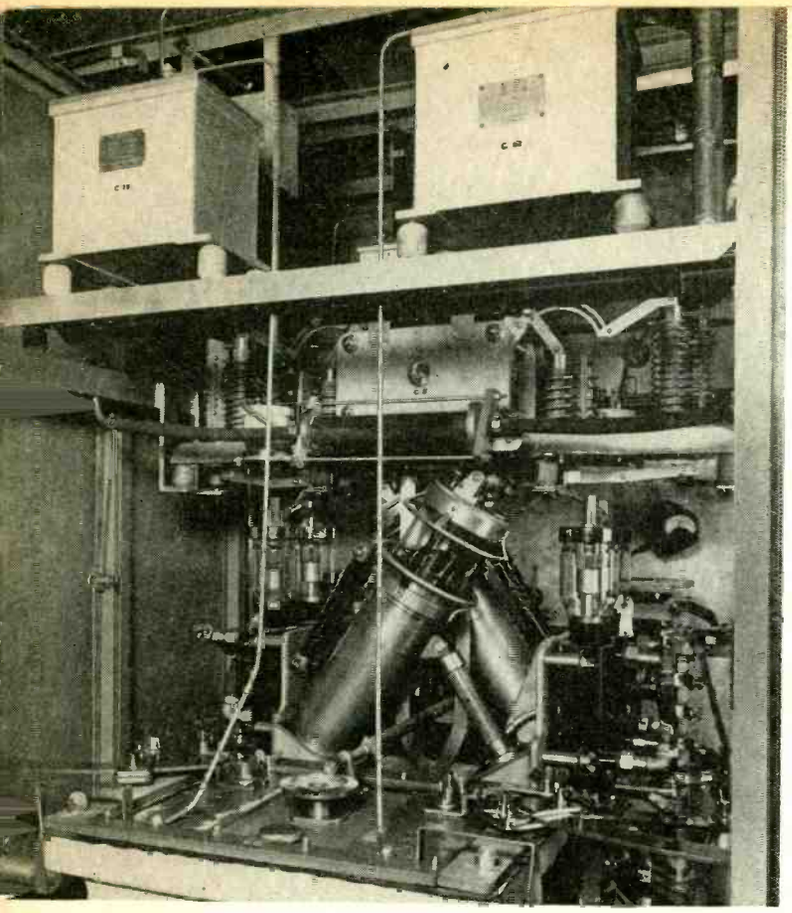
Audio System

As can be seen from an inspection of the schematic diagram, the audio system consists of a triode driver (6C5) and a pair of 6F6's triode connected and operated in Class A, push-pull. The interstage coupling transformer should be of as high a quality as the constructor can afford.

The power supply is entirely conventional and needs no detailed comment. The speaker field is used as the filter



The schematic diagram of the Pre-Tuned High-Fidelity Receiver. See Legend for parts values.

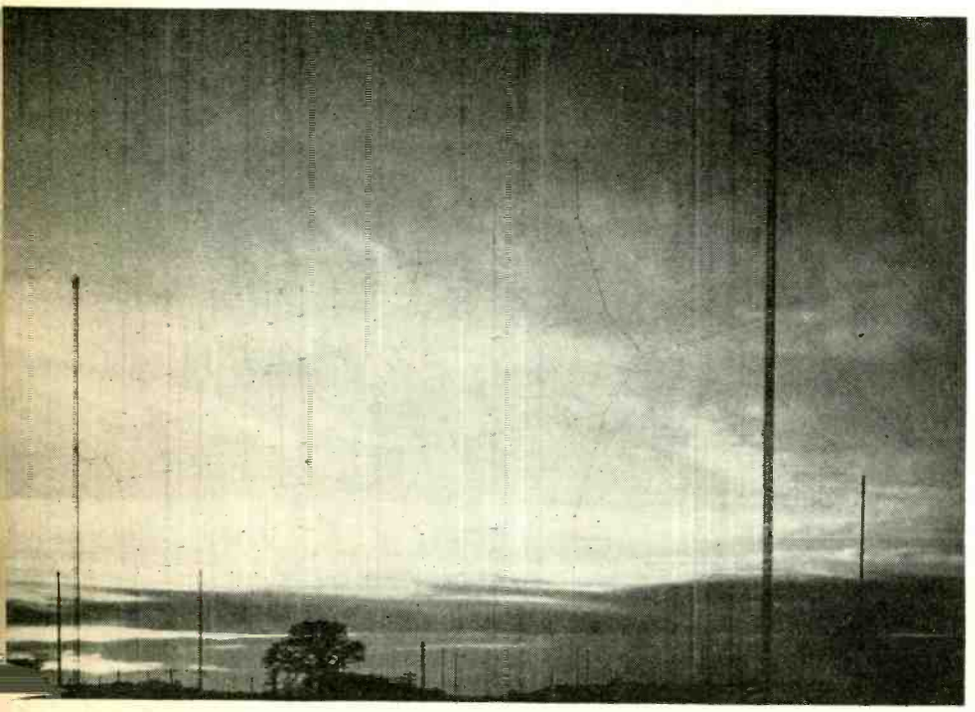


Interior view of the power output stage of the Empire Broadcasting Station transmitter.

Technical Consulting Committee for Radio Communications, i.e., an error not exceeding plus or minus one part in 10,000. Actually, quartz crystal drives are used, giving a better performance than this (to wit, one part in 25,000) and in order to permit the necessary flexibility of operation of the two transmitters on eleven wavelengths, some twenty-four separate crystals are provided.

It might seem that an exacting specification for frequency characteristic of the modulation system of the transmitters would not be necessary, since conditions of short-wave reception, particularly during times of differential fading, are generally, unfavorable to the reproduction of high musical quality. The Daventry transmitters have, however, a very good overall frequency characteristic, similar to that of modern medium-wave broadcasting transmitters, so that the best quality may be obtained when reception conditions are good. It is important that a high mean degree of modulation should be employed, in order to give the best possible chances of reception, and the transmitters were designed to be capable of a high peak modulation without distortion.

The antenna system at Daventry. The 31-meter aerial is on the left, 25-meter aerial center, 49-meter aerial on the right.



The Aerials

Initially, eleven directional aerials and six omni-directional aerials were provided, the former giving transmission in selected directions to serve the five zones into which the Empire was originally divided for Empire broadcasting purposes.

During October 1933, changes in the arrangement of the transmissions were made, since it became increasingly obvious that the zonal basis, as an indication of the geographical areas of reception, was unsuitable. Reports were received on the reception in the West Indies of the so-called Indian Zone program, and of reception in New Zealand of the African Zone program. The daily transmissions from the Empire Station are now divided into six periods known as Transmissions 1, 2, 3, 4, 5 and 6, of which you are undoubtedly familiar.

In designing a system which relies for its success on the use of short waves, it is desirable to make the system as flexible as possible, and accordingly the aerials originally installed at the Empire Station were simple in construction, supported by masts 80 feet in height.

With the development of the service, experiments have been carried out using types of aerial different from those initially installed, and the results obtained so far as most promising. Further changes and additions to the aerial system are made from time to time as experience shows them to be necessary.

In general, the results of the experiments have indicated that the use of high aerials at Daventry gives better reception conditions than the use of low aerials, and that the question of the correct choice of polar diagram of the aerial in the vertical plane is at least as important as the correct choice of polar diagram in the horizontal plane. While this latter point has long been appreciated for point-to-point service, it was not known whether similar principles could be applied to a broadcast service.

Wavelengths and Frequencies

Until several years ago, there were only two groups of waves generally used for broadcasting. These were known under the names of "long waves" and "short waves." Subsequently shorter wavelengths have come into use for broadcasting, making it necessary to use the term "medium waves" for the original short waves, and to define the newer short-wave bands as "short" and "ultra-short."

The generally used designations for broadcasting waves in England are now as follows:—

Long Waves

150-300 kc (2,000 to 1,000 meters)

Medium Waves

550-1500 kc (545-200 meters)

Short Waves

6,000-30,000 kc. (50-10 meters)

Ultra-short Waves

Above 30,000 kc (below 10 meters)

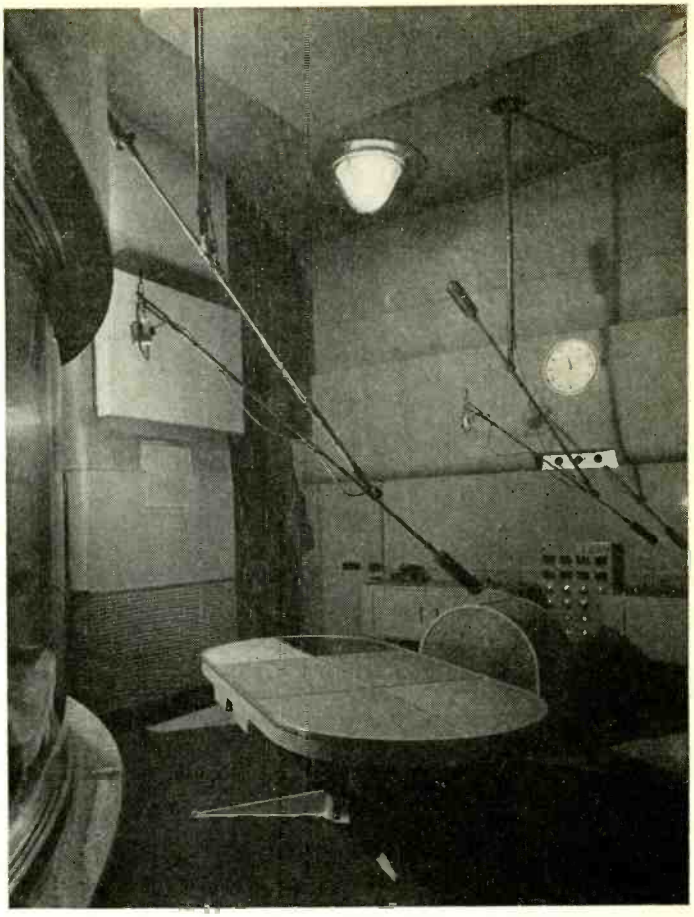
The transmissions from the Empire Station are made within the band of short waves, namely between 6,000 and 30,000 kilocycles per second, that is between 50 and 10 meters.

Seven short-wave bands within the above limits have been allotted to broadcasting. These are of different widths and are in the neighborhood of the following waves:—

6,000	kc	(50	meters)
9,500	"	(31.6	")
11,769	"	(25.5	")
15,150	"	(19.8	")
17,750	"	(16.9	")
21,500	"	(13.95	")
26,000	"	(11.54	")

The actual waves which have been notified for use by the Empire Station, together with their call-signs and the words used to facilitate identification over the microphone, are as follows:—

	kc.	meters
GSA A for Aerial	6,050	49.586
GSB B for Broadcasting	9,580	31.315
GSC C for Corporation	9,580	31.297
GSD D for Daventry	11,750	25.532
GSE E for Empire	11,860	25.284
GSF F for Fortune	15,140	19.815
GSG G for Greeting	17,790	16.863
GSH H for Home	15,260	19.659
GSI I for Island	21,470	13.972
GSJ J for Justice	21,530	13.934
GSK K for King	26,100	11.494
GSL L for Liberty	6.6110	49.110



Special dramatic-effects studio in "Broadcasting House." (Illustrations on these pages by courtesy of the B.B.C.)

The "Queen Mary's" Radio Equipment

THE "QUEEN MARY," new Cunard White Star superliner, will make use of a total of 32 different wavelengths, made necessary by the extraordinary scope and power of the ship's radio equipment which will link the ship at sea with all the world. The wavelengths used will be divided up as follows: 11 for short wave, 9 for radiotelephony, 7 for long wave and 5 for medium wave.

Nine Aerials

For operation of these wavelengths there will be at least 9 separate aerial systems comprising one main aerial having a length of 600 feet, 1 auxiliary aerial with a 150 foot span, 3 short wave aerials, 3 receiving aerials and 1 emergency aerial.

The elaborate radio installation of the "Queen Mary" is necessitated by the variety of operations aboard the ship involving radio. Every modern device for facilitating the reception of wireless or radiotelephonic communication will be installed so that the "Queen Mary's" radio station will be comparable in equipment to that of the largest and most modern land stations and, in fact, will be operated on largely similar lines.

Dual Radiophone System

Not only will there be a ship-to-shore radiotelephone but the equipment will be duplicated so that it will be possible for two passengers to speak simultaneously, in one case to a friend in New York, and in the other to someone in London or Paris. Radiotelephone booths will be provided in suitable positions on the ship, but the ship-to-shore telephone can also be hooked up with any of the 500 staterooms on the telephone system of the ship, depending on the preference of the passenger making or receiving a call. By means of the "Queen Mary's" powerful radio-telephone, passengers will be able to converse with friends anywhere in the civilized world.

The receiving station of the "Queen Mary" is situated on the boat deck between the first and second funnels and the control of the entire radio equipment is concentrated at this point. This structure occupies an area of approximately 800 square feet and within it will be found eight operating positions, the radiotelephone exchange, the emergency installation and the chief accepting office for the radiotelegrams of passengers.

Typewriters and high speed machines for transmission and reception are provided for the handling of messages and telephones are installed for communication with the Bridge and other important positions. A particularly interesting feature of the radio installation is the remote control of the transmitting station by the staff stationed in the receiving station.

Duplex Operation Provided

The transmitting station is located 350 feet further aft than the receiving station to permit of simultaneous transmission and reception of signals without mutual interference. The transmitting station contains four large transmitters, each of which will be capable of maintaining continuous communication with both sides of the Atlantic throughout the voyage.

Each of the wireless operators on duty

(Turn to page 46)

VOLUME EXPANDER AMPLIFIER

A Dynamic Amplifier of the Variable-gain Type Which Provides a Volume Extension on Phonograph Music of 20 Decibels. Complete Circuit Details Are Provided

By C. M. SINNETT

Engineering Dept., RCA Manufacturing Co.

THE DESIGN of equipment for reproducing music for entertainment in the home and in auditoriums has always met with serious problems dealing with limitations in dynamic range as well as frequency range. The limitation in frequency range has been somewhat overcome in the past few years. To date, however, no equipment for home use has succeeded in reproducing the dynamic range of a large symphony orchestra.

We learn from our study of music that a wide range of frequencies is often encountered in the rendition of a musical selection; the lowest note of an organ being as low as 16 cycles per second, and the highest overtone of an oboe being approximately 16,000 cycles per second. This range in frequency is much wider than that reproduced by the best grade of modern radio receivers, since in most receivers the range extends from about 60 cycles to 4500 cycles. Modern electric phonographs cover a little more frequency range particularly at the higher frequencies.

Listening Tests Used

Results of listening tests, attended by famous musicians, indicate that for practical purposes this range meets present day requirements. In dynamic range, however, both the radio and the phonograph have definite limits falling far short of that which is encountered in a large symphony orchestra. The change in volume may extend over a range of 70 db from a pianissimo violin solo to a fortissimo ensemble. This dynamic range is much greater than that which can be satisfactorily reproduced by present day radios and phonographs. Such factors as noise in studio lines, tube noise in both transmitter and receiver, and distortion at high volume levels limit the dynamic range of a radio to about 55 db.

In the case of the phonograph, this range is reduced to a maximum of 45 db, because of the danger of overcutting the wax during recording and the presence of surface noise during reproduction. If it were possible to restore this loss of dynamic range, then a reproduction more nearly like an original would result. With the above limitations in mind, considerable development work has been carried on to increase the dynamic range of the phonograph.

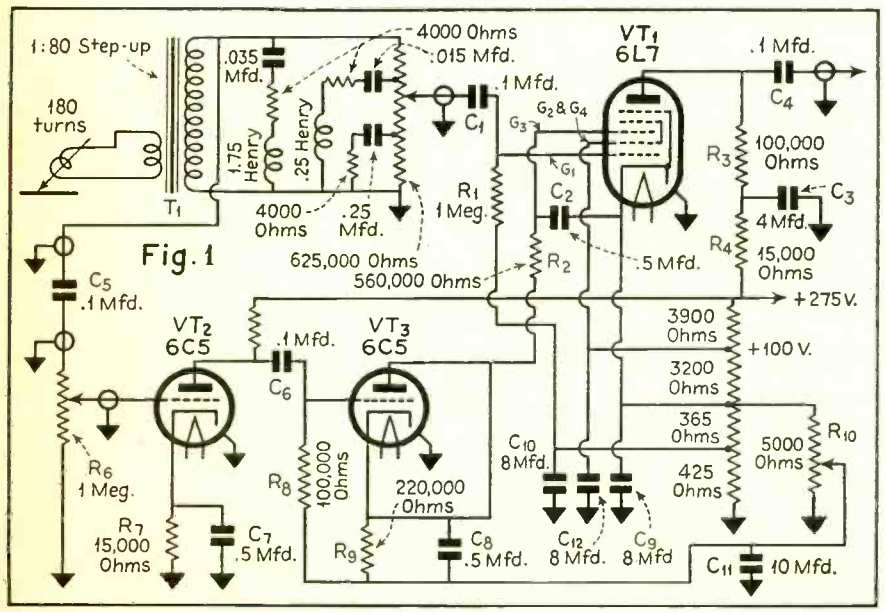
Adaptable to Old Records

Many systems which restore this dynamic range have been developed, but due to the fact that they required a change in recording technique and a completely new library of records they have been discarded. The system about to be described depends for its action upon the variation in amplitude of recording, and gives a new sense of realism on any type of recorded symphonic music.

Three Tubes Used

Fig. 1 is a schematic diagram of the volume expander used in RCA Victor Model D-22-1. Three of the new metal tubes are employed in this circuit. VT-1 is the 6L7 hexode-pentagrid converter employed as a variable-gain voltage amplifier, VT-2 and VT-3 are 6C5 triodes. VT-2 is resistance coupled to VT-3, and acts as a voltage amplifier and buffer tube between input transformer T-1 and VT-3. VT-3 is connected as a rectifier, and serves to furnish a bucking voltage for the bias appearing on No. 3 grid of the 6L7. In operation, the circuit functions essentially as follows.

Voltage from the electro-magnetic pick-up appearing across the primary of the 1:80 step-up transformer T-1 is impressed on an aurally compensated volume control VC-1, and by means of coupling capacitor C-5, on the degree of expansion control R-6. It will be noted that the voltage delivered to expansion



The circuit diagram of the Volume Expander Amplifier. Values for all parts are included. The experimenter should have no difficulty in constructing this device.

control R-6 is taken off ahead of the signal volume control VC-1. This was considered desirable since it allowed any degree of expansion, which would be independent of any setting of volume control VC-1. The variable-gain characteristics of the No. 3 grid of the 6L7 permits the use of this tube for volume expansion. The signal is impressed on No. 1 grid which is operating at a fixed bias of approximately minus 10 volts, obtained from the voltage drop across the 365-ohm section of the bleeder resistor.

Fixed Bias

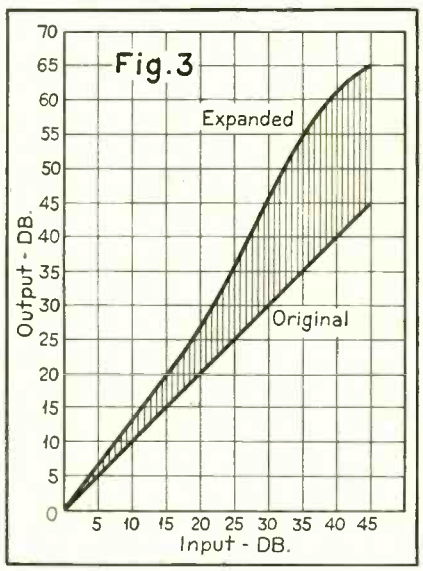
This method is to be preferred over self-bias, since self-biasing of this type tube would result in unstable action during volume expansion, and would cause the bias to vary greatly with different tubes.

Voltage impressed across the degree of expansion control R-6 is fed to the grid of VT-2 which has its plate circuit resistance coupled to VT-3 which acts as a rectifier. A 100,000-ohm plate resistor is used in the plate circuit of VT-2 in order that nearly maximum gain can be realized from this tube. The value of cathode by-pass condenser C-7 has been chosen as .5 mfd in order to permit some degeneration to take place and thus reduce the low frequency response of this portion of the circuit. Curve A in Fig. 2 shows the frequency characteristic of the phonograph amplifier. Curve B shows the frequency characteristic of the dynamic amplifier alone. This characteristic has been used in order that low-frequency signals will not cause unnatural expansion such as would occur with normal frequency response characteristics in this type of an amplifier when bass drum, tympani or bass viol music were being reproduced. VT-3 acts as a simple diode rectifier and has a 220,000-ohm resistor in its cathode circuit. Voltage appearing across resistor R-8 is thus rectified and appears across resistor R-9 as direct current. Condenser C-8 of .5 mfd capacity serves as a filter to smooth out pulsations in this rectified voltage. Resistor R-9 is connected in series with the bias supply to the No. 3 grid of the 6L7.

A bias of approximately 18 volts negative is taken from resistor R-10 which is adjustable. It is desirable to have this bias adjustable, because of the variations in tubes; optimum results are obtained when, with a screen voltage of 100 and a bias of 10 volts negative on No. 1 grid of the 6L7, a plate current of .10 to .13 mils is obtained. This bias to the No. 3 grid also passes through the time delay and filter circuit composed of R-2 and C-2 having the values shown. The time delay circuit is necessary in order that the operation of the expander may take place smoothly. If zero time delay were used then low-frequency responses would gurgle and cause unnatural reproduction since the rectified impulses would bring about rapid changes in bias and correspondingly jerky performance. On the other hand too long a time delay would result in a smoothing out of staccato passages, and the overall effect of the expander would be nearly lost. The values of R-2 and C-2, as shown in the time delay circuit in Fig. 1, were selected as a result of a great number of listening tests conducted during the development of the device. If it is desired that the time delay be a variable then R-2 should be made a variable resistor of approximately 1 megohm total resistance.

THE complete article on the Volume Expander Amplifier appeared in the November 1935 issue of Electronics. *The abstract appearing on these pages is published with the permission of the editor, and Mr. C. M. Sinnett of the Engineering Department of RCA Manufacturing Company, Inc.*

The device itself is not overly complicated, nor is it remarkable in its functioning—but remarkable is an inadequate word to describe the sensational results that may be obtained with the unit when used in conjunction with a good amplifier for reproducing recorded music. Nothing can quite compare with it. —Ed.



Curves showing output increase due to expansion. Note that expansion at very low levels—where expansion is not required—is practically zero. Total expansion at high levels is 20 db over original.

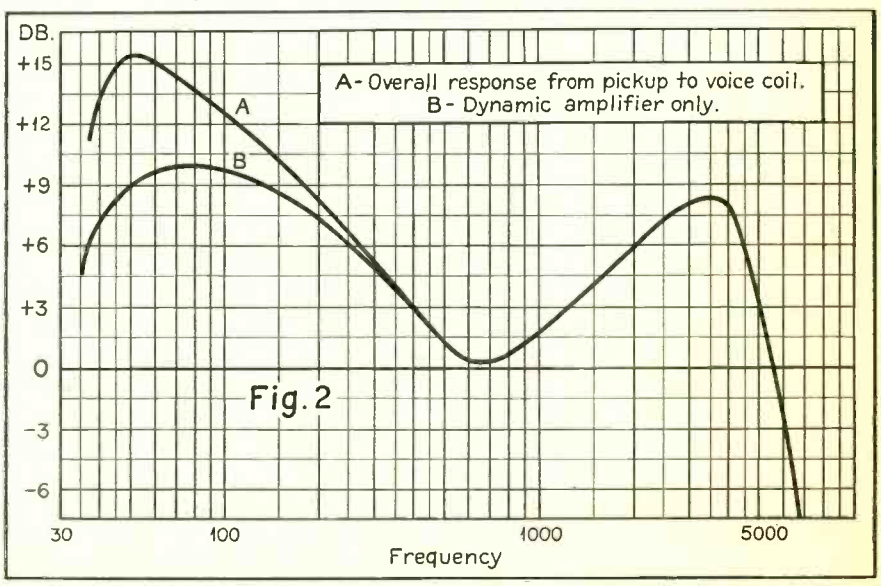
Avoids "Hash"

This will permit variation of the time delay over wide limits. The time delay circuit also prevents rectified "hash" from appearing in the main audio channel to the 6L7.

The volume expander circuit shown can be duplicated quite easily. A hum-free voltage of approximately 275 volts across the bleeder will give the required voltages and by means of variable resistor R-10 the plate current of the 6L7 can be adjusted to the required value. Output from the pick-up and transformer assembly should be of the order of 1.00 to 1.25 volts at 1000 cycles for normal operation. The compensation of the input system will of course vary with different input transformers and pick-ups. Values shown are only for the particular instrument being described. It is evident from the diagram that the output of the 6L7 is fed to the grid of the next audio stage.

For best performance, this stage should have a fixed gain of about 15, and should be coupled through a 1 to 3 ratio transformer to an output stage capable of at least 10 watts undistorted output.

(Turn to page 45)



The frequency characteristics of the phonograph amplifier with which the Volume Expander Amplifier is used.

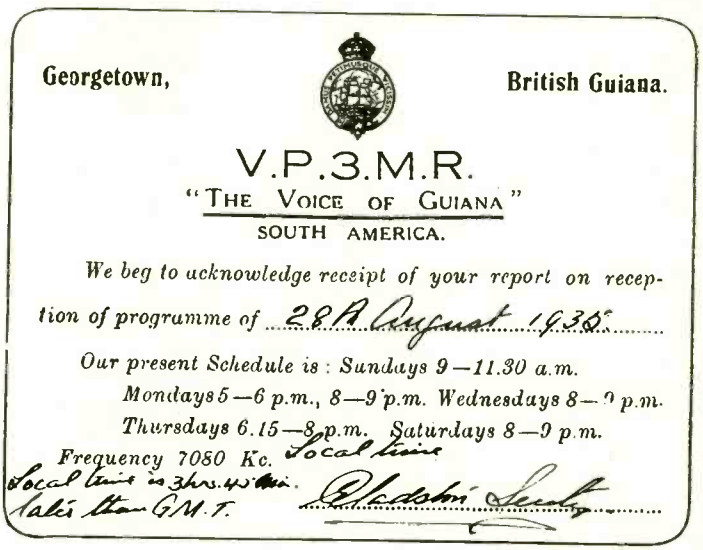
GLOBE GIRDLING

CONDUCTED BY J.B.L.HINDS

A GREAT MANY letters are received from readers of ALL WAVE RADIO expressing the desire to receive certain distant stations, but citing in the same letter the call letters of certain stations they have already received, which are equally as far or farther away from their receivers, as the stations desired. The inference given is that they have not the ability to bring in the stations in question. Now to my mind, with a fairly good receiver, which you understand perfectly, ability does not play such an important part as some are inclined to believe. While persistency is a great asset, system in method and tuning is a greater one. None of us should therefore be too vain in boasting about our achievements or ability. In fact, does the practice compensate us anyhow?

Let me briefly explan what I mean.

Show me the person who has persistency, method or system, with initiative, or the ability to reason out things for himself, and I will show you one who is fairly successful in any hobby or endeavor.



Georgetown, British Guiana.

V.P.3.M.R.

"THE VOICE OF GUIANA"

SOUTH AMERICA.

We beg to acknowledge receipt of your report on reception of programme of 28th August 1936.

Our present Schedule is: Sundays 9—11.30 a.m.
Mondays 5—6 p.m., 8—9 p.m. Wednesdays 8—9 p.m.
Thursdays 6.15—8 p.m. Saturdays 8—9 p.m.
Frequency 7080 Kc. Local time

Local time is 3 hrs. 45 min. fast on G.M.T.

P. Gladstone Secty.

Verification card received by Mr. Hinds from VP3MR. The original has rounded edges and looks like an engraved invitation.

Know Your Receiver

Therefore, first *know* your receiver, what it will do under all conditions, then calibrate your set, and know positively *where* you receive each signal whether on voice or program. Then provide yourself with a reliable station list, and you will be surprised at the results you obtain. Calibration means calibrating each coil. Then if you know you receive a certain station at 30, for illustration, and another at 40, and with your station list you know there is a station between the two which you wish to receive, it should not be a difficult trick to tune it in, providing the proper conditions exist.

Verifications

In my contact with short-wave listeners I receive many letters of comment that they are unable to secure a verification from this or that station after sending an International Reply Coupon and tracing various times for reply. It is known that a number of stations do not reply promptly and some without quite a little persuasion, but I wonder sometimes if the station is always at fault.

While on this subject I would like to say that I just received a letter from my friend, Henry Guerrero, foreign representative of stations XEB and XEBT, Mexico City. Mr. Guerrero says that they receive various reports of reception which are not reports. For example, they receive reports as follows: "Last night we heard your station. It came in very clear and could be heard in every room in the house. We heard chime bells and siren. Please verify."

If you send a report of this nature it is not surprising you do not receive a verification. Station XEBT when receiving a report of this kind (if accompanied by Int. Reply Coupon) send a courtesy card. Now a courtesy card with them is a verification card with the word "Verification" crossed out and the words "courtesy card" written in where the date of reception should be shown. So if you receive one of the latter don't display it among your friends.

Most stations verify, but don't be too impatient. They all receive a great many reports and with a limited force it is not always possible to make a return quickly. Be sure that you make an intelligent, helpful report. Don't be afraid of telling them how you heard them, but allow for conditions. The station engineers are interested in the strength of the signal, fading conditions, modulation, etc. Be sure and tell what you heard and when—give the exact time and description of each number if you cannot give the title of the selection. Twenty to

Mr. J. B. L. Hinds at his "Listening Post" in his home in Yonkers, N. Y.

thirty minutes is sufficient time to cover. Never change Eastern or Central time to the local time of the country transmitting the program. Most stations will verify a typewritten report but XEBT says they are not considered legal reports, so reports to them should be hand written.

The Guatemala Stations

Inasmuch as there seems to be considerable confusion and misunderstanding with reference to the Guatemala stations, I am giving you below the facts as given to the writer from an official source from that country.

TGW—National broadcasting station under control of the Ministerios de Fomento. Broadcasts daily, except Sunday, 12 noon to 2 P.M.; 8 to 9 P.M. and 10 to 12 P.M., and a special program on Saturday 12 A.M. to 6 A.M. Sunday on 1210 kc (long wave). Power now being changed over from 500 to 10,000 watts.

TGWA—On 6000 or 12,000 kc and same program as TGW. Power 200 watts.

TG1X—Experimental with directive antenna toward U. S. A. 9450 kc. Same programs as TGW, but not on regular schedule pending completion of antenna arrays.

TG2X—Station built by the staff of TGW for National Pohee Musical programs daily from 4 to 6 P.M. and 9 to 11 P.M. on 5940 kc, 200 watts.

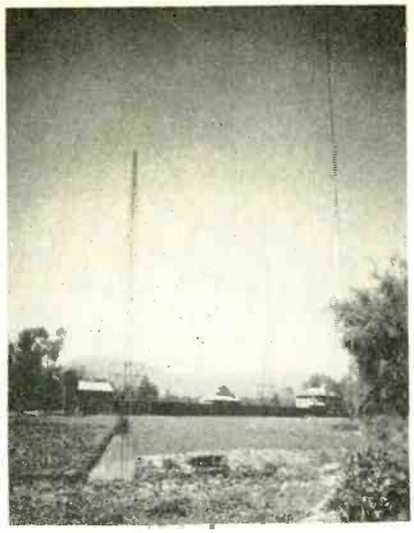
TGS—"The Liberal Progresista Daily," 1400 kc, 15 watts power. No short-wave outlet for the past six months. This dispels the idea that some had TGS lately. Short-wave license has been granted by the authorities but no information as to when the station will be on the air. It is thought that when on the air they will be somewhere around 47 meters.

HJ2JSB "Ecuador Radio" Guayaquil, advises me on making this month's station list that they broadcast daily on 1070 kc (280 meters) 250 watts and 7854 kc, 38.19 meters, 500 watts, 9 A.M. to 1:30 P.M. and 6 to 11 P.M. Ecuador time.

W1XAL, Boston, state that frequencies 11,790 and 6040 kc are used on regular broadcasts. The other frequencies, 15,250 and 21,460 kc, are used experimentally for distant broadcasts on special occasions, but not used on regular schedule.

New Stations

Station HII, Santo Domingo, R.D., is being heard on 10,040 kc (29.88). Address Apartado 577. It is not yet known if it is a broadcasting or phone station.



The antenna of the stations XEB and XEBT, Mexico City.

Valencia, Venezuela, is putting on a new station YV-13RV on 6330 kc, 47.39 meters, to be known as Ondas del Tacarigua and to be operated by Senor Miguel Angel Arraez. The recent added station YV-12RM, at Maracay, Venezuela, on 6300 kc, is transmitting some fine programs.

The new station at Colon, Panama, HP5F on 5080 kc (49.34 meters) is not being heard to any great extent if on the air. It is said to be operated by the management of HP5J, Panama City.

W2XE—Wayne, N. J., has added two more frequencies; 17,760 and 21,520 kc and changed its time on the other three now being used.

YNDA—8500 kc, Managua, Nicaragua, listed in station list and address section. Station YNVA called DeRuben Dario, Managua is now being reported on same frequency. Possibly same station.

XEXA, near 6180 kc, Mexico City, is now being heard with good signal and asking for reports. Broadcasts programs of long wave XFX—610 kc. Official lists of Mexico show XFX as operated by Secretaria de Educacion Publica, Mexico, D.F., but no listing of short-wave transmitter.

Station list carried TI8FF, 7590 kc—39.74 meters. Further developments will be reported later.

The verification card from HJ2ABD, 5980 kc is a very pretty card done in colors with the map of Bucaramanga appearing alongside the call letters. It states "verification from Bucaramanga," although no mention is made of the date of your letter or date of reception. It would appear as easy to include this information as to omit it.

Reports are being received of a station HRY testing near 6350 kc (47.24 meters). Reports should be sent to Tropical Fruit Co., Bank Bldg., New Orleans, La.

RV59, on 6000 kc, is again being heard afternoons from Moscow. Note changes in schedule of RNE on 25 meters.

TFJ—Iceland, is broadcasting each Sunday on 12,235 kc (24.52 meters) from 1:40 to 2 P.M. instead of 8:40 to 9:00 A.M. as stated by the writer in December ALL-WAVE RADIO. The program comes through with steady consistent signal.

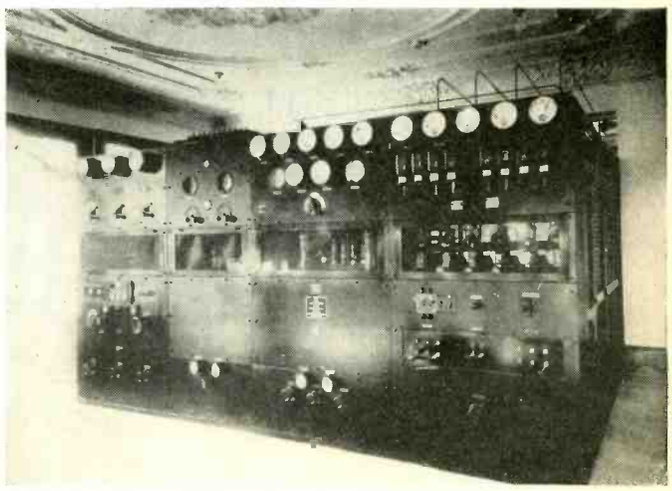
A letter from Radio Club Tenerife, Santa Cruz, Canary Islands, advises that Station EA8AB is on the air Monday, Wednesday and Friday from 3:15 to 4:15 P.M. and that frequent broadcasts to America are made on 7211 kc (41.60 meters) in early evening.

VE9DN — Drummondville, Canada, 6005 kc, is again on the air with the Midnight Saturday broadcast to the Far North. VE9DR on the same frequency has not as yet resumed broadcasting the regular Montreal program.

VE9HX, Halifax, 6110 kc is again on the air transmitting the broadcasts of long-wave station CHNS, Halifax.

New Italian Station

A new station IRY, Rome, is on or near 16,107 kc (18.62 meters) mornings and early P.M. phoning Cairo, Asmara



Transmitter and control panels at station XEB, Mexico City.

and others and broadcasting music at times.

Some say that YDA shown in list on 6120 kc is now on 6040 kc or 49.67 meters. The actual location is Tandjongpricok, D.E.I.

Germany is now using several new frequencies in broadcast service, including DJI, 9675 kc; DJJ, 10,042 kc, and DJM, 6079 kc. Possibly these frequencies are being tested out with a view to improving the present service.

The advance programs issued by the British Broadcasting Corporation list the call letters, frequencies and wavelengths of those transmitters which will transmit the programs in the various transmissions. In some cases the calls for four transmitters are given. For illustration; Transmission No. 3 shows four stations, GSC-GSF-GSE-GSB. Of course only two will be used. Not knowing in advance which two are to be used all four are listed in station lists. It will doubtless be necessary, therefore, to listen to the frequent announcements.

English Announcer at TIPG

TIPG—6385 kc, San Jose, Costa Rica, has recently added an English announcer to their staff, and likewise improved the output of the station.

It is the thought of the writer that a great many South American stations might increase their fan mail if they would identify themselves each 15 minutes so that their American friends could know to what station they were listening to. A small precentage of listeners only are consequently making reports. If my South American friends disagree with me, let them investigate the results gained by HRN, Tegucigalpa, Honduras, with its fine English announcer—or listen to him on their "appreciation hour" when he reads the fan mail on the air.

Some insist that CNR, Rabat, Morocco is not on the air, but they are still retained in the list until definite advice has been received from the station.

RADIO CENTER SOLIANKA 12 MOSCOW, USSR.

Dear Listener:

We thank you for your report of . 30.11.33

We are glad to verify that you heard our broadcast on .30.11.33 . . . at .4.30. P.M. o'clock, on a wavelength of . . 50. . . . .meters.

We shall always be glad to hear from you and to have reports of reception. We shall also welcome criticisms of our programmes and suggestions for improvement inthe future.

Yours truly,

Inna Marr
Chief Editor

Not beautiful, but cordial . . . a verification from Radio Center, at Moscow.

Mr. Thomas R. Dunn, of Yonkers, reports hearing a test program recently by a station broadcasting near 48 meters, asking for reports and giving call as YV1RN, located at Maracaibo, Venezuela.

New W4XB Veri

We understand W4XB, Miami, Florida, is now sending out a new card veri which actually verifies and gives the date of your reception, which is an improvement over their old circular letter which neither tied to your letter or date of reception.

It is noted from a late issue of the Quitota Radio Club Short Wave Reporter, Hendersonville, N. C., that a new station H14? (last letter not known) on 6483 kc and a station HCBT at Ambato, Ecuador, on 6558 kc, are being reported.

CJRO—CJRX

Some radio time schedules show frequency of CJRO, Winnipeg, as 6160 and 6140 kc. The owners say 6150, as we have shown in ALL-WAVE RADIO. CJRX broadcasting simultaneously with CJRO is on 11,720 kc. In the past few weeks both stations have been completely modernized, to make them conform to the rigid requirements of today, and all improvements have embodied the latest in engineering practice. A full 2 kilowatts of carrier will be available, 100% plate modulated, and a frequency stability of within a very few cycles, will be maintained. CJRX is the "pioneer" short-wave station in Canada, as it was one of the first short-wave stations on the continent of North America and the first Canadian short-wave station to go on the air with regular daily musical programs.

Silent Stations

Here are a few stations who do not seem to verify or reply to a report. It would be interesting to know if others are experiencing the same trouble as the writer:—HC2CW, HC2ET, HKV, HCETC, HJ3ABI, HRN, HCK, HJIABJ.

Late reports indicate that JVT, Japan, on 6750 kc, in addition to early morning program as listed in station list, is also broadcasting from 5 to 7 P.M. and 9:45 to 11:45 P.M., while JVP on 7510 kc, and JVQ on 7470 kc are

(Turn to page 43)

A pretty baby Mr. Hinds received from Austria. Call letters are in red; the border and panels in pink. The reverse side has sketches of Dachstein, Wien and Salzburg.

ON DECEMBER 12th, 20-year-old Gordon Smith, radio operator aboard the S.S. *San Lucas*, sat at his transmitter for three hours with a bloody right hand hanging loosely by his side. The fingers of that hand had been mangled in refrigerating machinery.

Gordon worked the key with his left hand, and apologized to the operator ashore for his "bum sending."

Gordon's fingers were amputated. It's too bad, because the lad thought a lot of his fist. And that's something these days . . .

◆

NO SOONER do we make mention of Moo-Moo than we receive fan mail. Are there so many cat lovers?

The following was received along with our Christmas Cards:

"I have observed that you usually conjoin Moo-Moo with the non-committal *it*. Are you doubtful? Are you aware of the facts of life? Are you merely cautious? And rightly you may be so. Have I told you about Peggy, also feline? We got the animal as a kitten and so named it without thought for the morrow or heed for the gender. Blush for our grammer when I tell you that later the adolescent stood revealed as a man-cat. Since then I take no chances: cow, mare, hen, even the shy little tadpoles—I mention them only in connection with the undiscriminating neuter. Hence I commend your discretion." Signed "Zim."

The fact of the matter is that Moo-Moo *is* an "it"—he or she (we forget which) was altered at the age of six months.

Zim to you, Q. K. Z.

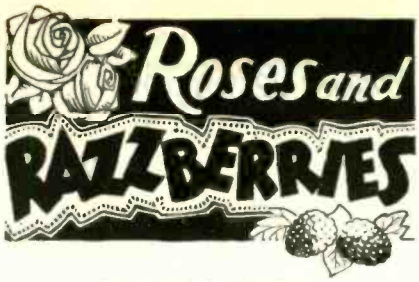
◆

THERE IS, of course, no good reason for hauling Moo-Moo into a radio magazine, were it not for the fact that it, with the aid of its loving mammy, has brought to light an interesting phenomenon that should be recorded by all cat owners for future reference.

We had, with some difficulty, tuned in K6LJB, out Honolulu way, when the signal was assaulted by an odd form of interference that for the moment we took to be the now famous "Shadow" who plies his trade in the high-frequency bands.

We cocked our head to one side to better determine the inherent character of this invader, when our eyes lighted on mammy with Moo-Moo curled up in her lap.

There was some peculiar coincidence to this set of circumstances that at first escaped us. Then slowly it filtered into this head of ours that the tempo of the interference was in exact synchronism with the pretty stroking mammy was giving Moo-Moo.



By BEAT NOTE

Moo-Moo might be tickled to know that her static busted up K6LJB's transmission.

◆

THE EDITOR of *QST* has raised his voice against duplexing in the amateur bands. He refers in particular to Hams with remote-control switching on the transmitter who leave their carriers idling between QSO's.

This sort of practice is undoubtedly unfair, and so is most any form of duplexing in an amateur band. But, we can't help but remark that we would feel sad if these practices were discontinued altogether.

We are naturally lazy, and there is nothing that pleases us more than to have someone else do our DX hunting for us. Our idea of solid comfort is to tune our receiver to one of these "constant-carrier" boys, place our feet on the table and listen to what the fellow at the other end may wish to dish up.

One night we heard practically every district in the U. S. without once touching the dial of our own set—and would probably have chalked up a one-sided "WAS" if we hadn't fallen asleep.

◆

SPEAKING OF the "Shadow," we have heard that this interference has been traced to some new type of diathermy machine now commonly used in hospitals. We have also heard that when the F.C.C. was approached on the matter, the reply was to the effect that the F.C.C. is powerless to deal with such cases because the equipment is not used for the transmission of intelligence.

If such be the case, there are a lot of amateur and commercial code stations free to park on any frequency they wish —the F.C.C. won't be able to touch 'em.

◆

TRANSMISSIONS WE WOULD LIKE TO HEAR:

The operator at ETA saying, "73, OM," to the operator at ISG.

James Joyce dramatizing the last chapter of "Ulysses" on a Sunday evening program over WEAF.

The remarks in the studios after the microphone is killed.

Some advertiser damning the American public for not using his product.

A blast from the *Queen Mary's* transmitter before she is launched.

WE HAVE WAITED patiently to see what DJC would do about the interference it has had to contend with from a Cuban and a Central American station . . . and we are pleased to note that DJC took direct measures—more power.

No amount of complaining helps much in the world as it is today; there is little sense in seeking justice through "conversations"—it is much easier to take things into your own hands.

People are shocked at the outset, but they soon forget (do you remember who killed Cock Robin?) and thence forward life goes on in its usual complacent manner.

Having the courage of your own convictions helps a lot, and no doubt the Germans were of the opinion that their programs had sufficient merit to warrant their being heard by the world at large. We, for one, agree.

◆

AND SPEAKING of interference, the Shadow was still at it the last time we passed through the megacycle bands. He shifts hither and yon and is not to be caught napping.

But the mystery appears to be getting deeper; if we are not mistaken, there are *two* Shadows and not one. The second fellow sticks fairly close to one frequency, and points only one nasty finger, while the original Shadow points *three* nasty fingers simultaneously.

Or is the original Shadow a Werewolf, quite capable of changing form when it is his whim to do so?

The mystery is by no means solved, and we doubt very much if any real headway will be made until the general public joins in the hunt. This, we presume, could be accomplished readily enough by obtaining a sponsor for the Shadow, and offering $1000 a year for life to the person who reveals the true identity of the intruder, if accompanied by a box top.

◆

WE HAD BEEN looking forward with the greatest of anticipation to the day when the *Queen Mary* would lift her pretty anchor and barge off for these shores with a list of celebrities aboard that would put the *Normandie* to shame. We *had* looked forward to this occasion, believing in our simple soul that the good ship's radiophone transmitters would bring to our ears the famous voices of this era. But we have learned much to our distress that speech is to be scrambled, and presume, therefore, that we will not have the opportunity of hearing what HRH will have to say to his pappy and mammy.

◆

WHAT THIS COUNTRY needs is a good five-buck unscrambler.

(Turn to page 47)

W2GYL—

Edwin Ruth, 3rd

APPLE-PIE ORDER FROM MIKE TO ANTENNA —WHICH MEANS EFFICIENCY PLUS

By S. P. McMINN, W2WD

Edwin Ruth 3rd, owner and operator of amateur station W2CYL. The front panel of the transmitter may be seen at the left.

PRECISE TO A degree, Edwin Ruth 3rd has designed, assembled and constructed radio station W2GYL from an experience stretching back to the real beginnings of amateur radio. Today his station in Hempstead, L. I., N. Y., is the kind of a station that a whole lot of Hams look forward to owning some day, but seldom do because they haven't got the compelling urge that makes Ed dissatisfied with anything that is not exactly 100% and in apple-pie order. There isn't an inch of hay-wire in the shack.

Some antenna—the 20-meter vertical half-wave aerial at W2GYL. It's made of sections of copper leader pipe.

The fact that he has worked some 16 different countries during the past few months and that as this is written a most gorgeous card has come to report reception of his fone signals in New Zealand, is no indication of the power he is using. On CW the input seldom exceeds 300 watts; on fone the carrier is about 140 watts, which, with suppressor-grid modulation gives him between 40 and 50 watts voice power. That's what was heard in New Zealand—and copied solid.

No, it's not power that does it. It is careful designing, rated loading of tubes and a precision of building that gets every bit out of the equipment that can be expected. Ed has no place for guesswork anywhere. Constants are mathemetically correct. All circuits are meter tuned, right on the nose. Input, output and modulation are continuously checked.

The Transmitter

But you are interested in what does the business. The real work is done by a pair of RK-20 Raytheons in push-pull functioning as a Class C amplifier. Those tubes were chosen for the "final" for a number of reasons. First and foremost, they are very easy to excite, which means a minimum of exciter stages, and simplicity is always desirable not only as a means of conserving the well-known bank account but to eliminate a lot of the grief that generally comes with a multiplicity of amplifier stages. Also, their design is such that they are excellent for use at high frequencies; they are physically of such proportions that mounting them in a compact rig is no trick at all; and finally they can take it, and do.

Ahead of the RK-20's the r-f portion of the rig starts out with a 53 in which one of the grid circuits is controlled by either of two crystals selected by a panel switch. The other half of the 53 is used either as a doubler or a quadrupler—as a doubler with a 160-meter crystal for 80-meter work, or with an 80-meter crystal for 40-meter work, or a 40-meter crystal for 20-meter work. For 10-meter work a 40-meter crystal is used, with the second half of the 53 quadrupling. Following the 53 there is a 59 which may be used as a second doubler or as a neutralized straight amplifier.

S. P. McMINN, W2WD, the author of this interesting article describing W2GYL, is, during his working hours, the editor of Automotive Merchandising. In the automotive field Mr. McMinn is considered to be an expert on sales problems, and many manufacturers have arranged to have him broadcast talks over the various networks from time to time.

When not following his profession, he spends most of his time on one of the several Ham bands. His station is equipped with apparatus for operation on any of the bands.

He is the secretary of the now famous Garden City Radio Club, and it may be remembered that he wrote the interesting description of Doc. Dunn's station which appeared in ALL-WAVE RADIO *for November.—Ed.*

Thus, those two tubes, running light, provide more than enough grid excitation for the two RK-20's, even for 20-meter fone using an 80-meter crystal to start off with.

Here are the plate voltages and current used on the tubes:

	V	MA	
53	350	50	(both plates)
59	400	30	
RK-20's	1600	200	(CW)
	1400	100	(fone)

Due to the fact that suppressor-grid modulation is used, the modulator is the acme of simplicity. There is a 57 high-gain stage resistance coupled to a 56 which is transformer coupled to a pair of 45's in Class A. All these tubes have 250 volts on them.

Power Supply

Power comes from four separate power packs. The main power supply delivers either 1400 or 1600 volts and is husky enough to provide regulation well within the desirable 10% limit. The rectifiers are 866's, of course, and the filter consists of a swinging choke and a smoothing choke with enough condenser to reduce the ripple to the point where it is negligible. Of the other power packs, one supplies the exciter unit, one feeds the modulator and the third provides both suppressor and bias voltage for the RK-20's.

One very important and mighty handy feature of the transmitter is that each part of it is a separate unit all by itself, though the whole is mounted in a steel rack and when connected together by means of a few patch lines containing multiple feeders they become to all intents and purposes a single unit. Thus it is possible to pull out any unit in something less than a minute in the event that trouble has to be traced, or where some circuit change is to be made. It is only necessary to pull out the patch plug, take out a couple of screws in the standard panels—and lay the unit on the bench.

The Antennas

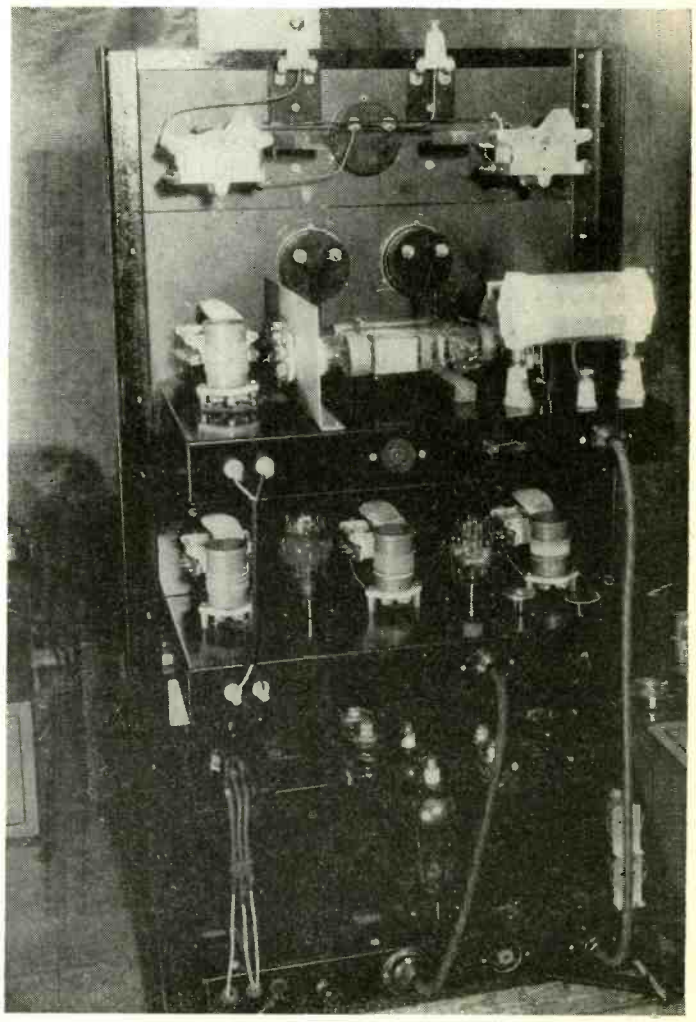
A great deal of experimenting has been done with antennas and the final evolution (for 20-meter work) is a vertical copper pipe antenna one-half wavelength long with a quarter-wave matching section and a 600-ohm transmission line inductively coupled to the final tank. For 40-meter work there is a half-wave doublet center fed with a transmission line consisting of Giant Killer Cable. Receiving antennas are 10- and 20-meter doublets.

The whole transmitter is remotely controlled with switches for filament and plate power contained in a small case that sits on the operating table at the operator's finger tips. For CW the key is plugged into the plate circuit of either of the exciting stages, the jack that is ordinarily used to meter the plate current of the stage being used for the purpose.

The receiver is a National FB7A with a one-stage regenerative pre-selector and the microphone is a Model 24 Turner crystal instrument fed directly into the grid of the 57 stage.

Ultra High

In addition to this equipment the station also is completely equipped for ultra-high-frequency work with most of it done in the 56 to 60-mc band. The transmitter is a long-line oscillator with the usual Class A modulator. The receiver is a National SRR, which allows duplex work with the eight or nine other members of the Garden City Radio Club who keep schedules practically every evening.



The W2GYL transmitter, with the high-voltage power pack on the bottom shelf, above it the exciter unit, above that the pair of RK-20's in the final amplifier, and on the top deck the Collins type impedance-matching network.

KEYING THE TRANSMITTER

By RICHARD M. PURINTON, W2ICU

THE CONVENTIONAL methods of keying buffer and final amplifier stages are well covered in articles already published and in the reference pages of handbooks on amateur practice. Very little has been shown on keying pentode type tubes used in the Tritet circuit, however. It is the purpose of the writer to outline one method of Tritet keying which has worked satisfactorily and which provides keying without some of the difficulties found in most keying methods.

Break-in Operation

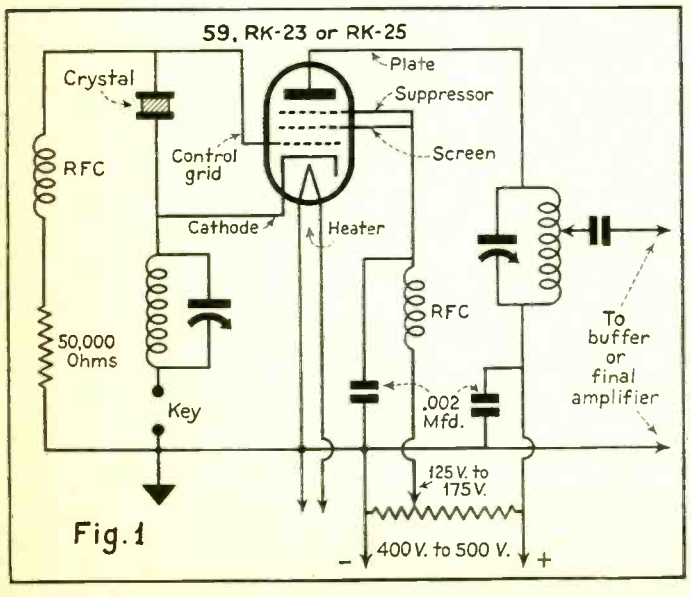
Crystal-oscillator keying has as its primary advantage the possibility for break-in operation. The disadvantages seem to be concentrated in the sharp change in plate and screen current from a condition of no current at all to one in which the screen current and plate current are at full-load values. The advantage of break-in may not be utilized by more than five percent of the amateurs who use cw. In any case, crystal-oscillator keying cuts the carrier completely so that no annoying backwash carries through to the receiver to complicate copying. Some of the old timers who used to jump from the main signal to the backwash for variety might grow tired of keyed-oscillator copy, but the majority of amateurs prefer crisp, clean signals.

Center-Tap Keying

Keying in the center-tap on straight pentode oscillators, such as the 47, is a straightforward procedure with no complications if care is taken to hold the screen-grid voltage at a value which does not change materially with the key up or down. Most of the crystal-oscillator circuits published for the 47 show the screen grid supplied with current through a 40,000- or 50,000-ohm resistor. In some cases, recognizing the need for good regulation of the screen-grid voltage, a bleeder resistor of about the same value is connected from the screen grid to ground. Through the use of the bleeder, chirp is reduced or completely eliminated when the crystal oscillator is keyed. With this arrangement, screen-grid voltage regulation is improved. The fact that it will not be perfect is quite obvious, however. A much better arrangement would call for not more than 15,000 ohms from the plate-supply voltage positive lead to ground or B- with the screen-grid voltage tapped off this bleeder. Most oscillator power units will supply more than enough current to feed the oscillator, a buffer stage and the bleeder current required for the screen-grid supply circuit.

Cathode Keying

Fig. 1 shows the Tritet crystal oscillator circuit used by the writer. The crystal operates in the 80-meter band, the plate tank is tuned to the 40-meter harmonic and the cathode tank is tuned to a frequency between 3.5 and 7.0 megacycles. The position for the key is indicated in the cathode lead at the low-potential or ground end of the cathode tank. It should be noted that the control-grid return, through the grid leak and grid r-f choke, remains connected to the B- and ground at all times. In the transmitter at the present time the key itself is used to break the cathode circuit. The leads running to the key from a plug on the transmitter front panel are eight feet long and are a part of the cathode return circuit when the key is down. A better arrangement would be to use a small keying relay connected with short leads to ground and to the low end of the cathode tank circuit.



Circuit showing cathode keying applied to a crystal-controlled oscillator. Full details are given in the article.

No Key Filter Required

It will be noted that no resistor- or capacity-network is shown in the key circuit. Key clicks were not found to be at all bothersome in a broadcast superhetrodyne only twenty feet from the transmitter. However, combinations of shunt resistance and capacity were tried with interesting results. It was found that the pitch of the signal could be varied several hundred cycles by connecting either resistance values between 10,000 and 100,000 ohms, or capacities up to 1 mfd, across the key jack at the transmitter panel. For clean, unvarying pitch signals the best arrangement was the simple one shown in the diagram. No shunt resistance or capacity was needed although either one might be helpful in some other case.

Cathode-Heater Voltage

Shunt resistance across the keying circuit was useful in one respect. Measurement of the voltage developed across the open key, using a 1000 ohms-per-volt meter on the 750-volt scale, showed approximately 75 volts. This voltage is between cathode and heater. If the heater insulation is of good quality, as it is in most tubes produced by manufacturers supplying amateurs, 75 volts is not excessive. This potential can be reduced to about 50 volts by connecting a 50,000-ohm resistor across the key. As mentioned before, shunt resistance across the key may give the signal some "whip." It is not essential that the resistor be used unless the voltage across the open key exceeds 75 or 80 volts so that usually the shunt resistor can be dispensed with. In using this circuit, or in fact, any keying circuit, the problem of key clicks can be tackled with best prospects for solution if the voltage across the key or relay is known. Keying in the cathode of heater-cathode type tubes should not introduce a potential between heater and cathode of more than 100 volts.

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CHANNEL ECHOES

BY ZEH BOUCK

EDWARD HOPE, writing "The Lantern" in the New York *Herald-Tribune*, once expressed the desire to erect a broadcasting station in the middle of the ocean—on a small island where he would be supreme dictator — and from this station broadcast every dirty story he had ever heard, starting with the travelling salesman and the farmer's daughter. We, ourself, on the occasions of every one of the many broadcasts in which we have participated, have had to overcome the perverse impulse to say something of a flagrantly profane nature—to get in a couple of sizzling cuss-words before the control operator could amputate our speech. But we never did it! It will take a more courageous person than ourself—some Dean Swift or Rabelais of this ether-conscious era.

Theoretically, there is no excuse for any degree of radio censorship in reference to expression, description or situation. Those who do not care to listen to what they consider offensive have the privilege of tuning to another station. Those who wish to listen to such things have every right in the world to do so, for psychologists will tell you that, rather than the contrary, the morals of such persons will be improved by this vicarious appeasement of what might otherwise find a more objective and dangerous mode of expression.

Of course, there always exists the argument concerning what our wives, our sisters and our children might hear—but this resolves itself into sort of a question of *honi soit qui mal y pense*. If they are as pure and innocent as some of us apparently would like to believe, then the "objectionable" matter will soar completely over their heads, and in no way besmirch their lily whiteness. If it doesn't go over their heads, why then they have already been contaminated, and no harm can be done.

We hope no one will think that we are recommending the wholesale broadcast of smutty stories. We are not—not that there is anything inherently wrong with the so-called smutty stories, plays or books. Only there are so many more important things to broadcast that it would be little short of criminal to clutter up the air with such nonsense. But it is in defense of these more important things that we object to the Sunday-school attitude of the broadcasting stations, and the censorships imposed upon such artists as Cornelia Otis Skinner and Helen Hayes. There are so many taboos

ZEH BOUCK

Says what he thinks . . .

and naughty-naughties concerning the phraseology, situation and plot, that it is seldom possible to take full advantage of the artistic possibilities inherent in many radio presentations. Witness the absolutely unnecessary and inartistic mutilation of the air production of "Coquette," in which Helen Hayes starred as she did on the stage.

This fear of naturalness and natural situations detracts from the merit of less important sketches. Gosden and Corell have said: "In radio, we, as Amos and Andy, first of all try to be natural." Amos 'n' Andy are probably the least natural of all popular airstrips. If they act like Harlem negroes, then we've never been to the Cotton Club. Did Andy ever get plastered on Seventh Avenue gin? Has anyone ever heard Amos pray to a pair of dice? True, Brother Crawford's wife is very unhappy and occasionally beats him up. But, whoever heard of Brother Crawford retaliating with a razor?

We, of course, admit that Amos 'n' Andy have held their popularity for a phenomenally long time. But would they be any less popular if they were more natural? Certainly, the possibilities for interesting and new situations would be multiplied many times. Of course, Pepsodent may maintain that if Andy went on a binge and Amos rattled the bones, they'd lose Deacon Brown as a customer. We wonder . . . But, if so, they'd surely gain a lot of John Smiths as listeners and buyers—many of whom have long since wearied of the emasculated program.

We doubt if Molasses and January have lost trade for Maxwell House despite their full quota of loose morals. Certainly, Tenderleaf tea and Royal Gelatine, by continuing "One Man's Family," tacitly admit that this, probably the most natural of all strips, brings them in business—undoubtedly from the same folks who buy Pepsodent toothpaste. Carlton Morse has had the courage to write life into this really excellent script, as it really exists—not the wishy-washy melodrama of the "Goldbergs" and the "House of Glass." Such facts as divorces, wild oats, running around with other people's wives and alienation of affections suits may not be Sunday-school material, but they are situations which almost everyone, some time or another, experiences directly or indirectly. It is a real script which one follows, not out of curiosity as to what is going to happen next, but out of interest in what the Barbours are going to *do* next.

◆

AS THE WINTER season swings into its full blustering force, most American short-wave enthusiasts will find that the best European reception has shifted from the 31-meter band in the late afternoon to the 25-meter band from 7:30 A.M., Eastern Standard Time to around noon.

◆

TO OUR MIND, the police channels are representative of several broadcasting ideals. They are exhilaratingly emancipated from box tops, labels and facsimiles. They go in for stark realism, and when a hurry call goes out to Car 13 that a negro is beating up his wife on the fourth floor of 200 West 129th Street, the listener appreciates that here is an Ethiopian situation quite different from anything encountered in Amos 'n' Andy. Occasionally one will actually become enthusiastic and root for the husband.

We have even found humor in the cop-bands. About the nearest we have ever come to box tops, etc., were manhold covers. Patrol cars in a mid-western city were told to be on the look-out for a crook stealing these gadgets. The thief was probably the same gob who held up the paymaster on a U.S. battleship when a thousand miles at sea. Another chuckle—the second best in the missing car stories—was the alarm sent out a month or so back for a fire engine

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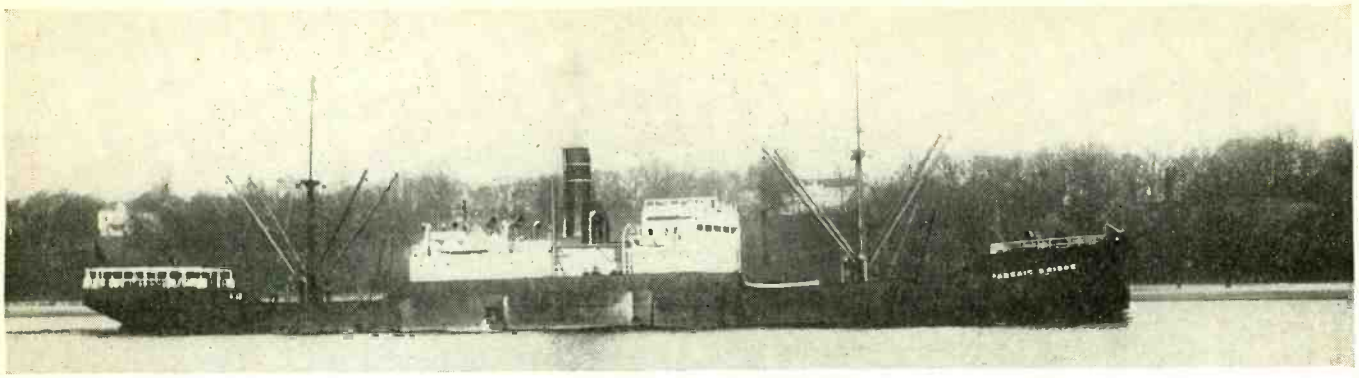

" . . . up the Elbe river to Hamburg where they were having food riots . . . " Actual photo taken from south shore of the River Elbe.

THE FOOTLOOSE REPORTER

"SPARKS"

ONE DRINK leads to another—and another usually leads to a brawl or a good story.

I think I've got the story, and because my meeting up with the fellow in Joe's was not pre-arranged, I think the story is a good one.

This fellow came up to the bar and yelled for another of the same. Up it came, and as he was turning to go back to his table, his eye caught the copy of ALL-WAVE RADIO I had stuck in my coat pocket.

"That's a new one on me," he said.

"It's a new sheet," I told him.

"ALL-WAVE RADIO," he mused. "Funny how times change. Ten—fifteen years ago, that title would have been as cock-eyed as hell. Fifteen years ago," he said, "I was walking down a dock in Brooklyn to take over my first radio job on a ship. Nearly froze my puss off. We pulled anchor and never saw these United States again for ten months. And for eight of those ten months I used an ancient receiver with a crystal detector, and did damned good work at that."

"And nowadays," I chimed in, "an operator has a hemorrhage if he doesn't get a super to work with."

"It's a fact, isn't it?" he said. And with that we had a drink together. Then we carried a pair of them over to his table in the corner and settled down for the evening.

"Listen," he said, pointing a finger at me, "today an op' sits on his can down at Broad Street and has the whole damned circuit from New York to B. A. dished up to him like a *Filet Mignon*. And it wasn't so long ago that we fought for a 200-mile contact. We used to fight static on 600; we used to fondle silicon crystals and stop breathing so's we could copy a fellow way down in the mud. But it was a hell of a lot of fun when you come right down to it."

"Guess it was," I said, "but I'm wondering if things are much different today—I mean on the cargo ships."

"I guess some of the old tubs are about the same—damned if I know. But the land stations are different, and a lot of other things are different.

"Take the first tub I shipped out on," he went on. "We go down the coast from New York and we're only a day off from Colon. The Captain he wants jam and he wants biscuits and he wants every other kind of edible, and he wants it all ready to pick off the dock as we go through the Canal. So I get a 150-word message and every word is something about food. That's fifteen years ago, but even today, every time I hear the word 'conserves' I get the jumps.

"Maybe the op' at Colon never heard of conserves. Anyway, there was a set of grinders on that night that would make your teeth ache for listening to them. First we tangled with the word 'biscuit' and then I think it was 'chutney' that got him, but 'conserves' just left him blank. He'd come back and say, 'please repeat from one case chutney—to—ten pounds Canadian bacon,' and I'd come back and say, 'sorry, OM, the grinders knocked the adjustment on my crystal . . . please repeat."

"Well, I'm telling you, by the time I had that message cleared, including the word 'conserves,' the Captain could have nearly given his order by megaphone.

"But, that's nothing," he went on. "We pass through the Canal and head out into the Pacific with me believing that old NPG at Frisco and some of the other babies along the coast will be QRK for at least 500 miles. Imagine my surprise when I lose 'em all at about 300. I'm telling you I couldn't hear a damn thing except a Jap cargo off our starboard.

"That gets me to worrying. Suppose, I asks myself, the Captain wants some conserves waiting for him in Honolulu? What then, my pretty boy? Maybe they can hear you, but you can't send a QST for a batch of jam and some biscuits.

"So, what do I do? I kick in twenty-five bucks in Pearl Harbor for a De-Forest audion detector unit and a bunch of honeycomb coils. Out comes the ship's receiver and I should worry about conserves after that. Boy, I started hearing things. I made the circuit regenerative and just kicked her into oscillation when I wanted press from Frisco or Honolulu on CW. After that crystal outfit, it was the nuts.

"And then, by God, if we don't get into the craziest damn mess. And I get the blame because the radio doesn't pull the trick.

"It was like this," he said "We had a hold full of five-gallon cans of gasoline. We pull into Yokahama and the Port Gang tell us to keep outside the breakwater because we have explosives aboard. So we're about two miles off shore and about a mile from the S. S. *President Cleveland*, I think it was.

"Everything is fine until one o'clock in the morning when one of the oil burners in the fire room kicks back, blows off the fire-box door and knocks hell out of the water tender. The oil keeps right on pumping into the firebox and the first thing we know the whole fire room is one mass of burning fuel oil.

" 'Out with the hoses,' yells the Captain—'get that goddam sand,' yells the First Mate—and in the meantime there's a little game going on in which two men go down into the fire room to bring out

the water tender and two more men go down to bring them out.

"It's all very merry hell, and the Captain wants nothing better than to blow the whistle, but the steam's been turned off, and by God if the valve isn't in the fire room!

"'Sparks,' he yells, 'what the hell are you doing down here? Get to your radio and get help before we're blown to hell off this earth.'

"That's when I remembered the cans of gasoline—and it was in the hold right next to the fuel-oil tanks. Holy Mackeral, I thought, those oil tanks will set the whole mess off.

"Boy, I get on the air with full power and yell at the *President Cleveland*. Not a peep. Not a damn peep. The boys have gone to bed. So I yell at the Jap land station and tell him we're burning up out in the harbor. The Jap comes right back and says, 'We get Fire Boat,' and that sounded good to a man sitting on top of a volcano ready to shoot its cap off.

"'Hey, Joe,' he shouted, 'two more of the same.' And turning to me he said, 'I took the news to the Captain and he told me to get back to the radio and stay there. You couldn't blame him for being a bit excited.

"So I sat up there with the cans on my ears, and I could hear the shouting and banging going on down below. I calculated the distance between me and the hold full of gasoline—as if it made any difference. And I sat there sweating and wondering when the Fire Boat would pull alongside.

"Let me tell you, that was a hard wait. It was, exactly, one hour. But, before that hour was up, the boys below got the fire out. So, when the Fire Boat finally did show up, the Captain had some nice choice words for them, none of which were Japanese.

"The hitch was that these Japs were looking for us in the harbor, and never thought of coming outside the breakwater until they had disturbed the slumber of every last ship's crew in the harbor.

"But, I got the *real* hell—for not saying where we were."

"'Well,' I said, 'at least you got the Fire Boat.'

"'At least I got it,' he laughed. 'Let's drink this before it goes stale. Down the hatch,' he said, and we polished those off.

"'BUT,' he shouted, banging his glass on the table, 'I made up for it on the way back from Shanghai.'

"It was like this: The Captain fires the Steward in Shanghai and orders the supplies himself—plus plenty of conserves! Well, with that tub it was a 15-day run from China to Honolulu, so the Captain gets what he thinks is enough for the trip.

"Fine, only he's no Steward in the first place and in the second place he didn't count on our running light. He takes on a bit of sand ballast but even so the propeller is half-way out of the water. So, we breezed along at a snail's pace and five day's out run smack into the tail of a typhoon.

"Now, let me tell you, when you say typhoon, you say it with reverence—that is, if you've been through one. Why, the noise of the wind alone is enough to scare the pants off you. The wind starts up nice and easy and sounds like a couple of lions moaning outside your door. Then the old wind pulls in its belt a bit and starts blowing. Just a tryout to see how much the ship will keel. Then old wind decides to let loose and the moan turns to a wild, spine-chilling scream that makes you clamp your hands over your ears.

"So, we had a bit of that—and fifteen days later we were just half-way between Shanghai and Honolulu when we should have been listening to Aloha down at the docks. Fifteen days short, and all we have to eat is salt pork and hard tack . . . and conserves.

"A crew will last just about three days on that sort of diet, and then they get nasty. These boys got so cantankerous they thought it would be fun to heave the Captain over the side—and the Captain isn't long in finding out.

"So, pretty-boy Sparks is the nice boy . . . he's to save the day. Yes, sir, he's to get to his radio and call a ship and try to put over a bit of mid-Pacific panhandling and *do it goddam quick if he knows what is good for him.*

"And was Lady Luck with me? I'll say. Just a half hour of CQ'ing and I've lined up a Dollar Line ship who will let us have some beef and potatoes and bread and coffee and condensed milk and sugar. But I told the op' no conserves.

"When the fellows from the Dollar Line ship pulled alongside in a boat, with sides of cows and sacks of potatoes, a great cheer went up.

"We had a midnight feast that left us laying around on the deck. And Sparks was the little hero.

"'Which goes to show,' I said, 'the value of radio.'

"'You're damn tootin',' he said. Listen—on my second trip the steam turbine busted wide open about 100 miles north of Trinidad—and right in the middle of a good storm of the Cape Hatteras variety. With no headway, the old tub wouldn't answer her helm, so we rigged up the canvas hatch covers as sails, which did about as much good as

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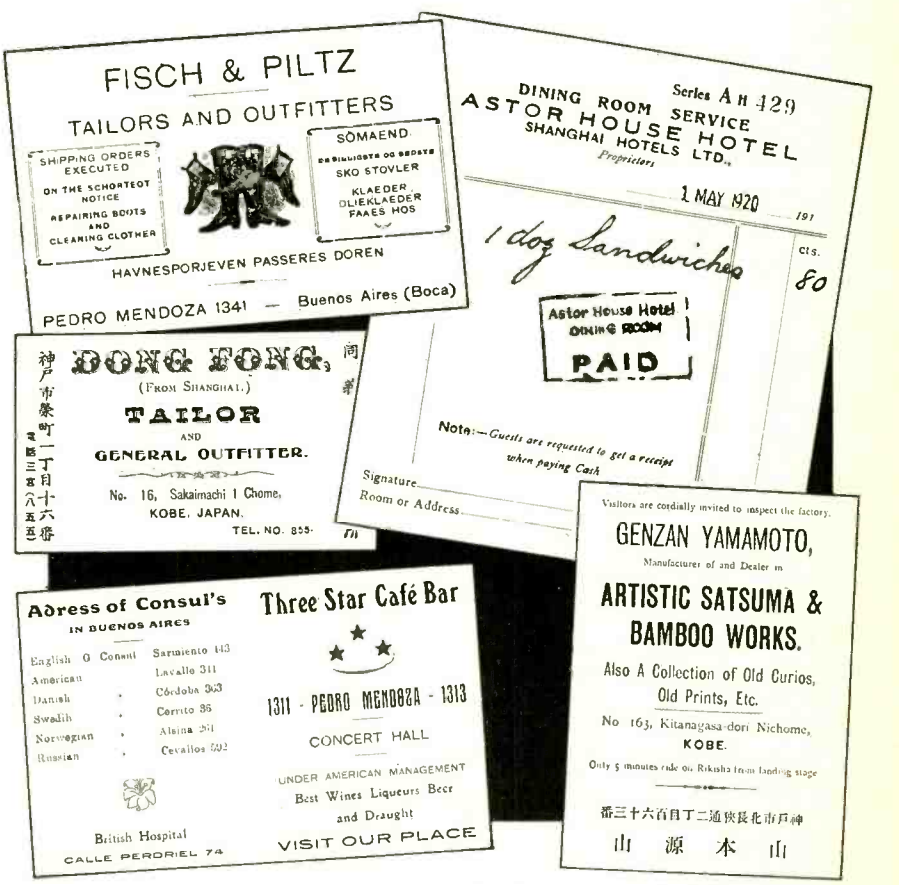


The sort of collection any sea-going operator might pick up in his travels. Note that Fisch & Piltz execute shipping orders "on the schorteot notice." Also note that "Sparks" got one dozen sandwiches for only 80 cents in one of the best hotels in Shanghai . . . but, that was 1920. (Note also that he paid for them!)

QUERIES

IS A NOISE REDUCTION ANTENNA DESIRABLE IN A NOISE-FREE LOCATION?

Question Number 1.

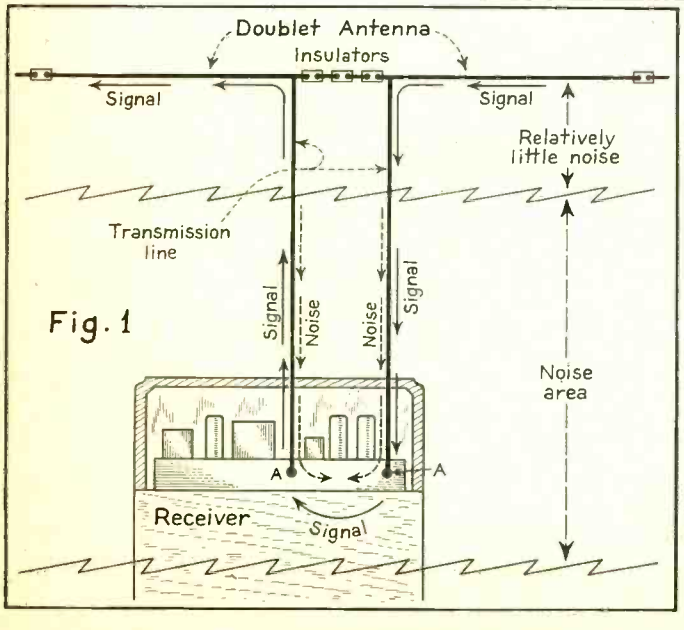
"I am seriously considering the purchase of a new, all-wave receiver. The dealer is trying to sell me a noise-reduction antenna with this set. However, a friend of mine, who has had considerable experience with receivers, having built many of them himself, tells me not to waste the additional five dollars. I am living in the country far from any car lines, traffic signals and other sources of man-made static. The nearest house to ours is a thousand feet away. The only source of noise would be from passing automobiles, and as our house is located some three hundred feet back from the road, my friend assures me that the transmission line lead-in would have little or no effect in reducing this interference. It occurred to me that ALL-WAVE RADIO is the logical magazine to give me the straight dope on this.—*A. J. S., Cairo, N. Y.*"

Answer.

As is usually the case in most disputes, there are logic and truth on both sides. However, in this instance, the preponderance of right is on the side of the dealer. By all means invest the extra dollars in the noise-reducing antenna system.

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. The editors of ALL-WAVE RADIO *will endeavor to make this a different kind of a Question-Answer department — just as* ALL-WAVE RADIO *is a different kind of a radio magazine. 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.*

You may ask as many questions as you wish. Aside from exceptional instances, this service is free to all readers, subscribers or otherwise. Where special circuits are required, or considerable research involved, the inquirer will be sent an estimate of the cost before the work is started.



Demonstrating the action of a noise-reduction antenna system. This arrangement has features other than noise reduction which recommends its use even in so-called "noiseless" locations.

It is probable that no noise-reduction qualities—and by this we mean noise-to-signal ratio—will be experienced on the disturbances set up by passing automobiles. The reason for this is quite simple. Figure 1 shows a fundamental noise-reduction system. This has been simplified to its bare essentials in order to make the action more clear. In actual practice, the down-lead, or transmission line, may be twisted or transposed, and the coupling between the different units—antenna proper, lead-in and receiver—is usually more complicated.

It will be observed that the receiver and most of the down lead are located in the noise area, while the antenna—so we hope—is high and clear in a relatively low intensity noise field. (The receiver, being effectively shielded, will pick up no noise.) The following simple principle should be remembered: *Any noise-reduction antenna system is really only effective when the noise field is more concentrated around the lead-in than about the antenna.* This is usually the case, for most man-made static is generated on or near the ground, and the radiations are weakened considerably by the time they get as high as the aerial. For the short distances involved in noise reduction, the intensity of the field may be said to vary indirectly with the square of the distance from the source. Thus it is possible to have a strong noise field in the neighborhood of the lead-in and a comparatively weak field about the antenna—offering a simple means of reducing the noise-to-signal radio.

A signal will be picked up by the antenna, and the dark arrows in Figure 1 show the momentary direction of the signal current. It goes down one lead-in, through the set, and up the other. The idea is to have the signal current going through the receiver in only one direction at a given instant. Obviously, this is what is happening, in accordance with the solid arrows. Of course, the lead-in will pick up some signal also, but both wires are so close together that the signal current induced in them will be in the same direction—for instance down. These two currents will nullify or buck each other in the receiver, so that no effect of lead-in pick-up will be noticed.

Exactly the same thing happens to a noise pick-up by the transmission line, and the dotted arrows show the course

of the noise current which "commits suicide" in a sort of head-on collision.

With the antenna system so far away from the road, it is probable that the noise field, from automobile disturbances, will be just as strong at the antenna as the lead-in. Of course no noise will be picked up by the lead-in, as would be the case were an ordinary down-lead employed. But if an ordinary lead-in were used, you might have more signal pick-up, which would offset the additional noise. Thus probably nothing is to be gained, as far as auto interference is concerned, by installing a noise-reduction antenna system in our correspondent's location—and his friend is right on this score.

However, that goes only so far as auto noise is concerned. No radio installed in a modern home can be said to be in a noise-free location. An electric refrigerator, vacuum cleaner, sewing machine, furnace thermostat, kitchen mixer, electric fan, washing machine, electric pump and even an electric clock are all sources of man-made static of just the variety that noise-reduction antenna systems are designed to combat. (We realize that A. J. S.'s friend may argue that some of these motors are of the type that should cause no interference when running. But all motors will often build up static charges, the intermittent discharge of which can be quite annoying.)

Another feature, which the dealer should have emphasized, is the fact that the doublet types of all-wave antennas are usually designed to give especially efficient reception on two or more of the short-wave *dx* bands. This is accomplished by tuning the aerial to these frequencies in a manner comparable to that by which the receiver itself is tuned to the desired wave. The results are similar—greater strength on those distant stations you wish most to receive, and better rejection of undesired signal.

Of course an open antenna—the conventional aerial and ground system—can be designed and tuned to respond best to given frequencies. However, the factors involved in so tuning this type of antenna are more difficult to control than the simple tape-measure considerations which determine the resonance or tuned points of the doublet.

When installing your doublet all-wave antenna, bear in mind that the directional effect is exactly opposite that of the open type. The latter receives signals best in the direction it is strung. In the case of an "L" aerial, the end at which the lead-in is taken off points in the direction from which best reception will be had. With the doublet, the direction of best reception is at right angles to the direction of the antenna. If the aerial is strung north and south, stations to the east and west will be your best bets.

"The Shadow"

RADIO'S FIRST "mystery drama," in which radio emissions from unknown sources mysteriously invade different parts of the short-wave band at irregular intervals, was disclosed recently by William A. Winterbottom, Vice President and General Manager of R.C.A. Communications, Inc.

Because of their unpredictable raids into marine, trans-oceanic, aircraft, military, naval, amateur, and probably also in the television sections of the radio spectrum, the strange radio signals have become known to engineers as "the shadow." It is a facetious nickname, but the hunt for the source of these sounds in space is nevertheless determined.

"Fingerprints" Have Been Taken

These radio waves have not the character of telegraphic or telephonic signals, and are definitely unrelated to any "static" or cosmic ray phenomena within the experience of engineers. Unlike static, they are usually observed on definite frequencies. Their "fingerprints" have been taken in the form of phonographic recordings of the weird sounds they produce, and the engineers are slowly but surely "closing in" on the answer to the mystery. Radio direction finders and cathode-ray oscillographs are other devices of modern radio science that are being employed in the hunt, the one being used to determine the direction from which the signals come, and the other to measure their phase, and frequency of modulation.

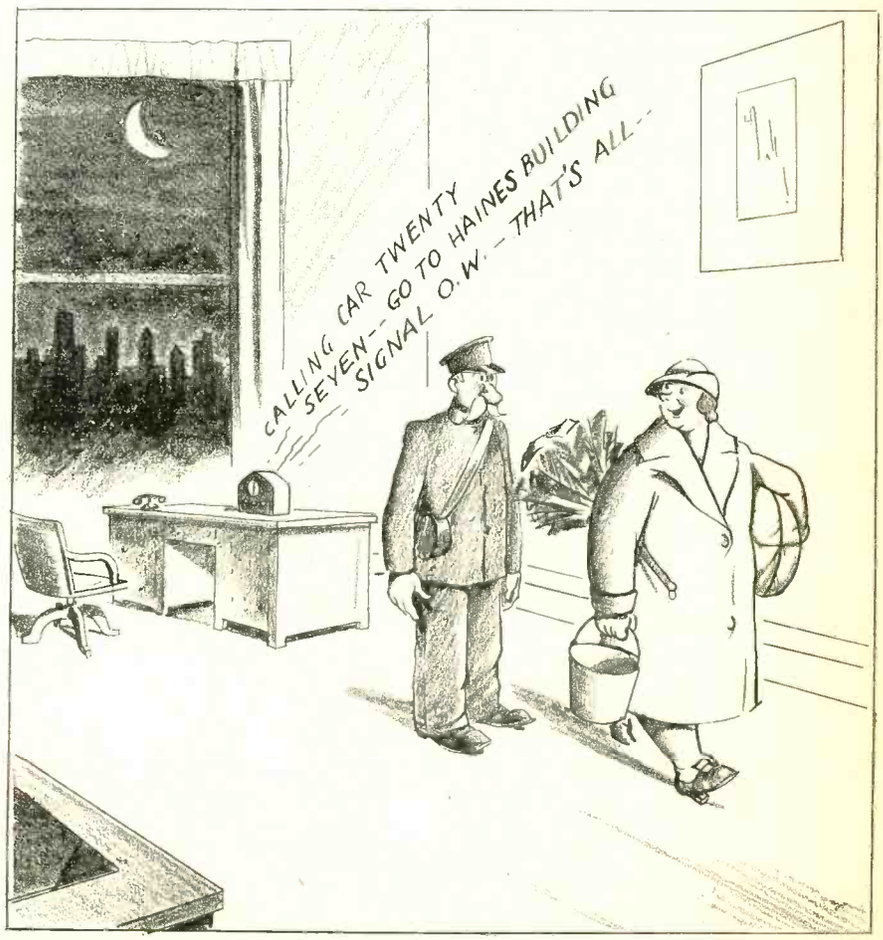
Through the past year "the shadow" has been most active in the frequency band between 11,000 and 14,000 kilocycles, although it has been observed as low as 6,000 kilocycles and as high as 18,000.

The type of signals emitted by "the shadow" are annoying but rarely disruptive to the communications paths across which they sweep. Their interference is most serious to radiotelephone signals, which of course includes the short-wave broadcasting services that hundreds of thousands of persons in this country tune in on their all-wave radio sets.

Active Daily

At stations of RCA and other radio companies in the eastern United States, the mysterious signals are most frequently observed between the hours of

(Turn to page 45)



"There's Clancey now—he alus sends a car fer me."

BACKWASH

A PAGE GIVEN OVER TO THE EXPRESSIONS AND OPINIONS OF READERS

DON WALLACE REPLIES

Editor, ALL-WAVE RADIO:

I enjoyed reading your magazine so much, especially to see such a good list of old timers in print.

"Constant Reader" probably wouldn't think of listening in on the conversations that go on in the drawing room, on the street car, on the train, or elsewhere—those conversations are rarely of interest to anyone save the participants themselves. Such is the case among amateurs. Once the conversation takes on the "show for listeners" idea, most of us turn off that particular Ham station, as it no longer is interesting from the conversational angle.

If, on the other hand, "Constant Reader" should join us and become one end of the conversation, he no doubt would be interesting, so long as he didn't start putting on the show for the BCL's which he now craves.

My first phone rig worked fine, 24 years ago, and every year it becomes more and more interesting.

Best regards.

DON C. WALLACE, W6AM,
LONG BEACH, CALIF.

P. S. I've just completed another 5000-mile trip of the coast, and have mentioned the fine articles in your magazine to a great many. In my talk before the Sacramento Valley Radio Club, it came up, and as a result, there was a rush on the local newsstand the next day.

To say that we are pleased, is putting it mildly. Many thanks for the "lift"—and we trust that ALL-WAVE RADIO *will continue to be of interest to you.—Ed.*

◆

Arthur Harris, Jr., W1JGX, at his all-wave listening post, enjoying (we hope) a copy of ALL-WAVE RADIO.

READER'S LISTENING POSTS

Editor, ALL-WAVE RADIO:

The first issues of ALL-WAVE RADIO have proved far better than excellent. The entire force of ALL-WAVE RADIO is to be congratulated on the wonderful piece of work you have shown so far. Without a doubt, it looks like ALL-WAVE RADIO will be up and ahead of the leading all wave radio magazines.

I have no criticisms to offer whatsoever, but I would like to suggest a department that most every radio magazine has—that is, a page devoted to photographs of the listener's receiving post and a short letter from him. I think that a page devoted to this would meet with immediate success.

I enclose a photograph of my listening post. The receiver is an Atwater-Kent Model 708 all-wave set. I have received 39 foreign countries and 48 states in the U. S. on short wave and a number on the broadcast band. The antenna is a Lynch Doublet and performs well.

I am fifteen years of age and hold an amateur radio station license (W1JGX) which I obtained when I was fourteen. I started in radio when I was twelve.

The trophy in the picture was awarded me by *Short Wave Listener* magazine for a prize listening post. I have 372 verifications.

ARTHUR HARRIS, JR., W1JGX,
WINCHESTER, MASS.

Many thanks for the letter and the photo. We started in radio when we were twelve years old, but we hate to think how many years ago that was. Your idea is an excellent one, but the final verdict rests with the readers. We shall watch the mails with interest.—Ed.

◆

THE "WORLD WIDE DIAL CLUB"

Editor, ALL-WAVE RADIO:

I think the second issue of ALL-WAVE RADIO is quite an improvement over the first issue and think your magazine will be a success.

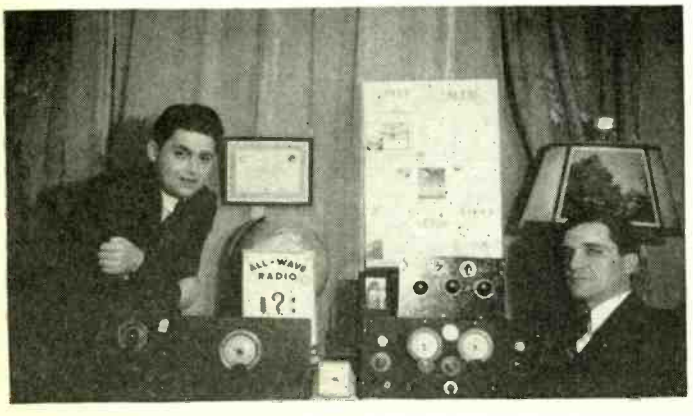
I notice you are publishing pictures of amateur stations. I am enclosing a picture of my SWL corner for your consideration.

I haven't gotten into the amateur circle yet, but find the SWL quite interesting. I am secretary of the World Wide Dial Club, a local get-together SWL organization that meets on the first and third Tuesdays of each month at 8:00 P. M. at the Morrison Hotel, Chicago.

The person sitting in the picture is Frank Anzalone, of the Reception Committee of the club.

ROBERT R. IRWIN,
CHICAGO, ILL.

Thanks for the letter, the photo and the dope on the World Wide Dial Club. Come again.—Ed.



Robert R. Irvin (right) and Frank Anzalone at Mr. Irwin's "SWL Corner."

FOREIGN NEWS

REVIEWING THE MARCH OF WORLD TOPICS

ACTIVITY IN CHINA

SHANGHAI: For some time the China Technical Development Company, Inc., (British control) operating station XQHC has been in financial difficulties. Unfortunately, the company had to liquidate its assets to meet necessary obligations; hence, during the fall of 1935 the station equipment was dis-assembled and sold to Chinese broadcasters. Holders of the corporations common stock received thirteen cents on the dollar; holders of secured and preferred stock were paid in full.

While silencing of XQHC was lamented throughout the English-speaking world, DX devotees will be happy to learn that construction has begun on the largest commercial broadcast station in China. It is contemplated to have the station on the air in late December or about the first part of the year; no reports have yet reached this country as to call letters and wavelength. The station is to be located at Woosung, mouth of the Whangpoo river, which is approximately 12 miles from Shanghai. Power second to the Government station at Nanking which is 75 kw.

◆

EGYPTIAN BROADCASTING UNHEARD IN EUROPE

CAIRO, Egypt: Local press reports have been filled with Arabic-speaking residents that they cannot hear the transmission of the Egyptian State Broadcasting station. Despite the fact that the Abu Zaebal station has a power of 20 kw., it is found that inasmuch as the Brussels and the Abu Zaebal stations have the same wavelength it is almost impossible for receiving sets in Europe to get the Egyptian broadcasting program because of interference from heterodynes.

Egyptian delegates to the next Wireless Congress will, it is reported, attempt to alter Egypt's present wavelength. (*Acting Commercial Attache Leys A. France*, Cairo.)

◆

BBC "NOT ALLOWED" LIST

LONDON: In the United States there are numerous taboos which artists must know before etherizing their talent, and so in England, the British Broadcasting Company has compiled a list of items to conform to radio social eitquette; outstanding "must nots" are:

Proprietary articles and business names.
Religion (including Spiritualism)
Public personalities
Infidelity
Immorality of any kind
Physical infirmities and deformities (including blindness, dumbness, stammering, loss of limbs, cross-eyes, etc.)
Painful or fatal diseases (including cancer, consumption, mental deficiency, etc.)
Reference to Negroes as "Niggers," and Chinese as "Chinks."

If these items are enforced, and they will be, it is unquestionable that British radio transmission must suffer heavy censorship.

◆

150-KW STATION REOPENED

VILLA ACUNA, Mexico: After long litigation the Supreme Court of Mexico decided in favor of Dr. John Brinkley, famous "goat gland" expert, in restoring the ownership of his radio station XER. This very powerful transmitter is located across the Rio Grande River from Del Rio, Texas.

The officials at villa Acuna have been directed to remove soldier guards who patrolled the premises. A large part of the equipment was wrecked during the litigation which now, fortunately, has been settled. More than 600,000 pesos ($100,000) of fines and assessments have been cancelled by legal decree. Repairs and replacements are now under way and the station is expected to be on the air sometime in January.

◆

RESTRICTIONS AND BANS

ROME, Italy: An official order has been given to all keepers of hotels and bars and all places where the public may congregate to listen to broadcasts that, until further notice it will be unlawful to tune in on foreign stations.

BERLIN, Germany: All forms of light music including that of jazz bands have been banned from being broadcast from German transmitters. Premiere performances inaugurating new styles in German dance music are now in vogue throughout the German Empire.

COPENHAGEN, Denmark: A clause in the Danish Radio Act decrees that broadcasting must observe strict neutrality in all contingincies; consequently the program director at Copenhagen banned a new fox-trot entitled: "Black Sheba from Addis Ababa."

◆

INTERNATIONAL BROADCASTING UNION

WARSAW: At the annual meeting of the U. I. R. held in Warsaw, definite moves were made to hold a world conference of broadcasting organizations in 1936 at Paris, France. On account of the universalism of short-wave broadcasting and the extensions of inter-continental program exchanges, it is expected that all of the twenty-two countries represented (members) will exchange ideas and promote new plans for bettering the inter-continental services.

At the last meeting, the conference adopted a plan for radio-casting international lectures written by outstanding men of the day. The lectures will be broadcast from local stations in each country, languages being translated to conform to territorial tongues. The benefit received by this important movement will, undoubtedly, increase the esthetic and cultural values of all individuals within listening range of the transmissions.

◆

NOISE ABATEMENT PROGRESS

LONDON: At a recent meeting of the Internation Electro-technical Commission, a problem which raised considerable interest was that of radio interference, especially that perplexing question: "When is a noise not a noise?"

Considerable diversity of opinion exists as to the noise level necessary to cause interruption. It being realized that there are many factors to be considered, such as the nature of the program inter-

(Turn to page 45)

RADIO PROVING POST

The Super Skyrider

THE SUPER SKYRIDER designed for the late 1935 and the 1936 season incorporates a number of new features of design which are of interest to the amateur and to the man who likes to listen to amateurs and to short-wave broadcasts.

Tuning System

The Super Skyrider covers a total of five bands with overlapping frequency coverage from 545 kc to 48 mc. Tuning is accomplished through the use of a master condenser gang and an auxiliary gang of low maximum capacity. The master condenser gang tuning dial is vernier driven at a ratio of about six to one. This dial carries the receiver calibration in five concentric 180-degree scales. On the outer rim of the dial is engraved a 100-division scale which opposes a ten-division vernier reading scale. Thus, it is possible to reset the dial and master condenser to one-tenth division. The dial diameter is five inches and the reset scale (100) divisions are separated by approximately .080". The "band-spread" dial is driven by a smooth friction vernier at a ratio of approximately ten to one. The 180-degree movement is divided into 200 divisions.

Band-Spread Action

The band-spread action of the Super Skyrider was found in test to be fully satisfactory on ten, twenty and forty meters using the "band-spread" dial alone and with the master dial set to the center of the band in use. Eighty meters was tuned with wide band spread using the "band-spread" dial alone, but could also be tuned satisfactorily with the main dial. Likewise, the 160-meter band could be tuned satisfactorily with the master dial.

The self contained power supply unit dissipates some heat as might be expected. The positioning of the tuning coils under the sub-base, and adequate ventilation, hold drift due to temperature change down to a comparatively small value. The built-in speaker is convenient for communication. For broadcast reception and the reception of short-wave broadcasts of music, an external speaker can be plugged into a jack in the front panel. This feature is worth while for the audio system in the Super Skyrider is resistance coupled and capable of very satisfactory tonal reproduction.

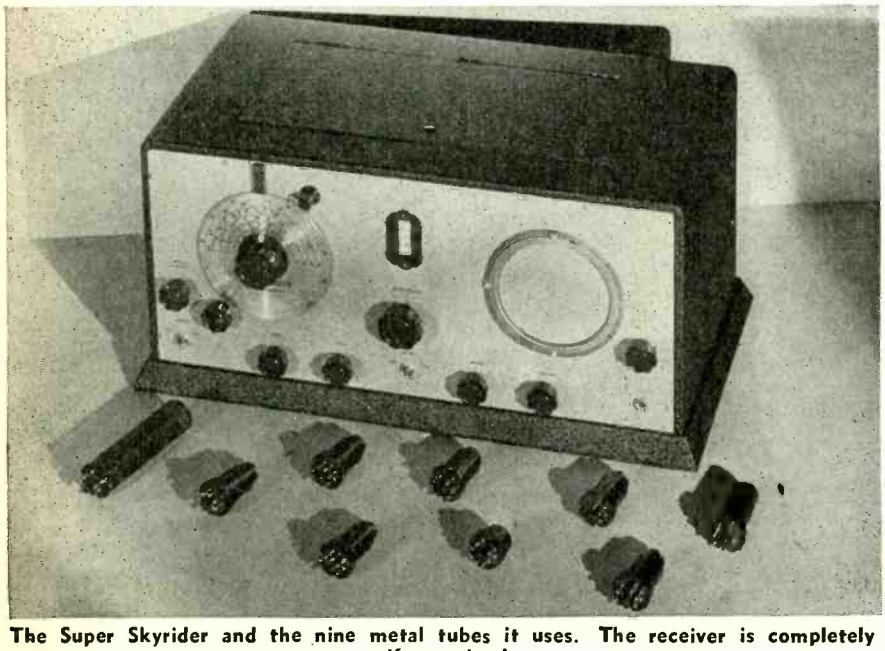
The Crystal Filter

The crystal filter action was found to match all of the claims that have been made for this type of filter in improving phone selectivity as well as selectivity in the reception of CW signals. The crystal filter action in the Super Skyrider is good on CW—that is, signals tuned in without the filter are not reduced in audio peak intensity when the filter is thrown in circuit. On phone reception, the filter control is easy to manage—a feature not found in many receivers which are crystal equipped.

Metal Tubes

The Super Skyrider is one of the first, if not the first, amateur communication receivers to be equipped with metal tubes throughout. To obtain a check on the efficiency and claimed freedom from noise for metal tubes, the Skyrider was checked with octal base glass tubes in place of the metal tubes. Tests made entirely by ear gave the impression of about the same noise but louder signals when the metal tubes were in use. The shielding of metal tubes is definitely superior to any shielding possible with glass tubes and it is evident that this factor has been used in the design of the i-f system.

This receiver is probably the first of the communication receivers to use iron-core i-f transformers also. Any amateur or short-wave broadcast listener who has attended the last two Institute of Radio Engineers conventions will appreciate the gain which can be had with the iron-core units.



The Super Skyrider and the nine metal tubes it uses. The receiver is completely self-contained.

The Circuit

An examination of the Super Skyrider circuit diagram shows a number of excellent design features. The use of the 6L7 mixer tube eleminates the capacity and space-charge coupling effects found in a 6A8 or 6A7 and has a decided advantage over the sharp cut-off pentodes such as the 6C6 which use screen grid injection of the oscillator signal. The 6L7 requires a relatively low amplitude from the heterodyne oscillator compared with the screen-grid injection types.

The crystal filter coupling unit in the Super Skyrider takes into account the wide difference in impedance between the crystal and the i-f amplifier tube grid circuit. This probably is the factor responsible for the excellent crystal performance of the receiver. It will be noted that the 6F5 audio amplifier grid feed and avc supply tap are moved down from the high-voltage end of the diode detector load resistor. This feature permits the diode to operate under the best conditions and is well worth while.

The monitoring feature of the Super Skyrider was found to have little value on phone communication except to inform the operator that the carrier was being modulated. Feedback trouble was encountered whenever the loudspeaker was used for monitoring and phones were taboo because of the bother.

Listening Tests

The Super Skyrider was given a thorough test on all of the bands which it covers. Broadcast stations on the band from 540 to 1500 kc were received with excellent selectivity and sensitivity.

The 160- and 80-meter amateur bands were covered with both the master control dial and the "band-spread" dial. On both bands the master control afforded rapid and very satisfactory tuning.

The 40 meter CW band was a hotbed of signals. Most receivers of any value will bring through DX signals on 40 meters. Here, the Super Skyrider performed as might be expected with the crystal filter doing an excellent job in separating wanted signals from the QRM.

Twenty-meter performance was excellent. Contacts with K6LJB on phone and with LA4K on CW were made from the East Coast. LU8DR and LU6AP were heard frequently during these tests. The unusually low noise level and fine crystal filter operation are the distinctive features of the receiver.

Ten Meter Reception

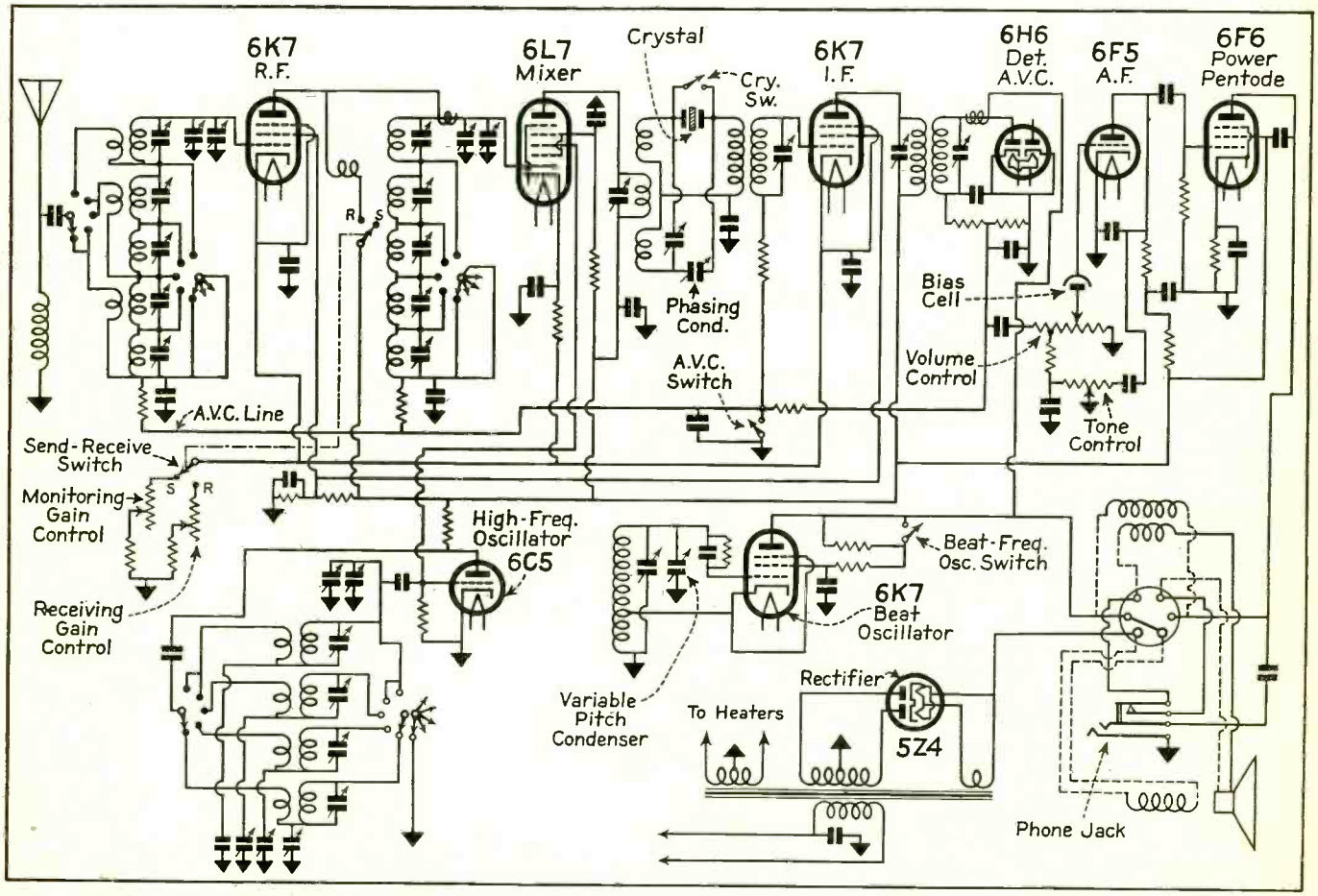
Ten-meter reception was spotty with signals coming through from a few European amateurs and all of the U. S. districts outside of New York City skip. The greatest difference in performance between octal base glass and metal tubes was observed on this band. The signal level actually averaged one to two R's louder with the metal tubes than with corresponding glass octal base types. As mentioned earlier in this description of the Super Skyrider, this difference might be accounted for by the i-f transformer design and at ten meters by alignment differences in the r-f section. However, the noise level was about the same for both metal and glass—indicating the best signal-to-noise ratio for the metal tubes.

Summary

In summarizing; the Super Skyrider has many features which are commendable. The most notable are the cystal filter action, freedom from noise, effective coil switching and the convenience of having everything in one cabinet. The drift is very low in spite of the use of mica trimmers throughout. The crystal-phasing and beat-oscillator tuning condensers are air dielectric, of course. The band spread available makes the Super Skyrider particularly suited to the critical short-wave broadcast listener. The 19, 25, 31 and 49 meter bands all yielded good signals with far less tuning effort than is required for the average all-wave broadcast receiver.

The appearance of the Super Skyrider is familiar to most people. Because of this fact it seems adequate to merely list

(Turn to page 43)



Complete circuit diagram of the Super Skyrider. Note the bias cell in the grid circuit of the 6C5 tube.

In Writing For Veries . . .

ADDRESSES OF PRINCIPAL SHORT-WAVE STATIONS BY COUNTRY

AFRICA

Call	*Address*
CNR	Director General des Postes, Rabat, Morocco.
CR6AA	Estacao Radio Difusora, Caixa Postal 103, Lobito, Angelo, Portugese West Africa.
OPL-OPM	Radio Leopoldville, Congo Belge, Africa.
SUV-SUX	Post Office Box 795, Cairo, Egypt.
VQ7LO	P. O. Box 777, Nairobi, Kenya Colony, Africa.
ZSS	Overseas Communications, Kodak House, Shortmarket St., P. O. Box 962, Capetown, So. Africa.
ZTJ	Radio ZTJ, P. O. Box 4559, Johannesburg, Transvaal, South Africa.

ASIA, OCEANIA AND FAR EAST

Call	*Address*
CQN	Government Broadcasting Station CQN, Postmaster General, Post Office Bldg., Macoa, (Portugese), China.
FZS	Postale Boite 238, Saigon, Indo-China.
HSP	Government Post & Telegraph, Bangkok, Siam.
Java Stations	H. Van der Veen, Engineer, Java Wireless Stations, Bandoeng, Java.
"JV" & "JZ" Stations	International Wireless Telephone Company of Japan, Osaka Bldg., Kojimachiku, Tokio, 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, Netherlands Indies.
RV15	Far East Radio Station RV-15, Khabarovsk, U.S.R.R.
VK2ME	Amalgamated Wireless Ltd., Wireless House, 47 York St., Sidney, N.S.W. Australia.
VK3LR	Australian Broadcasting Commission, Broadcast House, 264 Pitt St., Sidney, Australia.
VK3ME	Amalgamated Wireless Ltd., P. O. Box 1272-L, Melbourne, Australia.
VPD	Amalgamated Wireless, Ltd., Suva, Fiji Islands.
VUC	Indian State Broadcasting Service, 1 Garstin Place, Calcutta, India.
VUY-VUB	Indian State Broadcasting Service, Irwin House, Sprott Road, Ballard Estate, Bombay, India.
XGW	Radio Administration, Sassoon House, Shanghai, China.
YBG	Radio Service, Serdangweg 2, Sumatra, Dutch East Indies.
YDA	H. Van der Veen, Engineer, Java Wireless Stations, Bandoeng, 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 ZHI, Radio Society of Penang, Penang, Malay Straits.
ZLT-ZLW ZLR	Supt. Post & Telegraph, GPO, Wellington, New Zealand.

CANADA

Call	*Address*
CGA-CJA, et al.	Marconi Station, Drummondville, Quebec, Canada.
CJRX-CJRO	Royal Alexander Hotel, Winnipeg, Manitoba, Canada.
VE9BJ	Capitol Theatre, St. Johns, N. B. Canada.
VE9CS	743 Davie St., Vancouver, B. C. Canada.
VE9DN	Canadian Marconi Co., Box 1690, Montreal, Quebec, Can.
CRCX	Rural Route No. 4, Bowmanville, Ontario, Canada.
VE9HX	Post Office Box 998, Halifax, N. S., Canada.

CUBA, MEXICO, CENTRAL AMERICA AND WEST INDIES

Call	*Address*
CO9GC	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	Post Office Box 98, Havana Cuba.
COCD	"La Voz del Aire, S. A.", P. O. Box 2294, 25 y. g. Vedado, Havana, Cuba.
COCH	Estacion COCH, Calle B No. 2 Vedado, Havana, Cuba.
HI1A	Radiodifusora HI1A "La Voz del Yaque," Santiago de los Caballeros, R. D.
HI3C	Radiodifusora HI3C, Sr. Roberto Bernado, Prop., La Ramona, R. D.
HI4D	Radiodifusora HI4D, "La Voz de Quisqueya," Dominican Republic.
HH2T HH2S	Societe Haitienne d'Automobile, Port-au-Prince, Haiti.
HIH	Radio HIH, "Las Voz del Higuamo," San Pedro de Macoris, R. D.
HIL	Radio HIL, Apartado 623, Santo Domingo City, R. D.
HIX	Radio HIX, J. R. Saladin, Director of Radio Communication, Santo Domingo, R. D.
HI1J	Radiodifusora HI1J, Apartado 204, San Pedro de Macoris, R. D.
HIZ	Radiodifusora HIZ, Calle Duarte No. 68, Santa Domingo, R. D.
HP5B	Radio HP5B, P. O. Box 910, Panama City, Panama.
HP5J	La Voz de Panama, Apartado 867, Panama City, Panama.
TGX	Radiodifusora TGX, Director M. A. Mejicano Novales, 11 Avenue N. 45, Guatemala City, Guatemala.
TGW	Radiodifusora Nacional TGW, Republic de Guatemala.
TIPG	Radio TIPG, Perry Gir ton, Prop., Apartado 225, San Jose, Costa Rica, C. A.
TI8FF	Radio T18FF, Ecos del Pacifico, Puntarenas, Costa Rica.
TIEP	"La Voz del Tropico," Apartado 257, San Jose, Costa Rica, C. A.
TIGPH	Radiodifusora TIGPH "Alma Tica," Apartado 775, San Jose, Costa Rica.
TIRCC	Radioemisora Catolica Costaricense, Apartado 1064, San Jose, Costa Rica, C. A.
HRN	Radio HRN, La Voz de Honduras, Tegucigalpa, Honduras
VPN	Station VPN, Nassau, Bahama Island.
WTDV	H. M. McKenzie, St. Thomas, Virgin Islands.
WTDW	S. I. Winde, Christiansted, Virgin Islands.
XAM	Director General de Correos, Merida, Yucatan,
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	Estacian XECR Secretaria de Relaciones Exteriories, Mexico, D. F.
XECW	Radio XECW, Del Caballero Santokan, Bajio 120, Mexico, D. F.
XEFT	Radio XEFT, La Voz de Vera Cruz, Av. Independencia 28, Vera Cruz, Mexico.
XEXA	Secretaria de Educacion Publica, Mexico, D. F.
YNA	Tropical Radio Telegraph, Managua, Nicaragua, C. A.
YNIGG	La Voz de Los Lagos; Radiodifusora YNIGG, Managua, Nicaragua, C. A.
YNLF	Radiodifusora YNLF, c/o Ing, Moises Le Franc Calle 15 de Set No. 206, Managua, Nicaragua.
YNDA	Radiodifusora YNDA, Managua, Nicaragua.

EUROPE

Call	*Address*
2RO	5 Via Montello, Rome, Italy
CSL	Radio CSL, Emissora National, Lisbon, Portugal.
CT1AA	Antonio Augusto de Aguair, 144, Lisbon, Portugal.
CT1CT	Oscar G. Lomelino, Rua Gomez Freire 79-2 D, Lisbon, Portugal.
CT1GO	Portugese Radio Club, Parede, Portugal.
SPW	Radio SPW, Polski Radio Warsaw, Warsaw, Poland.
DAF	Hauptfunkstelle Nordeich, Norden-Land, Germany.
DJA, et al.	German Short Wave Station, Broadcasting House, Berlin, Germany.
Dutch Phones	Parkstaat 29, S'Gravenhage, Holland.
EAQ	P. O. Box 951, Madrid, Spain.
EA8AB	Radio Club Tenerefe, Alvarez de Lugo 1, 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, EC1.
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	Radio HVJ, Castine, Pio IV, Vatican City, Vatican,
IAC	Coltano Radio, Piza, Italy.
IRM-IRW	Italo Radio, Via Calabria
IRGIQA	N. 46/48, Rome, Italy.
LKJ1	Ministere Du Commerce, Administrator des Telegraphes, Oslo, Norway.
OER2	Radio OER2, Vienna, Austria.
ORK-ORG	Director de Communications, Bruxelles, Belgium.
OXY	Stateradiofonien Heibersgade 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.
Pontoise	Minister des Postes, 193 Rue de Grenelle, Paris, France.
RNE-REN RV59	Radio Centre, Solianka 12, Moscow, U.S.S.R.

SOUTH AMERICA

Call	*Address*
CEC	CIA Internacional de Radio, Casilla 16-D, Santiago, Chile.
CP5	Radio CP5, Casila 637, La Paz, Bolivia.
El Prado	Apartado 98, Riobamba, Ecuador.
HC2AT	Radiodifusora HC2AT, P. O. Box 872, Guayaquil, Ecuador.
HC2ET	Radiodifusora del Telegrafo, Casilla 249, Guayaquil, Ecuador.
HC2CW	Radiodifusora HC2CW Casilla 1166, Guayaquil, Ecuador.
HC2JSB	Ecuador Radio Station HC2JSB, Juan S. Behr, Prop., Guayaquil, Ecuador.
HC2RL	P. O. Box 759, Guayaquil, Ecuador.
HCJB	Casilla 691, Quito, Ecuador.
HCK	Radiodifusora HCK, Quito, Ecuador.
HJA7	Radio HJA7, Cucuta, Colombia.
HJ1ABB	Apartado 715, Barranquilla, Colombia.
HJ1ABC	Radiodifusora HJ1ABC La Voz de Quibdo, Quibdo, Columbia
HJ1ABD	Estacion HJ1ABD, Cartagena, Colombia.
HJ1ABE	Apartado 31, Cartagena, Colombia.
HJ1ABG	Apartado 816, Barranquilla, Colombia.
HJ1ABJ	"La Voz de Santa Marta," Radio HJ1ABJ, Santa Marta, Colombia.
HJ1ABK	Radiodifusora HJ2ABK, Apartado 580, Barranquilli, Colombia.
HJ2ABA	"La Voz Del Paiz," Tunja, Boyaca, Colombia.
HJ2ABC	Pompilio Sanchez, Cucuta, Colombia.
HJ2ABD	Hector McCormick Prop., Radiodifusora HJ2ABD, Calle 2A #1205, Bucaramanga, Colombia.
HJ3ABD	Colombia Broadcasting, Apartado 509, Bogota, Colombia.
HJ3ABF	Apartado 317, Bogota, Colombia.
HJ3ABH	"La Voz de La Victor," Apartado 565, Bogota, Colombia.
HJ3ABI	Apartado 513, Bogota, Colombia.
HJ4ABA	Emisora HJ4ABA, "Ecos de la Montana," Medellin, Colombia.
HJ4ABB	Radio Manizales, Apartado 175, Manizales, Colombia.
HJ4ABC	Radiodifusora HJ4ABC "La Voz de Pereira," Pereira-Caldas, Colombia.
HJ4ABD	Radiodifusora HJ4ABD La Voz de Citia, Medellin, Colombia.
HJ4ABE	Radiodifusora de Medellin, Medellin, Colombia.
HJ4ABC	Radiodifusora HJ4ABC, Ecos del Combeina, Ibague, Colombia.
HJ4ABL	"Ecos de Occidente," P. O. Box 50, Manizales, Colombia.
HJ5ABC	"La Voz de Colombia," Radiodifusora HJ5ABC, Cali, Colombia.
HJ5ABD	"La Voz del Valle," Cali, Colombia.
HJ5ABE	Radiodifusora HJ5ABE, Apartada 50, Cali, Colombia.
HJB	Marconi Telegraph Co., Apartado 1591, Bogota, Colombia.
HJN	Ministero de Correos y Telegraph, Bogota, Colombia.
HJY	All-America Cables, Inc., Bogota, Colombia.
HKE	Observatoria Nacional de San Bartolome, Bogota, Colombia.
HKV	Radiodifusora HKV, Radio Dept.—War Ministry, Government of Colombia, Bogota, Colombia.
LSN-LSL, et al.	Compania Internacional, 143 Defensa, Buenos Aires, Argentina.
LSX	Transradio Internacional, San Martin 329, 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.	Caixa Postal 500 Rio de Janeiro, Brazil.
PRA8	Radio Station PRA8, Radio Club of Pernambuco; "The Voice of North," Pernambuco, Brazil.
PRF5-PSK	Comp. Radio Internacional Do Brazil, P. O. Box 709, Rio de Janeiro, Brazil.
VP3MR	Radio Station VP3MR, Georgetown, British Guiana.
YV2RC	Apartado Correos 2009, Caracas, Venezuela.
YV3RC	Radiodifusora Venezuela, YV3RC, Caracas, Venezuela.
YV4RC	Estacion S.A.R., Este 10 bis N. 71, Caracas, Venezuela.
YV5RMO	Box 214, Maracaibo, Venezuela.
YV6RV	"La Voz de Carabobo," Radio YV6RV, Valencia, Venezuela.
YV8RB	Radiodifusora YV8RB, "La Voz de Lara," Barquisimento, Venezuela.
YV10RC	Radiodifusora YV10RSC "La Voz del Tachira," San Cristobal, Venezuela.
YVQ-YVR	Servicio Radiotelegraphico, Maracay, Venezuela.
ZP10	Radio Prieto ZP10, Asuncio, Paraguay.

UNITED STATES

Call	*Address*
Dixon Stations	140 Montgomery St., San Francisco, Cal.
W1XAL	World Wide Broadcasting Corp., University Club, Boston, Mass.
W1XK	Hotel Statler, Boston, Mass.
W2XAD-W2XAF	General Electric Co., Schenectady, N. Y.
W2XE	485 Madison Ave., New York, N. Y.
W3XAU	1622 Chestnut St., Philadelphia, Pa.
W3XL-W3XAL	30 Rockefeller Plaza, New York, N. Y.
W4XB	Isle of Dreams Broadcasting Corp.; Radio W4XB, Herald Bld., Miami, Florida.
W8XAL	Crosley Radio Corp., Cincinati, Ohio.
W8XK	Grant Bldg., Pittsburgh, Pa. burgh, Pa.
W9XAA	Navy Pier, Chicago, Ill.
W9XF-W9XBS	20 North Wacker Drive, Chicago, Ill.
WVD	Radio WVD, 517-Federal Office Bldg., Seattle, Wash.

SHORT-WAVE STATION LIST

STAR BROADCASTERS INDICATED BY BOLD TYPE; PHONE (P); EXPERIMENTAL (E); TIME, E.S.T.

KC	Meters	Call	Location	Time
21540	**13.92**	**W8XK**	**Pittsburgh, Pa.**	**7-9 A.M.**
21520	**13.94**	**W2XE**	**Wayne, N. J.**	**10-11 A.M. Daily**
21500	13.95	NAA	Washington, D. C.	(E) Time signals regularly
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 irregular
21140	14.19	KBI	Manila, P. I.	(P) Tests and relays P. M. irregular
21080	14.23	PSA	Rio de Janerio, 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
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 mornings
19987	15.01	CFA	Drummondville, Que.	(P) Phones: No A. M.; 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 mornings
19720	15.21	EAQ	Madrid, Spain	(P) Relays and tests in A.M.
19680	15.24	CEC	Santiago, Chile	(P) Phones OCI-HJY afternoons
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. Assise, France	(P) Phones LSM-PPU-YVR mornings
19345	15.52	PMA	Bandoeng, Java	(P) Phones PCK-PDK early mornings
19260	15.58	PPU	Rio de Janerio, Brazil	(P) Phones DFB-EHY-FTM mornings
19235	15.60	DFA	Nauen, Germany	(P) Phones HSP-KAX early mornings
19220	15.61	WKF	Lawrenceville, N. J.	(P) Phones GAS-GAU mornings
19200	15.62	ORG	Brussells, Belgium	(P) Phones OPL mornings
19140	15.68	LSM	Buenos Aires, Arg.	(P) Phones DFB-FTM-GAA-GAB mornings
18970	15.81	GAQ	Rugby, England	(P) Phones ZSS mornings
18960	15.82	WQD	Rocky Point, N. Y.	(E) Tests LSY irregularly
18950	15.83	HBF	Geneva, Switzerland	(E) Phones So. America mornings
18910	15.86	JVA	Nazaki, Japan	(P) Phones and tests irregular with Europe
18890	15.88	ZSS	Klipheuvel, So. Africa	(P) Phones GAQ-GAU mornings
18860	15.91	WKM	Rocky Point, N. Y.	(E) Tests and relays irregularly
18830	15.93	PLE	Bandoeng, Java	(P) Phones PCV mornings early. KWU evenings. Music at times mornings.
18740	16.01	PCP	Kootwijk, Holland	(P) Relays and phones mornings irregular
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
18480	16.23	HBH	Geneva, Switzerland	(E) Relays to N. Y. mornings irreg.
18440	16.25	HJY	Bogota, Colombia	(P) Phones CEC-OCI noon; music at times
18405	16.30	PCK	Kootwijk, Holland	(P) Phones PLE-PMC early A.M.
18350	16.35	FZS	Saigon, Indo-China	(P) Phones FTK early mornings
18340	16.36	WLA	Lawrenceville, N. J.	(P) Phones GAS mornings
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**	**ETA**	**Addis Ababa, Ethiopia**	**Daily 7 A.M. - 3 P.M. Wednesdays 5 P.M.**
18250	16.43	FTO	St. Assise, France	(P) Phones LSM-LSY mornings
18200	16.48	GAW	Rugby, England	(P) Relays and phones N. Y. irreg.
18190	16.49	JVB	Nazaki, Japan	(P) Phones Java early mornings
18180	16.51	CGA	Drummondville, Que.	(P) Phones GBB mornings
18135	16.54	PMC	Bandoeng, Java	(P) Phones PCK-PCV early mornings irregular
18115	16.56	LSY3	Buenos Aires, Arg.	(E) Phones DFB-FTM-GAA-PPU A. M.; evening broadcasts occasionally
18040	16.63	GAB	Rugby, England	(P) Phones LSM noon
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 mornings
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 mornings
17850	16.81	LSN	Buenos Aires, Arg.	(P) Phones S. A. stations irreg.
17830	16.82	PCV	Kootwijk, Holland	(P) Phones PLE early mornings
17790	**16.86**	**GSG**	**Daventry, England**	**6-8:45 A.M. 9:00 A.M.-12:00 noon**
17780	**16.87**	**W3XAL**	**Bound Brook, N. J.**	**9 A.M.- 5 P.M. daily**
17760	**16.89**	**W2XE**	**Wayne, N. J.**	**11 A.M.-1 P.M. Daily**
17760	**16.89**	**DJE**	**Zeesen, Germany**	**8-11:30 A.M.**
17750	16.91	IAC	Piza, Italy	(P) Phones and Tests to ships A.M.
17740	16.91	HSP	Bankok, Siam	(P) Phones DFA-DGH-KAY early mornings
17710	16.94	CJA-3	Drummondville, Que.	(P) Phones Australia and Far East early A. M.
17699	16.95	IAC	Piza, Italy	(P) Phones and tests to ships A.M.
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	DAF	Nordenland, Germany	(P) Phones ships mornings
17120	17.52	WOO	Ocean Gate, N. J.	(P) Phones ships daytime
17120	17.52	WOY	Lawrenceville, N. J.	(P) Phones England irreg.
17080	17.56	GBC	Rugby, England	(P) Phones ships daytime
16910	17.74	JZD	Nazaki, Japan	(P) Phones ships irregular
16305	18.39	PCL	Kootwijk, Holland	(P) Special relays and phones irreg.
16300	18.44	WLK	Lawrenceville, N. J.	(P) Phones England irreg.
16240	18.47	KTO	Manila, P. I.	(P) Phones JVE-KWU evenings
16214	18.50	FZR	Saigon, Indo-China	(P) Phones FTA-FKT early A.M.
16107	18.62	IRY	Rome, Italy	(P) Phones Cairo, Asmara and others, broadcasts music A. M. and early P. M.
16050	18.69	JVC	Nazaki, Japan	(P) Phones Hong Kong early A. M.
16030	18.71	KKP	Kahuku, Hawaii	(P) KWU afternoons and evening. 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.
15860	18.90	CEC	Santiago, Chile	(P) Phones OCJ mornings
15810	19.02	LSL	Buenos Aires, Arg.	(P) Phones GAA mornings; PSE-PSF afternoons
15760	19.04	JYT	Kemikawa-Cho, Japan	(E) Tests KKW-KWE-KWU evenings
15740	19.06	JIA	Chureki, Japan	(P) Phones 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 evenings.
15625	19.20	OCJ	Lima, Peru	(P) Phones CEC daytime
15620	19.21	JVF	Nazaki, Japan	(P) Phones KWO-KWU after 4 P.M.

KC	Meters	Call	Location	Time
15595	19.24	DFR	Nauen, Germany	(E) Tests and relays mornings irreg.
15430	19.44	KWE	Bolinas, Calif.	(P) Tests JYK-JYT-PLE evenings
15415	19.46	KWO	Dixon, Calif.	(P) Phones JVF evenings
15410	19.47	Prado	Riobamba, Ecuador	5:00-7:00 P.M. Sunday
15370	19.52	HAS3	Budapest, Hungary	Sunday 9-10 A.M.
15355	19.54	KWU	Dixon, Calif.	(P) Phones Japan, Manila and Java evenings
15330	19.56	W2XAD	Schenectady, N. Y.	2-3 P.M. Weekdays-Sunday 10:30 A.M.-4 P.M.
15305	19.60	CP7	La Paz, Bolivia	(E) Relays CP4 tests daytimes
15280	19.63	DJQ	Zeesen, Germany	12:30-2:15 A.M.
15270	19.64	W2XE	Wayne, N. J.	1-6 P.M.
15260	19.66	GSI	Daventry, England	12:15 P.M.-4:30 P.M.
15252	19.67	RIM	Tashkent, U.S.S.R.	(P) Phones RKI early mornings
15243	19.68		Pontoise, France	7-11 A.M.
15220	19.71	PCJ	Eindhoven, Holland	Sunday 7:30-10:00 A.M. Tues. 3-6 A.M. Wed. 7-11 A.M.
15220	19.71	W8XK	Pittsburgh, Pa.	9 A.M.-7 P.M.
15200	19.74	DJB	Zeesen, Germany	3:45-7:15 A.M. 8:00-11:30 A.M.
15140	19.82	GSF	Daventry, England	3:30-5:35 A.M. 6-8:45 A.M. 9 A.M.-12 noon
15121	19.84	HVJ	Vatican City, Vatican	10:30-10:45 A.M.
15055	19.92	WNC	Hialeah, Fla.	(P) Phones daytime
15040	19.95	RKI	Moscow, U.S.S.R.	(P) Phones RIM early A.M.
15040	19.95	HIR	Santo Domingo, R. D.	(P) Phones WNC daytime
14980	20.03	KAY	Manila, P. I.	(P) Phones DFC-DFD-GCJ early A.M.; KWU evenings
14940	20.06	HJB	Bogota, Colombia	(P) Phones WNC-PPU YVQ days
14920	20.11	KQH	Kahuku, Hawaii	(P) Tests irregularly
14910	20.12	JVG	Nazaki, Japan	(P) Phones Formosa irregular
14845	20.19	OCJ2	Lima, Peru	(P) Phones HJY and others daytime
14800	20.27	WQV	Rocky Point, N. Y.	(E) Tests Europe irreg.
14732	20.51	IQA	Rome, Italy	(P) Phones Japan and Egypt; sends music at times
14710	20.39	IRG	Massawa, Eritrea, Africa	(P) Phones and tests with JVH 5:00 to 7:00 A. M., and sends music
14690	20.42	PSS	Rio de Janerio, 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 and B.C. music
14590	20.56	WMN	Lawrenceville, N. J.	(P) Phones England daytime
14550	20.60	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 daytime
14485	20.71	TIU	Cartago, Costa Rica	(P) Phones WNC daytime
14485	20.71	YNA	Managua, Nicaragua	Phones WNC daytime
14485	20.71	HPF	Panama City, Panama	(P) Phones Daytime
14485	20.71	HRM	Tela, Hondura	(P) Phones WNC daytime
14485	20.71	TGF	Guatemala City, Guatemala	(P) Phones WNC daytime
14470	20.73	WMF	Lawrenceville, N. J.	(P) Phones England daytime
14440	20.78	GBW	Rugby, England	(P) Phones Lawrenceville daytime
14410	20.80	DIP	Zeesen, Germany	(E) Experimental; 12-4:30 P. M.
14236	21.07	HB9B	Basle, Switzerland	Monday, Thursday, Friday 4-6 P.M.
14200	21.20	W10XFB	The Schooner "Morrissey"	(E) Irregular
14100	21.25	HJ5ABE	Cali, Colombia	11:00 A.M.-12 noon daily ex. Sun. 6:00-10:30 P.M.
13900	21.58	WQP	Rocky Point, N. Y.	(E) Test daytime
13820	21.70	SUZ	Cairo, Egypt	(P) Phones DFC-DGU-GBB daytime
13745	21.83	CGA-2	Drummondville. Que.	(P) Phones Europe irregular
13738	21.82	RIS	Tiflis, U.S.S.R.	(P) Tests with Moscow irregular
13690	21.91	KKZ	Bolinas, Calif.	(F) Tests Japan and Java early A.M.; days Honolulu
13667	21.98	HJY	Bogota, Colombia	(P) Phones CEC afternoons
13635	22.00	S.P.W.	Warsaw, Poland	11:30 A.M.-12:15 P.M.
13610	22.04	JYK	Kemikawa-Cho. Japan	(E) Tests irregular A.M.
13585	22.08	GBB	Rugby, England	(P) Phones CGA3-SUV-SUZ daytime
13560	22.12	JVI	Nazaki, Japan	(P) Phones Manchukuo irregularly
13545	22.15	PFG	Kootwijk, Holland	(P) Tests mornings irregular
13415	22.36	GCJ	Rugby, England	(P) Tests with JVH afternoons
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
13340	22.49	KBJ	Manila, P. I.	(P) Phones nights and early A.M.
13285	22.58	CGA3	Drummondville, Que.	(P) Phones England days
13180	22.76	DGG	Nauen, Germany	(P) Relays to Riverhead days
13075	22.95	VPD	Suva, Fiji Islands	Mon. to Sat. 12:30-1:30 A.M.
13020	23.04	JZE	Nazaki, Japan	(P) Phones ships irregular
13000	23.08	FYC	Paris, France	(P) Phones CNR mornings
12985	23.11	DFC	Nauen, Germany	(P) Phones KAY-SUV-SUZ early A. M.
12865	23.32	IAC	Piza, Italy	(P) Phones ships irregular
12840	23.36	WOO	Ocean Gate, N. J.	(P) Phones ships days
12830	23.37	HJC	Barranquilla, Colombia	(P) Phones HJB-HPF-WNC days
12830	23.38	HJA-3	Barranquilla, Colombia	(P) Phones HJB-HPF-WNC days
12825	23.38	CNR	Rahat, Morocco	Sunday 7:30-9:00 A.M.
12825	23.38	CNR	Rabat, Morocco	(P) Phones FYB-TYB-FTA irreg.
12800	23.44	IAC	Piza, Italy	(P) Phones ships and tests Tripoli, irreg.
12780	23.47	GBC	Rugby, England	(P) Phones VWY early A.M.
12396	24.20	CT1GO	Parede, Portugal	Sun. 11:30 A.M.-1 P.M.; 7:15-8:30 P.M. Tues. to Fri. 7:15-8:30 P.M.
12394	24.21	DAF	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	Willmigton, 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 Sunday, 1:40-2:00 P.M.
12220	24.55	FLJ	Paris, France	(P) Phones ships irreg.
12215	24.56	TYA	Paris, France	(P) Algeria, days—"Inverted Speech"
12060	24.88	PDV	Kootwijk, Holland	(P) PLE - PLV - PMC early mornings
12035	24.93	HBO	Geneva, Switzerland	(E) Relays programs & phones irreg.
12020	24.95	VIY	Rockbank, Australia	(P) Tests CJA6 early A.M. and evenings
12100	24.79	CJA6	Drummondville, Que.	(P) Tests VIY early A.M. and evenings
12000	25.00	RNE	Moscow, U.S.S.R	Sunday 6-7 A.M. 10-11 A.M. Wednesday 6-7 A.M.
12000	2500	TGWA	Guatemala City, Guatemala	Daily Ex. Sun.-12-2 P.M. 8-9 P.M. 10 P.M.-12 A.M. Sunday 12 A.M. 5 A.M.
11991	25.02	FZS	Saigon. Indo-China	(P) Phones FTA-FTK early A.M.
11955	25.09	ETB	Addis Ababa, Ethiopia	Wednesday 5-5:30 P.M. and irregular
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
11885	25.23		Pontoise, France	11:15 A.M.-2:15 P.M. 3-6 P.M.
11870	25.26	W8XK	Pittsburgh, Pa.	5-9 P.M.
11860	25.29	GSE	Daventry, England	9 A.M.-12 noon
11830	25.36	W2XE	Wayne, N. J.	6-10 P.M. Daily
11811	25.40	2RO	Rome, Italy	8:15-9 A.M. 9:15-10:15 A.M. 12 noon-1 P.M.-1:45-5 P.M.
11800	25.42	CO9WR	Sancti-Spiritus. Cuba	4-6 P.M. 9-11 P.M.
11790	25.43	W1XAL	Boston, Mass.	Mon. to Fri. 4:30-7:30 P.M.
11770	2549	DJD	Zeesen, Germany	12 noon-4:30 P.M.
11750	25.53	GSD	Daventry, England	12:15-4 P.M. 10-11:05 P.M.
11730	25.57	PHI	Huizen, Holland	Sat. & Sun. 8:30-11 A.M. Mon. Thurs. Fri. 830-10:30 A.M.
11720	25.60	CJRX	Winnipeg, Manitoba	Week days 8:00 P.M.-12 midnight; Sunday 3-10 P.M.
11713	25.62		Pontoise, France	7-10 P.M.-11 P.M.-1 A.M.
11710	25.63	HJ4ABA	Medellin, Colombia	11:30 A.M.-1 P.M. 6:30-10:30 P.M.
11680	25.68	KIO	Kahuku, Hawaii	(P) Phones Far-East early A.M.
11670	25.71	PPQ	Rio de Janerio, Brazil	(P) Phones WCG-WET-LSX evenings
11660	25.73	JVL	Nazaki, Japan	(P) Phones Taiwan evenings
11570	25.93	HH2T	Port-au-Prince, Haiti	(P) Evenings; irregular
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.

KC	Meters	Call	Location	Time
11413	26.28	CJA4	Drummondville, Que.	(P) Phones VIZ3 early A.M.
11385	26.35	HBO	Geneva, Switzerland	(E) Phones and relays irregular
11275	26.61	XAM	Merida, Mexico	(P) Phones XDR-XDM irregular
11000	27.27	ZLT	Wellington, N. Z.	(P) Phones VLZ early mornings
11000	27.27	PLP	Bandoeng, Java	(P) Phones early A.M.; broadcasts 6:30-10 A.M.
11000	27.26	XBJQ	Mexico D. F., Mexico	8:15 P.M.-10:30 P.M. irregular
10975	27.35	OCI	Lima, Peru	(P) Phones CEC-HJY days
10975	27.35	OCP	Lima, Peru	(P) Phones HKB early evenings
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. mornings
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. and eve.
10740	27.93	JVM	Nazaki, Japan	4-7:30 A.M. irregular 12-1 A.M. Daily Mon & Thurs. 4-5 P.M.
10675	28.10	WNB	Lawrenceville, N. J.	(P) Phones ZFB daytime
10670	28.12	CEC	Santiago, Chile	(P) Phones HJY-OCI daytime
10670	28.12	CEC	Santiago, Chile	Daily 7-8 P.M. Sunday and Thurs. 8:30-9 P.M.
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. irregular. Daily 12-1 A.M. Mon. & Thurs. 4-5 P.M.
10630	28.22	WED	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 evenings
10535	28.48	JIB	Tawian, Japan	(P) Phones JVL-JVN early mornings
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: No A. M. days
10440	28.74	DGH	Nauen, Germany	(P) Phones HSG-HSJ-HSP early A.M.
10430	28.80	YBG	Medan, Sumatra	(P) Phones PLV-PLP early A.M.
10420	28.79	XGR	Shanghai, China	(P) Tests GBP-KAY early A.M.
10420	28.79	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) Special program service irreg.
10375	28.92	JVO	Nazaki, Japan	(P) Manchuria and Dairen early A.M.
10370	28.93	EHZ	Madrid, Spain	(P) Phones EHX daytime
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	2:30-4:00 P.M.
10310	29.10	PPM	Rio de Janeiro, Brazil	(P) Tests New York and Buenos Aires 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 irregularly
10290	29.15	DIQ	Zeesen, Germany	(E) Phone and pgm. service irreg.
10290	29.15	DIQ	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 6:30-10 A. M.
10250	29.27	LSK3	Buenos Aires, Arg.	(P) "Inverted Speech" afternoons
10220	29.35	PSH	Rio de Janerio, Brazil	(P) Phones LSL-WOK evenings; special pgm. service irreg.
10170	29.50	RIO	Bakou, U.S.S.R.	(P) Phones RIR-RNE early A.M.
10169	29.50	HSG	Bankok, Siam	(P) Phones DGH early A.M. irreg.
10140	29.59	OPM	Leopoldville, Belg-Congo	(P) Phones ORK afternoons
10080	29.76	RIR	Tiflis, U.S.S.R.	(P) Phones RIO-RNE early A.M.
10070	29.79	EHY	Madrid, Spain	(P) Phones YVR afternoons
10055	29.84	ZFB	Hamilton, Bermuda	(P) Phones WNB daytime
10055	29.84	SUV	Cairo, Egypt	(P) Phones DFC-DGU-GCA and GCB daytime
10042	29.87	DJJ	Zeesen, Germany	2-4 P.M.
10040	29.88	HJA3	Barranquilla, Colombia	(P) Tests early evenings irreg.
9990	30.01	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.	Phones and tests; Eng-irregularly
9870	30.40	JYS	Kemikawa-Cho, Japan	4-7 A.M. irregular
9860	30.43	EAQ	Madrid, Spain	Saturday 1-3 P.M. Daily 5:15 to 9:30 P.M.
9840	30.47	JYS	Kemikawa-Cho, Japan	(E) Tests irregular
9830	30.50	IRM	Rome, Italy	(P) Phones JVP-JZT-LSX-WEL mornings
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	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 evening
9675	31.00	DJI	Zeesen, Germany	5-7 P.M.
9635	31.13	2RO	Rome, Italy	Mon. Wed. Fri. 6-9 P.M. 6-6:15 English News 2-5:30 P.M. Daily
9630	31.15	CFA5	Drummondville, Que.	(P) Phones: No A. M. days
9620	31.17	DGU	Nauen, Germany	(P) Phones SUV A.M. Tests and relays irreg.
9620	31.17	FZR	Saigon, Indo-China	(P) Phones Paris early A.M.
9600	31.25	CT1AA	Lisbon, Portugal	Tues. Thurs. Sat. 4:30-7 P.M.
9595	31.27	HBL	Geneva, Switzerland	Saturday 5:30-6:15 P.M. First Monday each month 4-6 P.M.
9590	31.28	W3XAU	Philadelphia, Pa.	12-8 P.M.
9590	31.28	VK2ME	Sydney, Australia	Sundays 1 A.M.-3 A.M.; 5:00-9.00 A.M.; 9:00-11:00 A.M.
9590	31.28	HP5J	Panama City, Panama	11:30 A.M.-1 P.M. 7:30-10 P.M. Sundays 6:30-10:30 P.M.
9580	31.31	GSC	Daventry, England	4:00-5:45 P.M. 6:00-8:20 P.M. 10-11:05 P.M.
9580	31.31	VK3LR	Melbourne, Australia	Mon. Tues. Wed. Thurs. 3:15-7:30 A.M. Fri. 10:30 P.M.-2 A.M. Sat. 5-7:30 A.M.
9570	31.34	LKJ1	Jeloy, Norway	5-8 A.M. 10 A.M-6 P.M.
9570	31.33	WIXK	Boston, Mass.	Week days 7 A.M.-12 midnight Sunday 9 A.M.-12 midnight
9565	31.36	VUY VUB	Bombay, India	11:30 A.M.-12:30 P.M. Wed. & Sat. Sunday 7:30-8:30 A.M.
9560	31.38	DJA	Zeesen, Germany	12:30-2:15 A.M. 8-11:30 A.M. 5:05-9:15 P.M.
9545	31.43	CEC	Santiago, Chile	Daily 7-8 P.M. Sun. and Thurs. 8:30-9:00 P.M.
9540	31.45	DJN	Zeesen, Germany	12:30-2:15 A.M. 3:45-7:15 A.M. 5:05-10:45 P.M.
9530	31.48	W2XAF	Schenectady, N. Y.	Mon. to Fri. 4 P.M.-12 A.M. Sat. 1 P.M.-12 A.M. Sun. 4:15 P.M.-12 A.M.
9510	31.55	GSB	Daventry, England	3-5:20 A.M. 9 A.M.-12 noon 12:15-4:30 P.M. 4:45-5:45 P.M. 6-8:20 P.M.
9510	31.55	VK3ME	Melbourne, Australia	Wed. to Sat. Inc. 5-7 A.M.
9501	31.56	PRF5	Rio De Janeiro, Brazil	4:45-5:45 P.M. daily 9-10:45 P.M. irreg.
9480	31.65	PLW	Bandoeng, Java	(P) Phones Australia early A.M.
94.80	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 mornings.
9450	31.75	TG1X	Guatemala City, Guatemala	Sched. same as TGWA 6000 and 12000 KC when regular. Off temporarily.

KC	Meters	Call	Location	Time
9430	31.80	YVR	Maracay, Venezuela	(P) Tests mornings
9428	31.81	COCH	Havana, Cuba	10 A.M.-12 noon. 4:00-6:30 P.M. 8:00-10:00 P.M.
9415	31.86	PLV	Bandoeng, Java	(P) Phones PCV-PCK-PDK -VLZ -KWX and KWV early mornings
9400	31.92	XDR	Mexico City, Mexico	(P) Phones XAM irreg. days
9330	32.15	CGA4	Drummondville, Que.	(P) Phones GCB-GDB-GBB afternoons
9280	32.33	GCB	Rugby, England	(P) Phones Canada afternoons
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
9120	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 and early A. M.
8975	33.43	VWY	Poona, Ind.	(P) Phones GBC-GBU mornings
8950	33.52	WEL	Rocky Point, N. Y.	(E) Tests with Europe irreg.
8950	33.52	W2XBJ	Rocky Point, N. Y.	(E) Tests irregularly
8930	33.59	WEC	Rocky Point, N. Y.	(P) Phones Ethiopia irregular
8900	33.71	ZLS	Wellington, N. Z.	(P) Phones VLZ early mornings
8830	33.98	LSD	Buenos Aires, Arg.	(P) Relays to N. Y. early evenings
8790	34.13	HKV	Bogota, Colombia	(E) Tests early evenings and nights
8790	34.13	TIR	Cartago, Costa Rica	(P) Phones Central America daytime
8790	34.13	HKV	Bogota, Colombia	6:00-11:00 P.M. irregular
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	Sun. Tues. Wed. Frl. Sat. 5:30-8:30 A.M. Mon. Thurs. 5:30-7:30 A.M. 8-9 P.M.
8740	34.35	WXV	Fairbanks, Alaska	(P) Phones WXH nights
8730	34.36	GCI	Rugby, England	(P) Phones VWY afternoons
8680	34.56	GBC	Rugby, England	(P) Phones ships and New York daily
8665	34.62	CO9JQ	Camagney, Cuba	11:30 A.M.-12:30 P.M. 8:00-9:00 P.M.
8650	34.68	WVD	Seattle, Wash.	(P) Tests irregularly
8590	34.92	YNDA	Managua, Nicaragua	8-10 P.M. Daily
8560	35.05	WOO	Ocean Gate, N. J.	(P) Phones ships daytime
8500	35.29	IZF	Nazaki, Japan	(P) Phones ships irregularly
8470	35.39	DAF	Nordenland, Germany	(P) Phones ships irregularly
8400	35.71	HC2AT	Guayaquil, Ecuador	8:00-11:00 P.M. ex. Sunday
8400	35.71	HC2CW	Guayaquil, Ecuador	8-11 P.M. ex. Sunday
8380	35.80	IAC	Piza, Italy	(P) Phones ships irregularly
8214	36.50	HCJB	Quito, Ecuador	12:30-2:15 P.M. 7:15-11:15 P.M. daily ex. Monday
8185	36.65	PSK	Rio de Janerio, Brazil	(P) Phones LSL-WOK evenings and special programs
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 mornings
8110	37.00	ZP10	Ascunsion, Paraquay	8:00-10:00 P.M.
8035	37.33	CNR	Rabat, Morocco	Sunday 2:00-5:00 P.M.
7970	37.64	XGL	Shanghai, China	(P) Tests early mornings
7968	37.65	HSJ	Bankok, Siam	(P) Tests and phones 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	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.
7797	38.47	HBP	Geneva, Switzerland	5:30-6:15 P.M. Saturdays First Monday each month 6-7 P.M.
7790	38.49	YNA	Managua, Nicaragua	(P) Phones Cent. & So. America daytime
7790	38.49	HC2JSB	Guayaquil, Ecuador	9:15 A.M.-2:15 P.M. 7:15-11:15 P.M.
7780	38.56	PSZ	Rio de Janerio, Brazil	(P) Tests LSX early evenings
7765	38.63	PDM	Kootwijk, Holland	(P) Special relays to Dutch Indies
7715	38.89	KEE	Bolinas, Calif.	(P) Relays programs to Hawaii seasonally
7669	39.11	TGF	Guatemala City, Guatemala	(P) Phones T1U-HPF daytime
7626	39.31	RIM	Tashkent, U.S.S.R.	(P) Phones RKI early mornings
7620	39.37	ETD	Addis Ababa, Ethiopia	Irregular
7610	39.42	KWX	Dixon, Calif.	(P) Phones KKH nights; KAZ-KTP-PLV-JVT-JVM mornings
7590	39.53	TI8FF	Puntaarenas, Costa Rica	9-10 P.M. ex. Sunday
7565	39.66	KWY	Dixon, Calif.	(P) Phones Shanghai, early mornings
7520	39.89	KKH	Kahuku, Hawaii	(P) Tests KEE evenings; Phones KWX-KWV nights
7518	39.90	RKI	Moscow, U.S.S.R.	(P) Phones RIM early mornings
7510	39.95	JVP	Nazaki, Japan	Tests Point Reyes early A. M.; broadcasts Monday and Thursdays, 4-5 P. M.
7500	40.00	CFA-6	Drummondville, Que.	(P) Phones: no A. M. days
7470	40.16	JVQ	Nazaki, Japan	(P) Relays and phones early A.M.; broadcasts Monday and Thursday, 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	40.54	WEM	Rocky Point, N. Y.	(E) Special relays evenings.
7400	40.50	HJ3ABD	Bogota, Colombia	12 noon-2 P.M. 8:00-11:00 P.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
7282	41.20	HJ1ABD	Cartagena, Colombia	11:15 A.M.-1:15 P.M. Sunday. Weekdays 7:15-9:15 P.M.
7211	41.60	EA8AB	Santa Cruz, Canary Is.	Mon. Wed. Frl. 3:15-4:15 P.M.
7177	41.80	CR6AA	Labito, Angela, Africa	2:30-4:30 P.M. Wed. & Sat.
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	Saturday 10:10-11:10 A.M.
7080	42.37	VP3MR	Georgetown, Br. Guiana	Sun 7:45-10:15 A.M. Mon 3:45-4:45 P.M. 6:45-7:45 P.M. Wed. Thurs. Sat. 5-7:45 P.M.
7074	42.48	HJ1ABK	Barranquilla, Columbia	3-6 P.M. Sunday
6990	42.92	JVS	Nazaki, Japan	(P) Phones China mornings early
6935	43.25	WEB	Rocky Point, N. Y.	(E) Relays programs evenings
6905	43.45	GDS	Rugby, England	(P) Phones WOA-WNA-WCN evenings
6900	43.48	HI3C	LaRomana, R. D.	Daily 12-2 P.M. 5-9 P.M. Sat. 12 Midnight-2 A.M.
6895	43.51	HCETC	Quito, Ecuador	8:15-10:30 P.M. ex Sunday
6880	43.60	CGA-7	Drummondville, Que.	(P) Phones Europe days
6860	43.73	KEL	Bolinas, Calif.	(P) Tests KAZ-PLV early A.M.
6840	43.86	KEN	Bolinas, Calif.	(P) Used irregularly
6830	43.92	CFA	Drummondville, Que.	(P) Phones: No A. M. nights
6796	44.15	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.
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	2:00-8:00 A.M. irregular
6740	44.51	WEJ	Rocky Point, N. Y.	(E) Commercial program service evenings
6733	44.53	WDA	Rocky Point, N. Y.	(E) Tests evenings irreg.
6725	44.60	WQO	Rocky Point, N. Y.	(E) Tests evenings irreg
6720	44.96	YVQ	Maracay, Venezuela	8:00-9:00 P.M. Saturdays
6701	44.71	TIEP	San Jose, Costa Rica	7:00-10:00 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.
6720	44.96	YVQ	Maracay, Venezuela	(P) Phones and relays N. Y. evenings
6650	45.11	IAC	Piza, Italy	(P) Phones ships irregularly
6635	45.00	HC2RL	Guayaquil, Ecuador	5:45-7:45 P.M. Sunday, 9:15-11:15 P.M. Tuesday
6620	45.31	Prado	Riobamba, Ecuador	Thursday 9:00-11:15 P.M.
6610	45.38	REN	Moscow, U.S.S.R.	1:00-5:00 P.M. irregular
6590	45.50	HI4D	Santo Domingo, R.D.	12:15-2:00 P.M. 5:00-8:00 P.M. except Sunday

KC	Meters	Call	Location	Time
6550	45.81	TIRCC	San Jose, Costa Rica	Daily 11 A.M.-2 P.M. 6-7 P.M. Thursday 7-10 or 11 P.M. Sunday 11 A. M.-1 P.M. 8-10 P.M.
6520	46.01	YV6RV	Valencia, Venezuela	11:30 A.M.-12:30 P.M. 5:30-10:00 P.M. except Sunday
6503	46.10	HIL	Santo Domingo, R.D.	Mon. to Sat. inc. 12:15-1:45 P.M. Sat. 7:45-9:45 P.M.
6490	46.30	HJ5ABD	Cali, Colombia	7:00-10:00 P.M. ex. Sunday
6460	46.44	HJ4ABC	Ibague, Colombia	7-10 P.M. ex. Sunday
6447	46.51	HJ1ABB	Barranquilla, Colombia	11:45 A.M.-1:00 P.M. 5:30-10:00 P.M. ex. Sunday
6425	46.69	VE9AS	Fredericton, N.B.	Occasional broadcasts — not regular
6425	46.69	W9XBS	Chicago, Ill.	Not regular. Usually Tuesday and Thursday 1:00-5:00 P.M.
6420	46.70	W3XL	Bound Brook, N. J.	No regular schedule maintained
6415	46.77	HJA3	Barranquilla, Colombia	(P) Phones HJA2 evenings
6400	46.88	YN1GG	Managua, Nicaragua	Daily 1:00-2:30 P.M. 7:00-10:00 P.M.
6385	46.99	TIPG	San Jose, Costa Rica	8:30-11:00 P.M.
6375	47.10	YV4RC	Caracas, Venezuela	4:30-10:30 P.M.
6357	47.19	HRP1	San Pedro de Sula, Honduras	8 P.M.-12 A.M.
6330	47.39	JZG	Nazaki, Japan	5:00-7:00 A.M. irregular
6315	47.50	HIZ	Santo Domingo, R.D.	Daily 11:30 A.M.-1:30 P. M. 5:30 P.M.-8:00 P.M.
6300	47.62	YV12RM	Maracay, Venezuela	8-11 P.M.
6275	47.81	HJ1ABH	Cienaga, Colombia	Broadcasts and phones. Irregular evenings.
6235	48.10	OCM	Lima, Peru	(P) Phones afternoons
6235	43.00	OAX4G	Lima, Peru	7-10 P.M. Daily
6198	48.40	CT1GO	Parede, Portugal	Sunday 11:30-1:00 P.M. 7:15-8:30 P.M. Tues. to Fri. inc. 7:15-8:30 P.M.
6185	48.50	HI1A	Santiago de Caballeros, R.D.	11:45 A.M.-1:45 P.M. 7:45-9:45 P.M. ex Sunday
6180	48.53	XEXA	Mexico City, Mexico	Evenings irregular
6170	48.62	HJ3ABF	Bogota, Colombia	6:00-11:00 P.M. ex. Sunday
6165	48.66	YV3RC	Caracas, Venezuela	10:30 A.M.-1:30 P.M. 4:30-10:00 P.M. except Sunday
6150	48.78	HJ5ABC	Cali, Colombia	Daily 11:00 AM.-12 noon; 7:00 P.M.-10:00 P.M. Sunday 12-2 P.M.
6150	48.78	HJ2ABA	Tunja, Colombia	1:00-2:00 P.M. & 7:00-10:00 P.M.
6150	48.78	CJRO	Winnipeg, Manitoba	Weekdays 7:30 P.M.-12 noon. Sundays 3:00-10:00 P.M.
6150	48.78	CO9GC	Santiago, Cuba	12:00 A.M. Sat.-2:00 A.M. Sunday. Friday 7:30 A.M.-11 P.M.
6150	48.78	CSL	Lisbon, Portugal	7:30-8:30 A.M. 2:30-7:00 P.M.
6140	48.86	W8XK	Pittsburgh, Pa.	9:00 P.M.-1:00 AM. daily
6130	48.92	ZGE	Kuala Lumpur, S.S.	Sun. Tues. Fri. 6:40-8:40 A.M.
6130	48.92	COCD	Havana, Cuba	Sunday 11 A.M.-2:00 P. M. 7:00-10 P.M. Weekdays 11:30 A.M. to 11 P.M.
6130	48.92	LKJ1	Jeloy, Norway	10:00 A.M.-6:00 P.M. daily
6120	49.02	XEFT	Vera Cruz, Mexico	Mon. to Fri. 11 A.M.-4 P.M. 7:30 P.M.-12 Midnight. Sat. 11 A.M.-4 P. M. 6:30 P.M.-12 Midnight. Sun. 11 A.M.-4 P.M. 9 P.M.-Midnight
6120	49.02	W2XE	Wayne, N. J.	10-11 P.M.
6120	49.02	YDA	Bandoeng, Java	5:30-11:00 P.M. 5:45-6:45 P.M. 10:30 P.M.-1 A.M.
6115	49.06	HJ1ABE	Cartagena, Colombia	Daily 11 A.M.-12:30 P.M. 4-5 P.M. Monday 7-9:30 P.M. 10:30-11:30 P.M. Tues. to Fri. 7-9:30 P.M. Sat. 6-8 P.M. Sunday 9 A.M.-2 P.M.
6110	49.10	HJ4ABB	Manizales, Colombia	11:00 A.M.-1:00 P.M. 5:00-8:00 P.M.
6110	49.10	VUC	Calcutta, India	Mon. 8-9 A.M. Wed. 10:30-11:30 A.M.
6110	49.10	VE9HX	Halifax, Nova Scotia	11:30 A.M.-2:00 P.M. 6:00 P.M.-1 A.M.
6110	49.10	GSL	Daventry, England	12:15-4:30 P.M. 6-8:20 P.M. 10-11:05 P.M.
6100	49.18	W9XF	Chicago, Illinois	Daily 12:00 M-1:00 A.M. Tues. Thurs. Fri. Sun. 8:00-9:00 P.M.
6100	49.18	W3XAL	Bound Brook, N. J.	Mon. Wed. Sat. 4:00 P.M. 12:00 A.M.
6095	49.22	CRCX	Bowmansville, Ont.	Sun. 12 noon-12 A.M. Mon. to Sat. 6 P.M.-12 A.M.
6090	49.26	VE9BJ	St. John, N.B.	5:00-11:00 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.
6080	49.34	W9XAA	Chicago, Ill.	Daily 11 A.M.-9 P.M.
6080	49.34	ZHJ	Penang, S.S.	6:40-8:40 A.M.
6080	49.34	HJ4ABC	Pereira, Colombia	9:30-11 A.M. 7-9 P.M. ex. Sun.
6080	49.34	CP5	LaPaz, Bolivia	8:00-9:00 P.M. daily
6079	49.35	DJM	Zeesen, Germany	Tests afternoons irregular.
6070	49.42	VE9CS	Vancouver, B.C.	6:00-7:00 P.M. Sunday. 1:45 P.M.-1:00 A.M.
6070	49.42	HH2S	Port-Au-Prince, Haiti	Evenings—irregular
6070	49.42	OER2	Vienna, Austria	9:00 A.M.-5:00 P.M. Saturdays until 6:00 P.M.
6065	49.45	HJ4ABL	Manizales, Colombia	11:00 A.M-12 noon Sat. to 5:30. 5:30-7:30 P.M.
6060	49.50	W8XAL	Cincinnati, Ohio	Sun. 7 A.M.-8 P.M. 11 P.M.-1:30 A.M. Week days 6:30 A.M.-8 P.M. 11 P.M.-2:00 A.M.
6060	49.50	HJ4ABD	Medellin, Colombia	6-11 P.M. ex. Sun. 10:30 A.M.-1 P.M.
6060	49.50	W3XAU	Philadelphia, Pa.	8-11 P.M.
6060	49.50	VQ7LO	Nairobi, Kenya Colony, Africa	5:45-6:15 A.M. 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	4-5:45 P.M. 6-8:20 P.M.
6043	49.65	HJ1ABG	Barranquilla, Colombia	12 noon-1 P.M. 6-10 P.M.
6040	49.67	PRA8	Pernambuco, Brazil	9:30-11:30 A.M. 2:30-8:30 P.M.
6040	49.67	W4XB	Miami, Florida	Weekdays 12-2 P.M. 5:30 P.M.-12 A.M. Sunday 11:30 A.M.-3 P. M. 5 P.M.-12 A.M.
6040	49.67	W1XAL	Boston, Mass.	Daily 7:00-9:00 P.M.
6030	49.75	HP5B	Panama City, Panama	12 noon-1 P.M. 8-10:30 P.M.
6020	49.83	DJC	Zeesen, Germany	12 noon-4:30 P.M. 5:00-10:45 P.M.
6020	49.83	CQN	Macoa, China	Monday & Friday 3-5:00 A.M.
6020	49.83	XEUW	Vera Cruz, Mexico	10 P.M.-1 A.M. Daily
6012	49.85	HJ3ABH	Bogota, Colombia	11:30 A.M.-2 P.M. 6-11 P.M. Sunday 4-9 P.M.
6011	49.89	HJ1ABC	Quibdo, Colombia	9-11 P.M. ex. Sunday
6010	49.92	ZHI	Singapore, S.S.	Mon. Wed. Thurs. 5:40-8:10 A.M. Sat. 10:40 P.M.-1:10 A.M.
6010	49.92	COCO	Havana, Cuba	Week Days 10:30 A.M.-1:30 P.M. 4 P.M.-7 P. M. Sunday 10:30 A.M.-1:30 P.M. 4-10 P.M.
6006	49.95	HJ1ABJ	Santa Marta, Colombia	11 A.M.-1 P.M. 7-9 P.M. Sunday 1-2 A.M.
6005	49.96	VE9DR	Montreal, Que.	Used very irregular
6005	49.96	VE9DN	Montreal, Que.	Used very irregular
6000	50.00	TGWA	Guatemala City, Guatemala	Daily Ex. Sun. 12-2 P.M. 8-9 P.M. 10 P.M.-12 A.M. Sundays 12-5 A.M.
6000	50.00	XEBT	Mexico City, Mexico	10 A.M.-12 midnight and later at times
5985	50.13	XEVI	Mexico City, Mexico	Sunday 1-2 P.M. Mon. Wed. Fri. 3-5 A.M. Tues. 8-9 P.M. 10-11 P.M. Sat. 9-10 P.M.
5980	50.17	HJ2ABD	Bucaramanga, Colombia	Daily 11:30 A.M.-12:30 P.M. 5:30-6:30 P.M. 7:30-10:30 P.M.
5980	50.17	HIX	Santo Domingo, R.D.	Mon. to Sat. 11:10 A.M.-12:40 P.M. 4:40-5:40 P.M. Tues. & Fri. also 8:10-10:10 P.M. Sunday 7:40-9:40 A.M.
5980	50.17	XECW	Mexico City, Mexico	4-4:45 P.M. 10-12 M.
5969	50.26	HVJ	Vatican City, Vatican	2-2:15 P.M. Sunday 5-5:30 A.M.
5960	50.30	YNLF	Managua, Nicaragua	6-11 P.M.
5950	50.42	HJN	Bogota, Colombia	8-10:45 P.M. Irregular
5940	50.65	TG2X	Guatemala City, Guatemala	Daily 4-6 P.M. Mon. Thurs. Sat. 9-11 P.M.
5930	50.60	HJ4ABE	Medellin, Colombia	11 A.M.-12 noon. 6-10:30 P.M.
5900	50.85	HJ2ABC	Cucuta, Colombia	11 A.M.-12 noon. 6:30-9 P.M.
5900	50.85	HCK	Quito, Ecuador	8:00-11:30 P.M.
5880	51.02	YV8RR	Barquisimeto, Venezuela	6-11 P.M.
5875	51.11	HRN	Tegucigalpa, Honduras	6:30-8 P.M. 8:30-10 P.M. Sundays - Appreciation Hour-9:30-11 P.M. or later.
5865	51.15	HI1J	San Pedro de Macoris RD	Daily 12:30-2 P.M. 6:30-9:00 P.M.
5853	51.20	WOB	Lawrenceville, N. J.	(P) Phones ZFA P.M.
5850	51.28	YV5RMO	Maracaibo, Venezuela	11:30 A.M.-1 P.M. 5:30 to 10 P.M.
5845	51.30	KRO	Kaukuku, Hawaii	(P) Tests early mornings
5825	51.50	HJA2	Bogota, Colombia	(P) Phones HJA3 afternoons irreg.
5820	51.50	TIGPH	San Jose, Costa Rica	7 P.M.-12 Midnight
5800	51.72	KZGF	Manila, P. I.	(P) Tests mornings irregularly
5800	51.72	YV2RC	Caracas, Venezuela	Sundays 9 A.M.-10:30 P.M. Week days 11:30 A.M.-2 P.M. 4:30-10 P.M.
5790	51.81	JVU	Nazaki, Japan	(P) Phones JZC early mornings
5780	51.90	OAX4D	Lima, Peru	9-11:30 P.M. Wed. Sat.
5750	52.17	XAM	Merida, Mexico	(P) Phones XDR-XDF early evenings
5730	52.36	JVV	Nazaki, Japan	(P) Phones JZC early A. M.
5720	52.45	YV10RSC	San Cristobal, Venezuela	8:00-11:00 P.M.
5712	52.54	CFU	Rossland, Canada	(P) Phones CFO and CFN evenings
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
5400 55.56 HJA7	Cucuta, Colombia	Phones irregularly; broadcasts music in eveing at times
5400 55.56 HJA7	Cucuta, Colombia	Monday 4-8 P.M.
5395 55.61 CFA7	Drummondville, Que.	(P) Phones: No Am.; irregular
5265 57.00 KEC	Bolinas, Calif.	(P) Phones Honolulu irregularly
5170 58.50 PMY	Bandoeng, Java	(E) Phones and relays programs early mornings
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, U. S. S. R.	(P) Phones afternoons 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.	4-8:15 A.M. Irregular.
4790 62.63 VE9BK	Vancouver, Canada	Week days 11:30-11:45 A.M. 3-3:15 P.M. 8:00-8:15 P.M. Sat. 7:30-7:45 P.M.
4752 63.13 WOY	Lawrenceville, N. J.	(P) Tests very irregular
4752 63.13 WOO	Ocean Gate, N. J.	(P) Phones ships irreg.
4752 63.13 WOG	Lawrenceville, N. J.	(P) Phones Rugby irregular
4600 65.22 HC2ET	Guayaquil, Ecuador	9:15-10:45 P.M. Wed. and Sat.
4555 65.95 WDN	Rocky Point, N. Y.	(P) Tests Rome and Berlin evenings
4510 66.52 ZFS	Nassau, Bahamas	(P) Phones WND daily; Tests GYD-ZSV irregular
4470 67.11 YDB	Socrabaja, D.E.I.	Broadcasts early mornings.
4465 67.19 CFA2	Drummondville, Que.	(P) Phones: No Am.; irregular days
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 2-3 P.M.
4295 69.90 WTDW	St. Croix, Virgin Is.	(E) Weather reports 2-3 P.M.
4295 69.90 WTDX	St. John, Virgin Is.	(E) Weather reports 2-3 P.M.
4272 70.20 WOO	Ocean Gate, N. J.	(P) Phones ships afternoons and eve.
4272 70.20 WOY	Lawrenceville, N. J.	(P) Tests evenings
4250 70.65 RV15	Khabarovsk. U.S.S.R.	1:30-9:00 A.M.
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.
3310 90.63 CJA8	Drummondville, Que.	(P) Phones Australia, A.M.
3027 99.10 CFA8	Drummondville, Que.	(P) Phones: No Am.

THE SUPER SKYRIDER

(*Continued from page 35*)

the front panel controls. These are as follows: Master Dial Vernier Knob, Band Spread Dial Vernier Knob, Automatic Volume Control Off-On Switch, Crystal Filter In-Out Switch, Beat Frequency Oscillator Off-On Switch, Send-Receive Switch, Phone Jack, Crystal Phasing Control Knob, R-F Gain Control Knob, Band Switch Knob, Audio Gain Knob, Tone Control Knob, and Beat Frequency Oscillator Pitch Control Knob.

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GLOBE GIRDLING

(*Continued from page 22*)

listed broadcasting between 4 and 5 P.M. on Mondays and Thursdays as well as JVN on 10,660 and JVM on 10,740 kc. Japan seems to be shifting the programs for overseas on these frequencies and they all seem to be heard by many in eastern states.

Station Lists

Your many complimentary letters on the make-up of station lists and address section are very much appreciated by the writer and the staff of ALL-WAVE RADIO. These lists will be revised each month, and it will be our aim to keep them as near correct as possible, so that the information will be of value to you. I am also very pleased to note the increase in letters of inquiry regarding station matters in general, and to assure you that it is a pleasure to hear from you, and likewise a pleasure to be of service to you by giving you the information sought.

Address all such letters to me at 85 St. Andrews Place, Yonkers, N. Y., and when requesting a reply, please enclose a self-addressed stamped envelope. When desiring information of a technical nature address your letters to ALL-WAVE RADIO, Queries Editor, 200-Fifth Avenue, New York, N. Y.

METAL TUBES

(*Continued from page 8*)

circuits and general tube types are practically identical. For one thing, if a fair comparison is to be made between a receiver with 6 glass-type tubes and another set with 7 metal-type tubes, the two may be considered equivalent only in the event that each set employs a combination mixer-oscillator, such as the glass 6A7 and the metal 6A8. If both receivers use separate tubes for these functions, it is a good bet that the metal-tube set will be equipped with a 6L7 pentagrid converter which is a far superior tube and as yet not duplicated in glass in any receivers so far on the market.

Comparisons

In our own comparisons we placed on test only such receivers as had one stage of r-f, a combination mixer-oscillator, an i-f stage, diode detector with avc, a stage of a-f voltage amplification, a single power output pentode and a full-wave rectifier. We were unable to make fair comparisons on any other combinations because of major differences in tube complement or circuit arrangement.

A few of the metal-tube receivers were inferior to the glass-tube types. In each case the inferiority was due to low sensitivity. It has since been determined that this lack of sensitivity is due to improper circuit design, in that no consideration had been given to the flow of gas current — a characteristic of metal tubes. The amount of gas current flowing in the grid-cathode circuits of the two or three tubes on the automatic volume-control line is often sufficient to cause enough voltage drop in an avc filter resistor to produce a negative voltage that will hold down the gain of the receiver even on weak signals.

The majority of metal-tube receivers, however, were equal in sensitivity to equivalent glass-tube sets, and in a few cases the sensitivity was undeniably greater. The higher gain was particularly apparent at the shorter wavelengths where the metal tube shows up better than the glass type.

In most cases the metal-tube receivers were quieter in operation, but in some instances this was due to the fact that sensitivity was low to begin with, as previously mentioned.

It should be mentioned that the comparisons were made with the latest type metal tubes and not those from first-production runs. The tubes now being produced are decidedly superior . . . which brings us to the war that has been gong on over the metal tube.

Late Improvements

The early metal tubes did develop leakage, they were noisy in some instances, they had high input capacity, they had grid losses, and some types had short life. But the new metal tube is a different animal.

Leakage was caused by welding imperfections around the Fernico eyelets in the header through which the element leads pass. This leakage has been eliminated by placing a small copper ring over the sleeve of each eyelet in the header and running the header through an electric furnace where the rings are brazed around the weld. The arrow 3 in Fig. 1 shows where the copper ring is fused into the eyelet joint.

The early metal tubes were noisy because the mica spacer and the glass insulator beads are so near the top of the header that vapor from the flashed "getter" condensed on these objects. The condensed vapor formed numerous conducting paths across these points of insulation.

The solution to this problem is quite ingenious: Before the shell is placed over the tube structure and welded into place, the glass insulating beads in the Fernico eyelets through which the leads pass, and the mica spacer, are sprayed with a liquid ceramic. When this liquid dries, it forms a rough, pebbly surface on each bead and on the mica spacer. If this surface were magnified, it would look much like a series of mountains each encircled by a deep valley.

The result of this process is, that when the tube is going through the exhausting process and the getter is flashed, any vapor that reaches the beads or the mica spacer can condense only on the "peaks of the mountains." In consequence, no direct leakage paths can be formed across the insulating surfaces. The arrows 1 and 2 in Fig. 1 show the beads and the spacer that are treated with the fine spray of liquid ceramic.

Gird Losses Reduced

High input capacity and control-grid losses were due to one thing only—the small disc of insulation that is spun into the top of r-f tubes and through which the grid lead passes. The difficulty here was that the small disc which insulates the grid cap from the top end of the tube shell was just not equal to the insulation of the envelope of a glass tube. The properties of the insulation were not sufficient to hold down grid losses and to provide a low-capacity input.

The development of a new insulating material—known as XM-262—solved this problem. This material has such superior qualities at radio frequencies that its present use as an insulating spacer for the grid cap in metal tubes of the r-f type has decreased both input capacity and grid losses to a point where they are about the same as in the glass-type tube.

The tube engineers have worked fast and done a fine job on the metal tube. Production shrinkage is running around 10 to 15 percent, about the same as it is for glass tubes. Many new processes have been put to use in the manufacture of the metal tubes, and the sum total result is, metal tubes that may be relied upon.

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FOREIGN NEWS

(Continued from page 33)

rupted and the sensitiveness of the particular listener. What may be pleasant background to one, may to another be an irritable and vexatious noise mechanism.

Standard apparatus for measuring the intensity of the noise levels is being designed and, it is believed, will supply a wealth of invaluable data when a conference is held in January under the auspices of both the Electro-technical Commission and the Internation Broadcasting Union.

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A TALKING NEWSPAPER

BUENOS AIRES: An interesting development of printed sound tracks has been commercialized by the Companie Funddora Fotoliptofono, of Buenos Aires. In general, the recording consists of a number of parallel tracks covering a rectangular area of paper approximately 17 inches by 20 inches, which, when wrapped around a cylinder of the reproducer join up to form a continuous spiral. A motor turns the cylinder and the spiral track is followed by a point source of light and a photronic cell which follows the track by means of a lead screw. The equipment is housed in a small cabinet and is furnished with an adapter for connection to the first amplifier stages in a radio receiver. Filament current for the exciter-lamp is supplied by the receiver power pack. The fidelity of the printed recordings are of a very high order and reach upwards to 7000 cycles. Interferences, such as defects in the paper, scratches, folding and other minor blemishes are practically imperceptible to the ear.

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VOLUME EXPANDER AMPLIFIER

(Continued from page 19)

With the amount of expansion afforded in this particular amplifier, this power output is about the minimum permissible. It enables the reproduction of distortionless expanded fortissimo passages to be a little above room level.

Output Curves

Fig 3 shows curves of output versus input—expanded and normal. As can be seen from the curve, the amount of expansion at very low levels is practically zero. With increases in input level, however, the amount of expansion increases until at maximum level a total expansion of approximately 20 db over the original is realized. This is within 5 db of that required to produce the dynamic range of a full orchestra, and is generally more than sufficient to produce a new sense of realism at normal output levels such as those used in the average home. Possibly a curve having a slightly different shape, particularly since records are manually monitored, would be nearer correct from a theoretical standpoint. Tests in the laboratory indicate that the advantages of a curve nearer the theoretically correct one are somewhat lost due to the variations in monitoring, and as a result the one shown has proven to be very satisfactory.

In demonstrating the expander, two strikingly different effects can be shown. If the maximum levels with and without the expander are adjusted to be the same, then the use of the expander will result in a *material reduction of surface noise* during low-level passages. In other words, the low level passages are reduced about 20 db below the level which would be reproduced under normal conditions. This reduction in level, while it does not actually change the signal to surface noise ratio, gives the impression that there has been a definite change in this ratio, and the result is pleasing.

Without Expansion

The other demonstration is equally effective, and consists of adjusting the low-level passages to the same output with and without expansion. The high level passages will then increase to 20 db over the normal high level passages, and result in a much more realistic reproduction. Care must be taken with this particular demonstration, or the output stage will be driven to overload. Of course, a third demonstration in which the average level of reproduction is fairly high, with occasional passages at extremely low or high levels, will prove very interesting. In this particular case a change of plus or minus 10 db over the normal phonograph can be obtained by proper manipulation of the volume and expander controls before the test.

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"SPARKS"

(Continued from page 29)

it might if you stood up in a canoe and held out a handkerchief—but men will try the damndest things when they're up against it.

"That old tub developed the worst roll I've experienced outside of a Sub Chaser. If you let go what you had hold of, you'd fly through the air with the greatest of ease and end smack up against a bulkhead. The First Mate weighed over 200 pounds, so we lashed him to his bunk the first night. It ripped the side right out of the bunk and he went sailing.

"I stood a continuous watch for twelve hours with the back of the chair up against the transmitter panel and my feet braced against a ventilator pipe. Every time the ship rolled, a couple of tons of storage batteries ten feet away groaned and tried to break loose from their moorings.

"After twelve hours of being battered, there wasn't anything to do but start up the one-kilowatt Navy transmitter this ship had, twirl the big nickle-plated dials on the SE-143 receiver, and make contact.

"Got two ships right off, both dripping at the mouth for salvage money. A fellow fifty miles off won out and towed us into Port-O-Spain.

"In a month we're off to Brazil and the Argentine . . . Rio, Rosario, B. A., Montevideo and a few other places. We load corn for Germany and hop off across the Atlantic, through the Bay of Biscay and up the English Channel into the North Sea.

"Boy, was that a spot, the Channel's full of ships, and the air's full of messages. I'm comparing rigs with the op' on a Dutch boat, when finally the op' at Lands End busts through and lays down the law about us jamming the Channel traffic. Man, was he sore!

"Later I become the white haired boy for reporting a floating mine which had broken loose up in the North Sea around Heligoland and is on its way down the channel. It slides right by us and rides merrily along toward the open sea.

"Then up the Elbe River to Hamburg where they were having food riots. They must have liked our corn . . . "

"'Boy, that calls for another drink,' I put in.

"'And how!' says he"

—W. R. Hynes.

◆

"THE SHADOW"

(Continued from page 31)

9 A. M. and 6 P. M. But it is already known that "the shadow's" operations are by no means limited to this section of the country, for it has been observed on both coasts, and at various points in between.

"The shadow" took a hand in the recent broadcasting which attended the stratosphere flight from Rapid City. On that occasion the RCA station at Riverhead, L. I., tuned in directly on the balloon's transmitter and had perfect reception but for the interference of these mysterious waves. This caused a quick

change in the technical facilities employed to bring voices from the balloon to the broadcasting networks, it being necessary to pick up the balloon's radio at an RCA station at Chicago, where the interference was not experienced at that time.

So far the radio communication and broadcasting companies have had no serious difficulty in circumventing the interference caused by the mystery signals. But there is little doubt that the public who listen in on short-wave bands have already suffered considerable inconvenience, and may expect still more, for within the last six months "the shadow" has become increasingly active in the United States.

New Clues Being Gathered

Engineers are confident that, from whatever source the mystery waves may come, they are not being employed in any known form of communication. It is therefore possible, if not probable, that whoever is generating the waves may be entirely unaware of the interference they are setting up. Were they carrying intelligence of any nature, this would supply important clues to their origin. But as it is, the searchers must rely entirely on analysis of waves by scientific devices in their approach to a solution of the mystery. It has already been determined that the power sources of the waves are of two types; on some occasions the signals are produced by half-wave rectified power, and on others, by a full-wave rectified source. New clues are being gathered daily.

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THE "QUEEN MARY'S" RADIO EQUIPMENT

(Continued from page 17)

in the receiving station will have in front of him a dial similar to those on the ordinary dial telephones. By the operation of this dial he will be able to start up or shut down a transmitter 350 feet away, increase or decrease its power as required, or change to any required wavelength. Each of these operations will take only a few seconds to complete while a system of indicators will keep the operator informed of the conditions under which the transmitter is functioning. The whole system will be duplicated to guard against possible breakdown.

Emergency Power

Elaborate precautions are being taken to prevent the radio system being put out of business by failure of power. The whole system will be supplied by a special power plant generating alternating current. The dynamos for supplying the current are duplicated, so that even if one were to break down the radio service could still carry on at full capacity.

In the possibility of grave emergency, under which both generating plants for the radio system might be put out of action, a complete emergency station, operated entirely from the ship's emergency lighting supply or from storage batteries, is available.

◆

CHANNEL ECHOES

(Continued from page 27)

stolen from in front of the fire house. The complete description neglected nothing from the shiny brass rails to the chromium plated bell. Probably the work of the same bright gob.

Topping them all is the case of a stolen patrol car which the thief had calmly driven away from the very steps of police headquarters. We understand that no cops were in the car at the time.

◆

THE INTERESTING possibilities of the amateur bands are featured by most manufacturers of short-wave and all-wave receivers as an additional inducement to purchase their products. However, we doubt the entertainment value of amateur radiotelephone conversations to others than the amateurs themselves and such folks who are addicted to bridge post mortems or who like phonograph records with crossed grooves.

◆

IN SETTING UP *and proof-reading a thousand words of copy there is about one chance in fifty that it will appear with an error. That such an error should exist with any particular word is one chance in fifty thousand. In other words, it was fifty thousand against one that the one and only word in our December copy that was the least bit vital should be garbled. But it was! If the reader is sufficiently interested to make the correction, cross out the letter "t" in the word "forget," fifth line, second verse of our ode to facsimiles (*ALL-WAVE RADIO, *December 1935, page 121.)*

◆

TRANSMITTER KEYING

(Continued from page 26)

Power Supply

The transmitter power supply used by the writer furnishes 500 volts to the plate and 200 volts to the screen of the RK-23 Tritet oscillator. The total screen bleeder resistance is 15,000 ohms and screen current for both the oscillator and a following RK-23 doubler is drawn from this bleeder. With the key up, the plate voltage rises to 600 volts and the screen voltage rises to 310 volts.

The keying circuit shown in Fig. 1 has proven to be most satisfactory. The idea is not new. It is probable that this type of keying has been in use in many stations since the introduction of the Tritet circuit.

THE RADIO YOU BUY

(Continued from page 11)

which would still make the set a good purchase for the person interested only in DX on all bands.

And so it goes; the manufacturers who are reputable give you as much for your money as they can afford to put into their product. If the product is too cheap, there is a nigger in the woodpile, and don't forget that. Prices have been worked out to a nicety by the larger manufacturers and it is doubtful if anyone can work in more for the same number of pennies without going bankrupt, or without going in for a bit of chiseling.

The smaller manufacturers in good standing work on the same basis, and in the final analysis the figures are about the same. The little fellow may have lower advertising and overhead costs, but on the other hand his turnover is smaller and he cannot buy in large quantities and thereby obtain the larger discounts. It all evens up pretty well.

Quality and Precision

There is one subject I have left for the last and that is, the relations of quality of materials and the precision of manufacture and adjustments of parts, to the efficiency of the receiver. In this instance the radio bears a very close relation to the automobile.

I have mentioned the fact that the capabilities of a receiver and its price may be gauged rather closely by the number of tubes used. This is true up to a certain point only; beyond that point the efficiency of the receiver rests almost entirely in the quality of the parts used and how precise the adjustments of these parts are before the set leaves the factory.

Any set, of course, is improved if losses are kept at a minimum, and this can be done by using good insulating materials and by proper mechanical and electrical design. But the particular point to keep in mind is that the larger all-wave sets and the combination all-wave and high-fidelity sets lose efficiency at an alarming rate if the best of parts and materials are not used, and if these parts are not made so that they may be adjusted precisely and maintained at the proper adjustment points over long periods of time. A slight mis-alignment in a receiver of this type shows up more readily than it would in a smaller set having less selectivity and covering a much narrower range of audio frequencies.

Conclusion

I am not so sure that the points brought out in this article have served to answer the questions listed in the opening paragraph. I believe I have made it clear, however, that most receivers produced by reputable manufacturers are good, just as most cars of today are good. I believe that I have also made it clear that the set you buy will have, in most respects, the worthwhile features to be found in other receivers. There is no guarantee, however, that it will be as sensitive as the set your neighbor owns, but it may have better tone instead. And there is no guarantee that the set you buy will be just the one you were looking for, because you may have missed a few sets in your quest for the ideal.

Some sets have sensitivity controls, some do not. Some have signal beacons or station finders, some do not. Some have tuning meters, some do not. But most all sets will give you sensitivity, selectivity, tone and power in degrees commensurate with the amount of money you spend.

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ROSES AND RAZZBERRIES

(Continued from page 23)

WE ARE TAKEN with a severe case of the jitters under any form of emotional distress. Being naturally a bit loose in this respect, it is our habit to steer clear of circumstances that might lead to an undue amount of excitement.

One afternoon when we were none too calm, we trundled out the buggy and sought the quieting atmosphere of the open road.

While working through a city to reach an especially beautiful countryside, we chanced to see directly ahead of us a broken-down Ford roadster containing some seven passengers, that had attached to the rear bumper a series of plates on which were stamped the call letters of amateur stations.

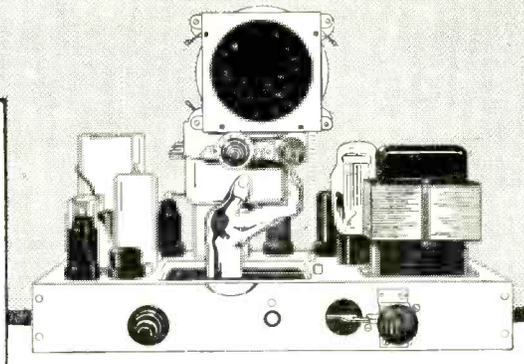
We thought it would be rather fun to pound out a CQ on our horn, just to see what would happen. This we did, and the ensuing pandemonium from all sides left us completely undone.

We had driven into a veritable nest of them, and it was no easy task to break loose from this honking, whistling, tooting horde without giving a complete account of ourself.

The day was saved by an irate traffic officer who had no sympathy for amateur radio—an officer who was interested only in breaking a traffic jam that extended an entire block.

We headed for home and a stiff shot of Scotch.

NEW *and* STARTLING



METAL TUBES *plus the* **CENTROMATIC UNIT** *in the* **NEW 1936 AMERICAN-BOSCH RADIO** *hand you all these definite advances*

- More long and short wave stations to enjoy.
- Better, clearer, purified tone.
- Greater freedom from noise —BETWEEN stations and ON stations.
- Tuning made easier on both long and short wave.
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- Extra performance from new metal tubes.

SO MANY good radios! But the CentrOmatic Unit in the new American-Bosch helps you choose the best!

You not only can hear the difference which CentrOmatic Engineering introduces. You can actually *see* the difference! The chassis—as you can see—has a separate unit on which are centralized all the sensitive radio elments; armored and insulated from internal set noises.

That's why CentrOmatic Radio is so free from noise. That's why you can get more long and short wave stations. That's why even short wave tuning is so accurate and easy. That's why tone is so pure and rounded out. *That's why CentrOmatic Engineering means more to your enjoyment than metal tubes alone.* In American-Bosch CentrOmatic Radio you get both.

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Model 595M — High Fidelity 10 tube, 11 tube performance, American, police and foreign, plus U. S. weather band, superheterodyne Console radio, with exclusive combination of new metal tubes and American-Bosch CentrOmatic construction. Range 540 to 18,500 Kilocycles and long wave U. S. weather band 150 to 350 Kilocycles. **$169.50**

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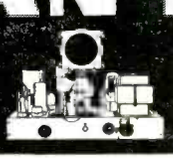
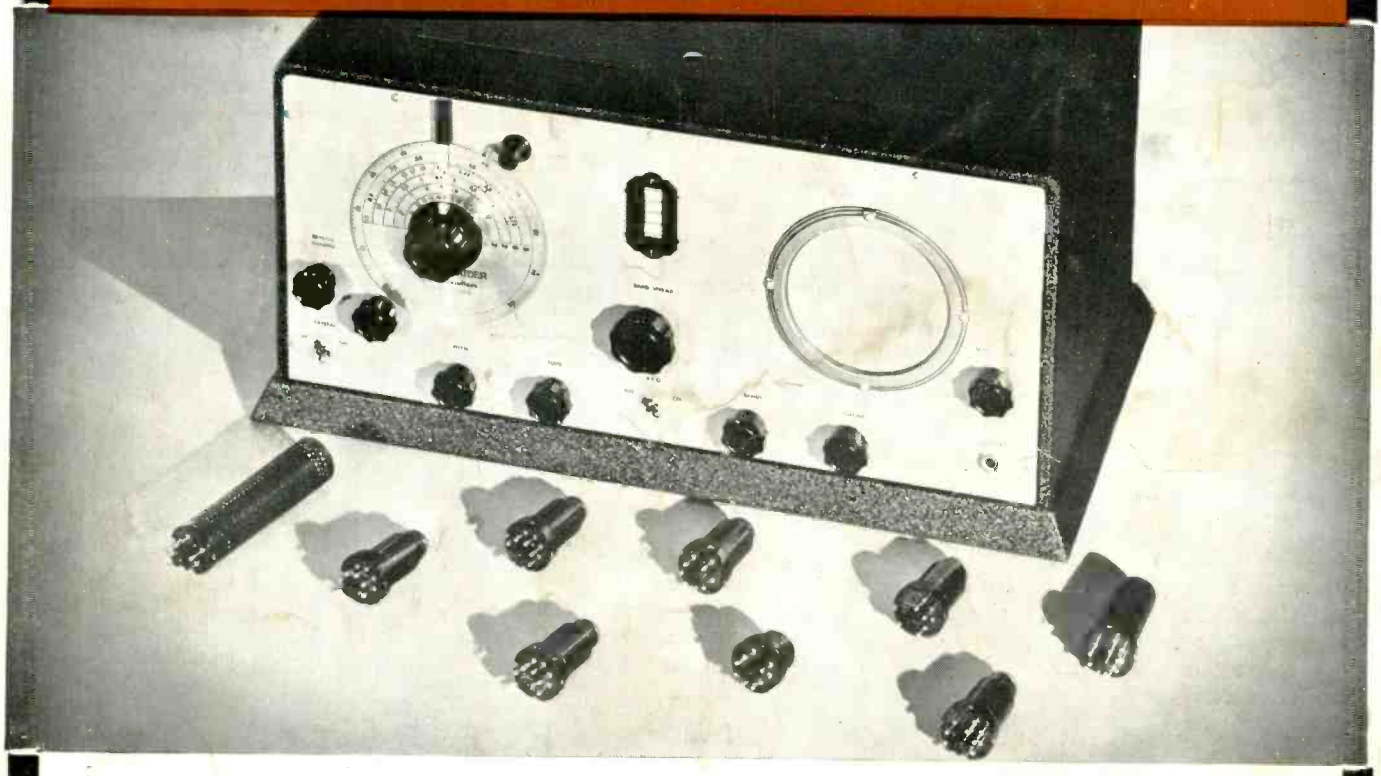
CentrOmatic  **RADIO**

The SUPER SKYRIDER is MODERN *



- 9 Metal Tubes—Dovetail perfectly with our efforts to improve signal to noise ratio—eliminate noisy tube shields—reduced interelectrode capacities and shorter leads afford greater gain.
- Iron Core I. F. system—greatly increased sensitivity and a signal to noise ratio unattainable with an air core system.
- Duo-Micro-Vernier Band Spread—provide improved logging accuracy—provides electrical band spreading and micro-vernier tuning in an exclusive and distinctive dial.
- More efficient Crystal Filter Circuit, controlled by variable knob on front of set gives one signal selectivity—without reducing sensitivity.
- Beat Oscillator with continuous range.
- Modern Band Changing System—any desired bands in the short-wave spectrum with the turn of an exact positive switch—no cumbersome plug-in coils.
- Compact—all completely enclosed in one convenient and efficient cabinet 19½" x 10" x 10".

When you install the Super Skyridér you have every modern feature known to radio, plus the progressive engineering that keeps pace with the latest developments and trends in short wave reception.

Examine the marvelous 1936 Super Skyrider. Compact, convenient, efficient, it's the embodiment of today's trends in radio engineering, and incorporates, too, the brilliant Hallicrafters engineering developments. It's orderly and workmanlike, different from the old-fashioned, loosely wired, separate parts that constitute the receiver of the past. Amateurs today want the compact convenience of the Super Skyrider.

There are no cumbersome, inconvenient, plug-in coils used in the Super Skyrider—modern receiver design and layout permit the use of a simple band switch that tunes in any band with a twist of the finger, while the Automatic Band Indicator shows it on the dial. Here's convenience to the Nth degree, obtained without sacrifice but with actual gain in efficiency.

The Super Skyrider is engineered for the New Metal Tubes, radio's great advance for 1936. Completely shielded, with short leads and small interelectrode capacities, they provide the last link in Hallicrafters' efforts to build a stable, high gain set.

Sensitivity is brought to a still higher level with the new Iron Core I. F. Transformers, first used in the Super Skyrider and now rapidly being adopted by the more progressive manufacturers.

It's modern features like these and a dozen others on the Super Skyrider that make it what it is, America's outstanding short wave receiver.

But with all the advantages the Super Skyrider is extremely reasonable in price, making it first in value as well as efficiency. Don't delay, see it at your dealer's today, you won't be satisfied until you own this MODERN short wave receiver.

the hallicrafters

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