The SHORT-WAVE MAGAZINE

6D

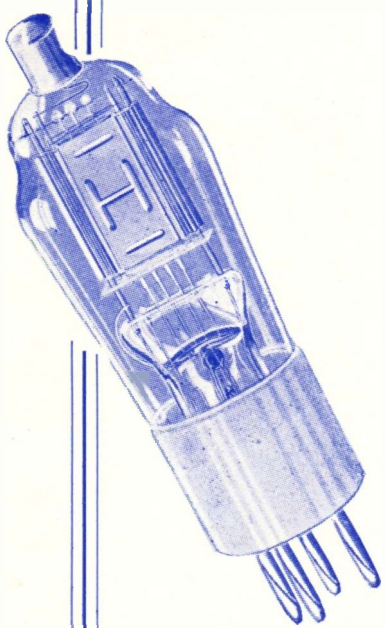
No. 6

AUGUST, 1937

Photograph: Engineer on watch at control apparatus of the new Bell directional aerials. (See story on page 9).

Courtesy of Bell Telephone Laboratories.

SHORT-WAVE VALVES



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RADIO AMATEUR CALLBOOK Magazine.—Contains complete lists of amateur stations (with names, addresses, etc.) from Alaska to Zanzibar, as well as lists of short-wave commercial stations, etc. A copy of this Magazine should be in the hands of every short-wave listener. Price 6s. per copy, post free. Write for lists of other books on short-wave reception and transmission.—G5KA, 41, Kinfauns Road, Goodmayes, Ilford. Dept. M.

THE SHORT-WAVE MAGAZINE

Vol. 1 AUGUST 1937 No. 6

Editor: BASIL WARDMAN (G5GQ) Editorial Asst.: S. W. CLARK

Advertisement Manager: C. T. MILDENHALL

THE IDEAL RECEIVER

This month we have pleasure in presenting to our readers the preliminary specification of the "Ideal" straight receiver. Every suggestion received has been examined carefully, and if possible incorporated. The result is a receiver of which any owner may feel proud, and which he can feel he helped to design.

Certain of the features are optional and may be added later if desired. The chassis and the majority of the components are identical whether battery or mains power is used, so that should the constructor of a battery model wish to change to mains only the minimum of expense will be necessary.

No "stunt" circuit is employed. Perhaps we should have played a few tricks with a standard circuit to make it look "original," but our experience is that these "improvements" are in name only, not in performance.

Instead we have approached it from an engineering standpoint. Sensitivity and selectivity have been the two essentials and these mean performance. To obtain this the layout, and especially the screening of the receiver have to be designed with the utmost care. Controls for every conceivable purpose must be included, but tuning must not be difficult.

The result may look unorthodox, because so much care and thought has been expended on each detail, but then it is unorthodox to attempt the design of a receiver which will be modern in a year's time.

We have considered ourselves engineers commissioned to design your receiver to your specification. We hope the result meets with your approval.

CONTENTS

Contributions for publication in our editorial pages will be given consideration and payment will be made for matter used. Only manuscript accompanied by a stamped, addressed envelope will be returned. Whilst we are willing to advise on suggested articles no guarantee of acceptance can be given.

The publisher does not necessarily agree with the views expressed by all correspondents and contributors, the aim being to open the columns to every phase of opinion.

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"RADIO NATIONS"

The League of Nations Wireless Station at Geneva is still in its infancy. The adult may turn out to be a veritable giant! At any rate the growth of this child is worth watching.

"GOOD EVENING, everybody! This is Radio Nations the wireless station of the League of Nations, calling on 31.27 and 38.47 metres."

Short-wave enthusiasts who haven't yet heard that call should listen some Saturday night at half-past eleven, British summer time. It's easy to get a verification, and reception reports from England indicate that the station is clearly heard on 31 metres.

But what is the story behind these League of Nations broadcasts? They've been going on ever since September 1932, and the League wireless station was first on the air eight months earlier than that, on the day of the opening of the Disarmament Conference, February 2, 1932.

● Intended for Private Traffic

When the Assembly of the League of Nations decided to construct a wireless station at its meeting in 1929, it was not thinking primarily of broadcasting to the public, and to this day Radio Nations is chiefly used for private traffic. What the League did want to have, and what Radio Nations assures, is independent and direct communications between the headquarters of the League in Geneva and as many as possible of the States' Members. The station is therefore used principally for wireless-telegraphic communications with South America and the Far East. Telegraphic circulars are sent by the Secretary-General of the League to States' Members, and sometimes long and important documents are sent in this way. A good example of the use of the station for this purpose was provided during the Italo-Abyssinian dispute, when many important decisions had to be communicated as quickly as possible to all the Members of the League.

The station is exploited for commercial purposes by a private company called Radio-Suisse, but it is available for all the League's regular traffic, and in time of crisis would be entirely at the disposal of the League. The Secretary-General of the League has only to inform the company that a state of crisis has arisen, and the staff, equipment and transmitters can be taken over entirely. Even the Central Telegraph Office in Geneva, from which the telegraphic traffic is normally despatched, would be transferred to the League's own building, the "Palais des Nations."

● Quick-change Wavelengths

The transmitters are situated at Prangins, a little village near Nyon on the north side of the Lake of Geneva. There is one long-wave transmitter for radio-telegraphy only, and two short-wave transmitters which can be used for wavelengths of from 14 to 40 metres. It is stabilised by the quartz system. The second has a range of from 14 to 100 metres, and is stabilised by means of the Franklin Drive. It works on four wavelengths which are interchangeable in several minutes.

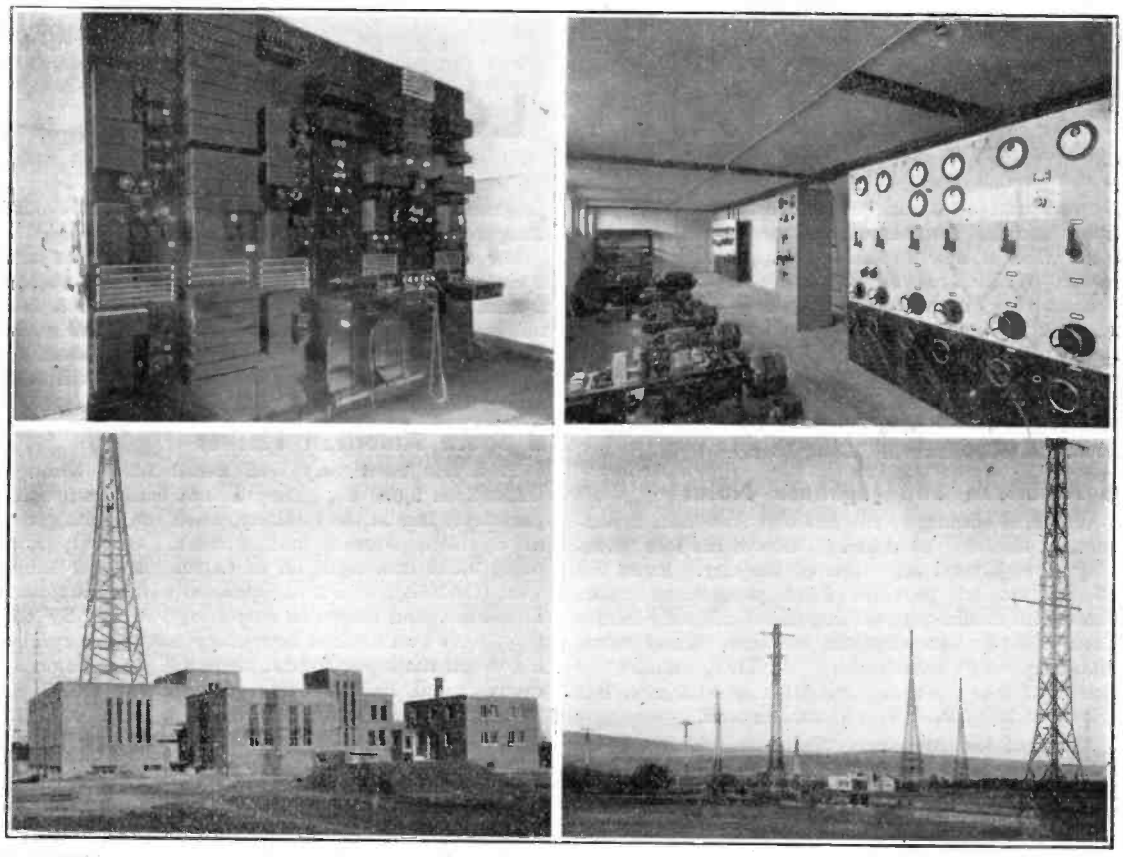
The aerial system is divided into five groups covering most of the world. Four of these are fully directional, and a fifth group of five non-directional aerials gives several intermediate wavelengths.

A receiving station, capable of picking up all overseas countries, is situated at Colovrex, another little village about five miles from Geneva.

This is the equipment which the League of Nations uses for its telegraphic and telephonic traffic.

Although the broadcasts to the public form thus only a part of the business of the League's station, they are the most interesting feature of it, and may well develop into one of the most important.

What does the League broadcast? Obviously its first business is to tell the world about itself. If you listen to the talks that are given each Saturday night, you will learn of a vast amount of work that is performed from day to day by the different organs of the League. It is work of which very little is known, obscure fields in which the nations are collaborating from day to day without any of the quarrels that make news. A recent broadcast was devoted to the anti-noise campaign. Who would know that experts from any countries had been meeting to pool their ideas about noise, if he did not learn it direct from Geneva? Or again, what do you know about the battle against opium and drug-taking? It's one of the epics of international endeavour since the war, but mostly it goes on in the dark. There's no lack of subjects at Geneva to provide interesting broadcasts.



VIEWS OF "RADIO NATIONS"
SHORT-WAVE STATION AT PRANGINS

● Real News

But there's more than that for the League broadcasting station to do. On many occasions in the course of the year Geneva is the centre of the world's news. At such times, Radio Nations is on the air more often, and short-wave listeners can get a direct first-hand account of what the world's statesmen are doing and saying. Sometimes these statesmen speak for themselves, and they are likely to do so more often than ever after this September. When the Assembly meets on September 13 it will occupy its new hall for the first time, and this hall is probably better equipped for radio than any other building of its kind. Not only are there microphones for the President and before the speaker's rostrum, but there will be seven boxes for radio commentators. The proceedings of the Assembly can therefore be broadcast with the comments of seven different observers (that is necessary because of the language problem), and any or all of this can be recorded for subsequent broadcasting at suitable listening hours.

The recording apparatus, which Radio Nations is now acquiring for the first time, is the crux of this new method of bringing the League's proceedings to the fireside. However interested, there are not many people who have the time, or the patience, to listen to the lengthy debates of the Assembly, any more than they would listen to the debates in their own parliament. But if on the same evening they can hear an account of the scene and a few of the most significant moments of the most striking speeches, then they will indeed feel that Radio Nations is giving them a first-class "actuality broadcast."

It is above all for news reports of this kind that the listener will turn to Radio Nations. But who can say how the station may develop? If the League Assembly attaches importance to this means of spreading information and fostering international co-operation, it may vote the credits that would make it possible to give a full short-wave programme from Geneva. Already many developments to the existing service are being considered, and the New Year may perhaps bring forth a greatly extended service.

Charles Wheeler's

JULY LOG

DESPITE THE EASE with which we hear U.S.A. stations, and the number of stations in use, it is not often that a new broadcaster appears. For this reason W2XGB is all the more interesting. At present they are working irregularly on 17,310 kc. A programme of gramophone records, or an occasional relay is transmitted daily, usually between 4 and 7 p.m. Announcements are made between each two items: these give the frequency, and state that W2XGB is owned and operated by Press Wireless Incorporated, Hicksville, Long Island.

● American and Japanese Notes

W2XE is coming to the front in American broadcasting, and can be heard on one of his five wavelengths at almost any time of the day. Even the 13 m. station provides good programme value shortly after mid-day, coming in considerably louder than GSJ on an adjacent channel. Their ultra high-frequency transmitter, W2XDV, unlike so many stations does not limit itself to 31.6 mc., but works on 35.6, 38.6, and 41 mc. as well.

Many of the American "below ten metres" stations have been heard in this country, but one I have not seen reported is W4XCA, Memphis. A Tennessee broadcasting station would be a good catch, so what about it?

Mr. C. A. Rigby, of Newcastle-on-Tyne has the following information regarding the Japanese stations. He says that a programme schedule may be obtained from this address: Nippon Hoso Kyokai (The Broadcasting Corporation of Japan), Overseas Section, Tokio, Japan. See last month's issue for official schedules.

The other evening when listening to JZK, I was waiting for the quaint tones of the Japanese announcer to say, "You are listening to the Land of the Rising Sun," but was surprised when a nasal voice broke in with "Your station is J Zee K, Tokio."

One of the Moscow commercials, working on about 18,420 kc. is being used to relay "Imeni Kominterna," the long-wave station: scrambled phone is also used at times. Does anyone know the call or schedule? If so I should be very pleased to have it.

Some time ago I referred to XEUZ, who had been well heard. After nearly three months I began to despair of getting a verification, but at last it has arrived. The reason for the delay was insufficient address; returned to Mexico, and then sent on again to me. Picture postcards, as well as the verification, were enclosed, signed by the manager, D. Bolaños, and the chief engineer, F. X. Stavoli. XEUZ relays XEFO, and transmits a special DX programme daily from 12 midnight to 2 a.m. C.S.T. They request reports.

For some time I had been wondering who the Spanish-speaking station on 9,500 kc. was. At last I managed to hear the call—XEWW, and a few minutes later an announcement was made in English. Their transmission times do not seem to be very regular, but they are usually on until 6.30 a.m. weekdays and 7.30 Sundays.

● South American Flashes

Peru has been very well heard lately through OAX4Z on 6,090 kc. They do not close until comparatively late in the morning, when the call is given in Spanish, French and English. OAX4I, now using 3,340 kcs. signs off at 04.30. Another Peruvian (OAX5A), who is not quite so well known, uses 11,800 kc. and comes in surprisingly well. By the way, have you noticed how many S.A.'s are springing up on the lower bands: there are about 30 on 31 metres, and half a dozen on 25 m.—INGU at Managua, Nicaragua is one of these. I have heard him on 9,300 kc. as late as half-past four.

An unusual station is LQA, who is not a regular broadcasting station but gives occasional B.C. relays. At about 11.30 one evening he was relaying a programme from LR3, Buenos Aires, and LU7 Bahia Blanca. All three calls were repeated frequently.

TIPG heard with English announcements at 5 a.m. and HJ1ABC (6,045 kc.) at 4.30. These two stations, although coming in very well (on that occasion) for their low power, will possibly not be heard again for months. It does seem strange how absolutely unreliable the smaller S.A. stations are.

You are all familiar with the "Personal Column of the Air," at the end of which exhortations are made to help the good work by purchasing "Chipso," but I wonder how many have heard it from W3XAL on 16 m. They broadcast it from a quarter to half-past four in the afternoon.

● Empire Commercials

It does not seem to be very easy to get 7LO at Nairobi this hot weather. QRN is at its worst in the evening, and successfully blots out any DX, but 19 mc. does not suffer, and VQG comes through very clearly, especially at mid-day when calling London.

Another Empire commercial on a near-by frequency is ZSS, who calls ships during the morning. He was recently calling IBSJ, the S.S. *"Duilio,"* on schedule; the *"Duilio,"* which was near Gibraltar, was some minutes late, and although full of apologies, received the following retort from ZSS: "Huh, thought you'd struck a mine, or something."

Does anyone know the correct frequency of LZA? Although generally listed on 14,920 kc. they seem to slide up and down between 14,800 and 14,900 kc.

● Expeditions

Through the courtesy of the A.R.R.L. I am able to give you information on those most elusive of DX catches, expeditions.

The Swedish East Asiatic Film Expedition has left for the Far East. Their radio transmitter, SM1VQ, works with G stations on 6 mc., and with amateurs on 14 mc. Transmissions take place at 06.00 and 21.00 G.M.T.

The yacht "*Iorano,*" belonging to the Smithsonian Roebling Exploring Expedition, uses the calls WORG and W1OXGY. Truman Smith (W1HQQ), the operator, requests amateurs using 7 and 14 mcs. to listen for W1OXG's C.W. on 8,320 kc., also phone on 12,862 and 6,425 kc. WORG uses 4,160, 8,320, 8,280 and 16,560 kc.

Two expeditions have set out for the Arctic now that ice conditions are suitable. One is the McGregor Expedition in the "*General A. W. Greely.*" Station WAWG will work with amateurs on 3,115, 4,145, 5,525, 6,230, 8,290, 11,050, 12,460, 16,580 and 22,100 kc. The operator is Jerry Sayre (W2QY) who will be away between eighteen months and three years. The other is the Macmillan Expedition, whose station WAWG will use the 5, 6, 6.4, 8.4 and 11.2 mc. bands to contact amateurs.

Yet another amateur, W2FEF, is away with an expedition. With Bowdoin's Kents Island Expedition, he will operate VE1IN until September 15.

An interesting station using the 3.5 mc. band is W3VSA, the boy scout Jamboree station at Washington.

The A.R.R.L. would like reports on reception from any of these expeditions. Address: A.R.R.L., La Salle Road, W. Hartford, Conn.

Please let me know any information you can regarding short-wave transmissions, so that I may pass it on.

Italian radio listeners breathed a long sigh of relief on July 1, date on which the Italian Broadcasting System banned all advertising from its programmes. Henceforth, the lover of operas and symphonies in Italy will no longer face the nerve-wracking strain of being brought suddenly face to face with toothpaste or tomatoes at the end of an act of La Traviata or Aida.

With the exception of Service 4, a power of 20 kw. is used, and announcements are made by C.W. and speech during the first and last four minutes. In 4, the power used is 1 kw.

The bureau welcomes reports, which include a description of the method of use, statement of fading, intensity, interference, etc., and suggestions for improvement of any details. All correspondence should be addressed to the National Bureau of Standards, Washington, D.C.

WWV

THAT REMARKABLE institution, the American Bureau of Standards, has for some time operated station WWV at Beltsville, Maryland, but from July 1 they have somewhat altered and extended their services. These now include:

(1) Standard radio frequencies.

(2) Standard audio frequencies.

(3) Standard time intervals.

(4) The standard of musical pitch, 440 cycles/sec.

(5) Bulletins of information on the ionosphere, and radio transmission conditions.

The standard radio frequencies provide a standard by which radio stations can adjust their frequencies, and the general public can calibrate frequency standards. Using a power of 20 kw., their schedule for this service is Tuesdays and Fridays as follows:

15.00-16.30 G.M.T.	5,000 kcs.
17.00-18.30 G.M.T.	10,000 kcs.
19.00-20.30 G.M.T.	20,000 kcs.

The accuracy of these frequencies is better than .00002%.

A standard audio frequency of 1,000 cycles is transmitted each Wednesday, according to the above schedule, and the accuracy is the same. It is stated that occasionally transmission effects in the medium cause slight variations from the standard in certain places: however the greatest fluctuation possible is about 1 cycle, and as a rule it can be relied on to one part in a million.

Suggested uses are the accurate measurement of audio frequencies and time intervals, calibration of tuning forks, etc.

The standard radio frequencies (Service 1) are used also to provide Service 3. A pulse, lasting .005 second is transmitted each second, so giving an interval of one second as accurately as it is possible to measure. This standard frequency of one cycle per second is based upon the standard time service maintained by the U.S. Naval Observatory. It is used in geodetic and seismological work, and for checking pendulum and chronometer rates.

In America, the standard of musical pitch is 440 c/s., which corresponds to A above middle C. This note is broadcast on 5,000 kc., from Monday to Friday between 21.00 and 07.00 G.M.T. The station call letters are given every ten minutes to assist in identification.

Details of the ionosphere and radio transmitting conditions are broadcast each Wednesday by voice at the following times:

18.30-18.33 G.M.T.	10,000 kc.
18.40-18.43 G.M.T.	5,000 kc.
18.50-18.53 G.M.T.	20,000 kc.

(*Continued at foot of column* 1).

The Higher Frequencies

LISTENING BELOW 10 METRES DISCUSSED

By LESLIE W. ORTON

TEN-METRE conditions are rather dull at the moment but within the next few days they are due to look up.

W1XEG at Storrs, Connecticut, a 500-watt experimental station, is one of the shortest wavelengthed stations in the world. It operates of .75 metre.

KDKA is relayed by a number of ultra short-wave stations, all employing the call W8XKA. Wavelengths employed are 4.96, 5.41 and 9.49 metres. Incidentally the last mentioned is listed as an experimental station and is consequently apt to change schedules suddenly—as, actually are most u.s.w. stations.

W2XDV relays the Colombia Broadcasting System programmes on 8.45 metres and also occasionally on 7.32 and 7.78 metres.

Incidentally another ultra short-wave station that is worth searching for is W6XAO, Los Angeles on 6.667 metres. It is a "vision" television station and consequently about the world's worst job verifying.

● Experimental Stations

W1XKA hides the identity of an experimental station at Chicapee Falls, Mass., that operates irregularly upon 9.5 metres with a power of 500 watts.

Other experimental stations that are worth searching for are EU1CD, Leningrad on approximately 10.5 metres and VE9FC, Winnipeg and VE9BY, London, Ontario on approximately the same wavelength. These stations are listed in the latest lists but I cannot guarantee to how regularly they broadcast.

There are a number of commercial transmissions on the 10-metre band and you may hear NSS, the United States Navy station at Washington, D.C.; NPO, U.S. Navy at Cavite, Phillipine Islands on 27,150 kcs.; WTA, Fort Santiago, P.I. on 26,280 kcs.; WVB, Fort Sam Houston, San Antonio, Texas on 26,280 kcs.; WXE, Anchorage, Alaska, or WVL, at Quarry Heights, Canal Zone on 26,190 kcs.

As might be expected there are a number of European stations on this band and among them are GIP, Dollis Hill on 27,270 kcs.; DGF (27,800 kcs.); DGF (27,400 kcs.) and DGX (26,800 kcs.), all at Nauen, Germany. A Zeesen transmitter DJV operates on 26,450 kcs. whilst Norway is represented by LLC, Jeloy on 26,350 kcs.

Somewhat naturally transmissions down here are rather irregular but many of the above stations are audible.

● Between 9 and 11 Metres

Between 9 and 11 metres the majority of America's ultra short-wave relay stations are situated. The following are worth attention: W9XHW, relay of WCCO, Minneapolis on 9.49 metres. Transmitting times from 12.15 to 3 p.m. on Mondays to Fridays; on Saturdays from 9 p.m. to 5 a.m. and Sundays from 2 to 3 p.m.

W9XPD relays KSD, St. Louis from 3 to 5 p.m. daily (latest schedule). W8XH relays WBEN, Buffalo, N.Y. from 1.25 to 11.30 p.m. daily and on Sundays from 3 to 11.30 p.m.

In some lists W1XKA is given as a relay of WBZA, Springfield, but in the latest American list it is given as an experimental station at Chicapee Falls, Mass., and not at Boston. I can't guarantee which is right but W1XKA has been heard relaying WBZA on approximately 9.5 metres.

● N.B.C. Relays

The National Broadcasting Company "pick-up" stations are worth listening for. They operate on various bands and programmes from outside halls, baseball matches, etc., are frequently relayed to the transmitter by means of these ultra short-wave "pick-up" stations. In this connection the following calls of N.B.C. portable stations are worth keeping in mind: W1OXAH, W1OXAI, W1OXAK, W1OXAM, W1OXAN, W1OXAP, W1OXAX, W1OXCG, W1OXBC, W1OXCR, W1OXDX, W1OXDZ, W1OXEA, W1OXEB, W1OXED, W1OXF, W1OXFL, W1OXFM, W1OXN, W1OXR, W1OXS, W1OXT, W1OXV, W1OXY and W1OXZ—quite a batch to remember! Nevertheless if you hear a N.B.C. relay you will be able to check the station you have heard from the above rather terrifying list.

● Amateurs

Amateur transmissions are, on the whole, heard better on the 10-metre band than on 20 metre, so you can guess that there are some thrills awaiting the beginner down there. A typical log of an ultra short-wave enthusiast is before me as I write. It includes such stations as W6GBO, Utah; ZS6Q and ZS6AJ, South Africa; ZB1H, Malta; 2L4AO, K6MVV, TI2RC, PY2AC, etc. From which you can see that the 10-metre band is well worth your attention.

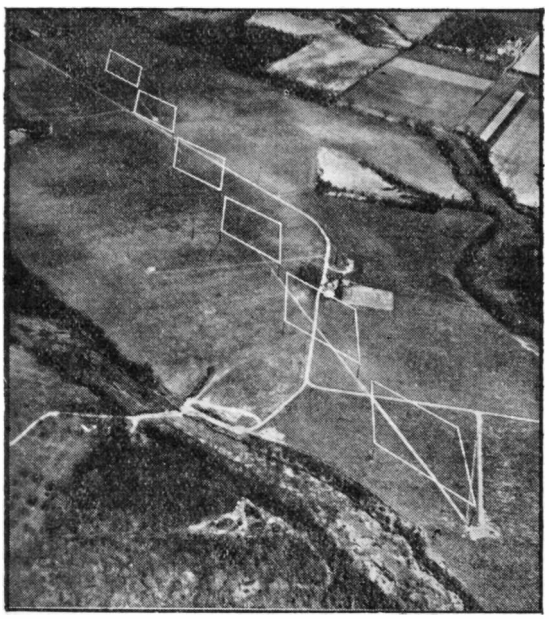
AMERICAN NOTES AND NEWS

New development in directional aerials for trans-oceanic communication. A large-scale field day - Residents in China complain - Magnetic storms cause poor conditions - Some American personalities who are radio fans.

(From our American Correspondent)

WHEN A RADIO station receives signals from only a single transmitter it is profitable to use an aerial which is insensitive in all other directions and thus excludes as much noise as possible. The new multiple system of directional aerials has proved highly valuable in reducing static interference.

It was found that sharply-discriminative aerials cannot be used due to the extensive range of vertical angles from which useful signals may approach, unless they can be "steered" directly into line with the incoming signal. Messrs. H. T. Friis and C. B. Feldman of Bell, in a paper entitled, "A Multiple Unit Steerable Antenna for Short-Wave Reception," reveal a system in which steering can be accomplished by combining the signals received over several aerials so that they all add up in phase. Aerials which, for commercial purposes, might be as many as fifteen or twenty, are stretched out for about two miles on a line toward the transmitting station. Transmission lines conduct the received signals to the receiving apparatus, which includes phase shifters for combining the signals so that they may be made to add up from any desired direction.



[*Photograph by courtesy of Bell Telephone Laboratories Inc.*

The six aerials as seen from the air.

The present experimental system uses six aerials and three separate combining-circuits are tapped off the lead-ins. An operator observes the signal on one of the combining circuits and "sweeps" it up and down until he finds a good signal. If the system were to be used for trans-oceanic telephony, he would then set one of the other circuits to that angle, and would connect its output to the telephone line. Usually a second good path can be found; the third circuit would also be set for it. This circuit is not connected directly to the telephone line but there is included an adjustable delay circuit through which it takes some time for the signal to pass. When this delay is adjusted correctly it compensates almost exactly for the fact that the two different signals coming in at different angles have travelled different paths, one longer and one shorter. Adding delay to the shorter path signal makes them of equal length before they are combined in the telephone line.

In an ordinary short-wave receiver with essentially non-directive aerial, all the signal components from different angles come into the receiver circuits together and combine without their delays being adjusted. This is what causes the severe selective fading and distortion characteristic of simple short-wave receivers on long-distance signals. The new system not only obviates this difficulty but on account of its sharp directivity still further reduces noise as compared with good previous practice.

* * * * *

Under the sponsorship of the American Radio Relay League, an organization of amateur operators, hundreds of "hams" were on the air almost continuously during the recent field day contacting as many other operators as possible. This is in keeping with the "be prepared" watchword of radio amateur operators who have demonstrated their worth in recent major national catastrophes, notably the great floods which wiped out all other methods of communication. The government encourages the amateurs and more and more licenses are granted each year.

The only stipulation of the contest, which was in the nature of a test of amateur equipment, was that the transmitter be operated by its own power

supply and away from the home station of the operator.

* * * * *

English-speaking residents of China rely for their short-wave programmes of English language broadcasts from England, France, Germany, Italy, Russia, Australia and Japan. They complain that they hear practically nothing from the United States because no station here is directing its news and entertainment broadcasts to the Far East.

This is brought to light in a report received by the Department of Commerce from its trade commissioner at Shanghai, A. Viola Smith. Mr. Smith suggests that a suitable short-wave transmitting station be erected somewhere along the Pacific Coast to furnish this service, pointing out particularly how the empire broadcasts from England, utilizing different wavelengths at different times of the day and year, have been very successful.

It is estimated by Mr. Smith that there are 300,000 radios in use in China, of which 50,000 are in the Shanghai area. While much of China's population is illiterate, he states, the 80,000,000 literates are largely in the higher purchasing group and include many American-educated Chinese who would be ready listeners to American programmes.

* * * * *

Reception conditions on the short-wave bands have been poor for quite some time. A cycle of magnetic storms has been disturbing the airwaves and is responsible for the poor reception. W. A. R. Brown, N.B.C. short-wave engineer, does not promise any relief inasmuch as several new storms are expected.

* * * * *

Most American listeners dialing to the amateur bands express dissatisfaction with the methods used by the "hams" in their conversations. Only first names, such as Bill, Herb, Andy, Ann, Alice, Sue and the like are given. The listener never can tell just who is broadcasting—it may be a salesman, a screen star, a sultan, or even a king, but they don't identify themselves.

Some of the country's ardent amateur radio fans include Herbert Hoover, Jnr., William Allison, the tennis champion; Andy Sannella, orchestra leader; Frank Hawks, the aviator. In other lands, there's the Sultan of Johore; the boy King of Yugoslavia, who it is said builds his own equipment; Mrs. Ann Morrow Lindbergh, and many others.

About the only solution is for outside listeners to secure copies of the amateur call books and check up on the ham QSO's.

* * * * *

Americans listening in to a German announcer on a recent Sunday afternoon broadcast were greatly amused to hear him say: "And now, for the benefit of any who may still be listening in, we will continue our musical programme with a polka."

INTRODUCTORY NOTES TO OUR NEW IDENTIFICATION PANELS

I HAVE been invited by the Editor of THE SHORT-WAVE MAGAZINE to compile a list of identification notes and other essential details of the world's short-wave broadcasters, which if carefully filed should prove of considerable aid to the beginner and experienced DXer alike. For convenience these notes have been arranged in the form of panels, and grouped by Continent, the various countries being listed alphabetically.

I cannot, and do not, claim that these notes are absolutely 100 per cent. authentic since the majority of the Latin-Americans summarized, though well heard in Great Britain, do not strictly adhere to certain identification signals or, for that matter, frequency! I do maintain, however, that the information given is reliable as it is based on a long study of the stations comprising the list, particularly in the case of the Latin-American broadcasters, which received practically my whole attention for a period of three years. The details such as postal address, standard time and so on, are frequently required by those interested in the verification of reception reports and, unfortunately, are often difficult to find when most wanted, but if the panels are kept the listener should have little trouble in turning up any desired information at a moment's notice.

It should be noted that the programmes emanating from Cuba, and many other countries, consist principally of sponsored entertainment thus accounting for the miscellany of peculiar identification signals radiated. For example COCX, COCH, COCQ, and several stations may be heard broadcasting the cry of a baby, roar of a car engine, bugle call, and so on. Actually the baby's cry signifies that a programme sponsored by a certain firm is in progress; the car engine that a petroleum firm is behind the announcement (listen carefully and you'll discover what firm is responsible for it—a well-known trade name is coupled to the noise), while the bugle call is associated with "La Voz de la Victor" throughout Latin-America. "The Voice of the Victor" refers, of course, to a well-known American receiver.

Don't convince yourself that Spanish is the sole language of the South American countries, for this is not the case. The majority employ Spanish, but Brazilian stations, of course, use Portuguese and the Republic of Haiti French. Fortunately English announcements greet us from the majority of these broadcasters, but due to their inconsistency in frequency, identification often proves a veritable nightmare. However by placing a regular order with your newsagent for THE SHORT-WAVE MAGAZINE you are assured of being conversant with the latest stations, schedules and identification characteristics in the future.—*F.A.B.*

LISTENERS' DX CORNER

ONCE AGAIN Bob Everard has turned in the best log. He says he is using the same receiver as Harold Taylor (Bridgend), but without the special aerial. Some of these commercial receivers can certainly give the communication ones a good run.

Well, Bob says that in addition to the stations Harold Taylor has logged he has picked up: K6NZQ, K6JLV, K6BAZ, K6CMC, K7FST, eight W7's, six VE5's, fourteen W6's, ten VK's, XE1JK, XE1GK, XE2FC, XE3AR, KA1ME, KA1HS, KA1YL, VP6FO, HC1EC, HC1ETC, HH2B, YN1OP, YN1HS, CE1AH, OA4N, OA4R, OA4AG, OA4AK, LU9BV, LU1HI, LU1JC, VV1AA, VP4TH, VP2CD, VP5PZ, TI1AF, TI2AV, TI2RC, TI3AV, and W7VA, operating portable at Nome Alaska. What a marvellous collection! And these are only a few of his catches. The K6's and K7's in particular attract me, especially the W7VA in Alaska, who really is a K7. Most of us haven't heard one station from these parts, yet he hears them by the dozen. By the way, who is VV1AA? I cannot trace him in the latest call book.

Regarding the list of low-power stations received (see last month's "Corner") he says:

"I have never possessed an RX with sufficient bandspread to calibrate 14 mc., etc., in the case of veries not giving specific frequencies."

He also congratulates W. E. Davey on hearing the two J's on phone, "very FB, om," and concludes by remarking that the next job is to land H.A.S. on 28 mc. Wait till conditions improve during the autumn and see how he gets on.

Colorado stations have aroused interest. The editor handed me a letter he had received from G5LK regarding W9UEL, who G5LK worked for his first European phone contact. Good going, LK.

Harold Taylor (Bridgend), has also heard Colorado, W9HDU in Colorado Springs, at 16.00 G.M.T. on October 26, 1936, on 28 mc. He is the first to claim Colorado on 28 mc. so far. An interesting paragraph in his letter is:

"I wonder how many readers have heard KZRM, Radio Manila, Philippine Islands, who is coming over well about 22.30 B.S.T. with a programme of gramophone records and news in Spanish and English. The frequency is about 9.58 mc."

This is an unusual time to receive Manila, the best time being the early afternoon and evening. I for one have never heard one as late as this. How about you?

Another Colorado claimant is R. W. Williams (Llangollen), who has also heard one on 28 mc., W9PWU, calling an F8 on February 25 last, around 17.00 G.M.T. He also writes:

"How many readers have heard Utah and Arizona on 10 metres? I have logged the Utah phone W6DTB, and the Arizona phone W6FZQ. I am sure all fans who tasted 10-metre reception last winter are looking forward to the re-opening of the band which should take place in September. One advantage of 10 metres is that one need not get up at the fantastic hour of 5 or 6 a.m. There is plenty of DX to be had at tea-time."

Yes, we shall all be glad for the come-back of 10 metres. I want to have a shot at it with one of the new S.-W.M. "Ideal" receivers, which look just the thing for this band.

F. G. Sadler, 2ASA (Stamford Hill), who has sent the photo of his shack, seen below, has verified amateurs in 57 different countries (sounds like

Heinz!), the best being VU2DB with ten watts. Modestly he says that conditions were mighty fine that day. Reminds me of old FB8C, in Madagascar, who used to get across with 8 watts, and put in a pretty good signal too.

A newcomer to this column is L. Levitt (Kippax, Leeds), who gets real results with a receiver similar to the S.-W.M. one valver. Anyhow his log since June 1 will make some of the superhet users sit

(*Continued on page* 34).

CORRESPONDENCE

GIVE US MORE U.H.F.

I wish to express my appreciation of your magazine—it really is good. Personally, I am only interested in wavelengths below 10 metres, and it is concerning this that I should like to put forward a suggestion.

In Pittsburg, America, for instance, an amateur can come on the air on 56 mcs. and work literally dozens of stations: an impossible thing in this country. Therefore I think it would be an advantage to build up enthusiasm about the 56, 112, 224 mc. bands, using decent gear which need not be costly. Super-regen. RX gear on 56 mc. should be buried, along with spark transmission. Furthermore, how much better it would be if all those hams using 1.7 mcs. for a Sunday morning chat (much to the annoyance of local BCL's) if they used the ultra high frequency bands for this form of transmission.

It is not difficult or tricky. I have had an RX operating on 1.13 metres, and the layout was not all that could be desired. I am at present designing a straight RX for the 56 and 112 mcs. bands employing S.G., electron-coupled det, L.F. and will forward details when completed and in operation.

Finally, I should like to wish your magazine the best of luck, and shall hope to see some ultra high frequency propaganda in the near future.—KENNETH A. COOK, BRS 2625, (R.E.S. ultra high frequency), 28 St. Georges Park Avenue, Westcliff-on-Sea, Essex.

DX RECORDING

I have just had an opportunity of examining your magazine, and find it is a most useful publication for short-wave experimenters. As my main occupation is concerned with sound recording and gramophonics my attention was naturally drawn to Charles Lawrence's article on "Record your DX Reception" in the May issue. I fear your contributor is a little optimistic as to the quality of recordings obtainable with such simple apparatus, as I have found that improvised "lash-ups" with oddments invariably produce unsatisfying results.

Space limitations preclude the detailed discussion of the article which I would like to give, but I will refer to two points (1) the aluminium blank is the cheapest to buy but it is not the best type to use, as there are many types of composition blanks on the market greatly superior, and (2) it is only essential to reproduce with a non-ferrous needle, e.g. fibre, aluminium blanks, as almost all other types may be played-back with a trailing steel needle.

It is not considered right in academic technical circles to advertise one's own wares, but in a sincere endeavour to help any of your readers interested in recording, may I refer to the "Simplat" booklet which I have recently compiled? It deals at length with a really high-grade blank and with practical direct sound recording in general. It is priced 6d. and is purchasable from the V. G. Manufacturing Co. Ltd., Gorst Road, Park Royal, N.W.10.—DONALD W. ALDOUS (M.Inst.E., BRS. 1006), Horns Road, Ilford, Essex.

[With regard to the article by Charles Lawrence, in fairness to him I must say he was instructed to compile as simple an article as possible, as it was intended purely for the non-technical listener, to whom ease of construction and cheapness are of primary importance.

We have to cater for all classes of short-wave listener; from the beginner to the most advanced, and at a later date we intend printing information regarding recording from the angle of the amateur transmitter, to whom technical information on this subject, together with the associated microphones and amplifiers, is always acceptable.] —Ed. S.-W.M.

TEST YOUR DIRECTION-FINDING GEAR

We shall be obliged if you will give publicity to the fact that the call sign of the experimental station at these works (G6SL) is being illicitly used on the 7 mc. amateur band. Some time ago Morse contacts were reported and recent information indicates telephony transmissions of particularly bad quality.

The transmissions from G6SL are confined to the 56 mc. band, and at present the station is in process of re-construction.

If any readers can give information which will enable us to trace the offender, we shall be most grateful.—Messrs. STRATTON & CO., LTD.

RENEWED INTEREST

As a journalist I don't muscle into print unnecessarily but I feel I must write and congratulate you on "The Short-Wave Magazine." It is quite the most intriguing little magazine I have ever read.

I lost interest in amateur radio temporarily some years ago when G6AI closed down his station at Broadstairs. He was a great friend of mine.

Just recently however, I took possession of a commercial 5 valve superhet and my experiences may perhaps be of interest to you.

Using either a mains aerial or a very small outdoor aerial I have consistently logged American, Canadian and Argentine amateurs on 20 metres during the last few weeks. I see from my record that in the three weeks I have been back on the amateur bands I have heard twenty-seven countries. Perhaps the best catch of all so far is a CE station at Santiago.

I have also managed to hear a couple of VK's but cannot seem to find any VQ's. Neither can I seem to get any further west in the U.S.A. than W9. Do you suppose this is due to the limitations of a commercial receiver or are conditions rather bad in this direction at present? Also, what is the formula (if any) for logging K6 and K7? So far my only K is K4.

In conclusion may I thank you once again for the splendid magazine you have put on the market. It has materially helped me back to experiencing those thrills I used to get working with 6AI.—NORMAN F. C. AUBURY, 17 Cecilia Road, Ramsgate, Kent.

[The lack of VQ's and W6's is not due to the limitations of a commercial receiver but more to conditions. VQ's are very erratic and the best time to look for them is early evening on twenty metres. W6 and W7 is coming through very well just at present around 07.00 G.M.T.

K6 is a difficult country to log. Sometimes it comes in with the VK's and other times with the W6's, but several are coming through now with the W6's.

K7 doesn't seem to follow any rule, although when conditions have been good for W6 and W7, and then they suddely vanish for a day or so, K7 then often comes through strongly when the band seems thoroughly dead.]—Ed. S.-W.M.

ON LEARNING MORSE

As an operator with ten years' experience at sea I feel I must butt in on the article "A quick way of learning Morse" by C. A. Rigby, in the July issue of your excellent magazine.

The "first essential" is to memorise the code by uttering aloud the *sound* peculiar to each letter, etc. The *sounds* of a dot and dash are *dit* and *dah* respectively. The combination, *dit-dah*, gives us the *sound* peculiar to the letter A, *dah dit dit dit*, the *sound* peculiar to B, and *dah dit dah dit*, C. The sound of N is *dah dit* and that of the break sign, *dah dit dit dit dah*.

Morse is the language of telegraphists and unless one commences to think in terms of the language from the outset, the task of learning is going to be much more laborious than it otherwise would. If the method suggested by Mr. Rigby is adopted then each *sound* received by the brain must be converted into dots and dashes before the appropriate letter, etc., can be written down, remembering at the same time which of the "opposites" is meant. The result is that the operator commences missing letters and even whole words and soon confusion reigns.

I admit that one *could* commence learning Morse on the lines suggested by Mr. Rigby and find themselves, in time, reading by the sound associated with each letter, having unconsciously discarded the dot-dash-reverses method. But why commence with a system that must eventually be discarded, especially if anything like speed is to be attained? —dit dah dit dit dah dah dah dah dit dah dah dit.

SUMMER CONDITIONS

Call for a Change from Medium to Short-wave Listening

DURING THE autumn and winter months we are able to select our programmes from the best that the capitals of Europe can offer, but now our receivers do not seem to have as much "punch." Copenhagen, Rome, Budapest, Rabat we have enjoyed, but now, alas, they are harder to hear, until in the summer, with its atmospherics and unfavourable radio conditions we find it impossible to hear them at all, and have to rely on more local programmes.

But why be restricted to local programmes during the summer? Atmospherics and summer conditions cannot be overcome on the medium waves, but on the short waves reception actually improves during this period.

● Summer Conditions

Short waves are practically unaffected by atmospherics. Even when there has been a bad, local thunderstorm reception of them is only interfered with for the short time that the storm is overhead, and when the medium wave reception is ruined, short waves still provide programmes from distant stations.

Short-wave broadcast stations use several wavelengths, because it has been found that a wavelength below 25 metres gives best results during daylight, and waves above 25 metres during darkness.

In the brilliant daylight of midsummer these stations will use a wave of between 13 and 16 metres; as the day wears on to afternoon they will change to 19 metres, and will gradually change to longer waves as darkness falls. During the winter, because the night is longer than the day the shorter waves—13 and 16 metres—are not used as much as during the summer, but these wavelengths in summer give as good, if not better reception than do the longer waves during the winter. Thus short-wave broadcast stations do not fade out during the summer as do those using the medium waves.

● Short Waves Not Experimental

Many listeners are under the impression that short-wave reception is experimental, unreliable, a hobby for wireless fiends. They imagine that all-wave receivers are difficult to tune, and that only experts can obtain good results.

This might have been true five years ago, but it certainly is fiction now. Responsible manufacturers would not produce sets which were difficult to tune —it would lose them their good name and business. The modern all-wave receiver is as easy to tune on short waves as the normal medium-wave machine.

European stations are only local for an all-wave receiver. In the height of summer, when Rome, Berlin and Moscow are only an indistinguishable background to atmospherics on the medium waveband, they will always be heard loudly and clearly on the short waves. Not only are there European programmes to choose from, but entertainment is available from all over the world.

● World Wide Programmes

All these programmes are intended for world-wide reception, and therefore most short-wave stations, no matter what their nationality, whether they be German, French, Italian, or Japanese announce in English. Here is a great improvement over medium wave reception. That annoying feeling occasioned by listening to the announcements of European stations in a foreign language is gone. Foreign reception can really be enjoyed, for the first time.

● English Announcements

Programmes intended for listeners all over the world must be of a higher standard than those intended purely for national listening. Rome gives frequent relays from La Scala, Milan, New York from the Metropolitan, the finest dance bands broadcast almost daily, film stars appear in person before the microphone. News in English allows short-wave listeners to form their own opinions of international political situations, after hearing all sides.

Unusual programmes are one of the many thrills of short-wave listening. Most of us heard the "*Queen Mary*" relayed by the B.B.C., but only short-wave set owners heard the special programmes from this ship to U.S.A.

● Reliability

Is reception reliable on an all-wave receiver? Reception of New York, Melbourne, or Tokio cannot be guaranteed every day without fail, but it is reliable nine days out of ten. The more important stations use special aerials which concentrate their signals, compensating for bad radio conditions. One of my favourite items, the Thatcher Colt mystery, sent every Sunday by Schenectady, New York, has been as reliable as the local B.B.C. station, and just as loud.

Should one or two stations fade out for a few days there are plenty more to choose from, there being about 100 short-wave broadcast stations receivable in England.

Why have your reception limited in summer? You wouldn't use a set which does not include the long waveband, so why have one which doesn't include the short? It costs no more.

Reflected Waves and Side-splash

in other words—All Sorts of Things

THE LAVISH use of superlatives applied to many very ordinary things has cheapened their value of description to an almost farcical degree. One daily reads of "colossal" cinema films, "mighty" organs, "stupendous" novels, "smashing" dance hits, and women's "ravishing" dresses—in fact everything is just too, too marvellous! Like the old cry of "Wolf" the big drum has been beaten too often and to-day few people pay any additional attention to such extravagant words. Radio sets, like parrots, speak for themselves. I fully realise that a well-chosen name has helped to popularise many a well-designed set, but on the other hand a large number of commercial and home-built receivers have proved disappointing to purchasers or builders who have been thus led to expect something extra special.

THE SHORT-WAVE MAGAZINE one-valver, when introduced, was modestly presented without a fancy name and with a bald, but very illuminating, statement of its actual performance. Time has proved that its popularity is increasing and now, six months after it was first described, when most other home-constructed sets are "superseded," several requests arrive each day for the back numbers containing constructional details. I feel almost inclined to say I was "astounded" when I first journeyed into the ether with this little fellow, but in view of what I have already written I will content myself with merely stating I was much impressed.

● Competition !

With the greatly increased numbers of all-wave receivers a new game is gaining popularity especially among non-technical listeners. During the "Five Hours Back" relays from the United States these listeners are matching their efforts with those of the B.B.C. engineers at the Tatsfield Listening Post, hoping to get better results with their direct reception than the B.B.C. are able to re-radiate. With directional aerials from the U.S. beaming in our direction reception is particularly good, but the Tatsfield engineers are an "odds on" chance as they use a special arrangement capable of picking up several signals and merging them into one to sustain a level strength. However, as this series of relays is to be a regular feature each Friday until October 1, listeners will have ample opportunity for comparison.

● Aerials—and Aerials

I have often heard sarcastic comment about the untidy array of aerials which offend sight of the orderly minded when viewed from a railway carriage window. Travelling by rail through any populous area one sees at the rear of almost every house scaffold poles of odd lengths, mis-shapen trees and clothes props leaning at widely diverging angles from which festoons of wires emanate in every direction. We short-wave fans, with our carefully planned aerial systems erected in a workmanlike manner can plead "not guilty" to this charge.

I agree that many aerials are an eyesore, but recently I saw something which, if not super-efficient, was at least original. That was a Ford car on the roof of which gleamed a large aerial fashioned in the shape of the famous V8 sign. Perhaps, if I have time next week when I go Kensington way, I will look in at Cadby Hall, not to find George, but to see if any of their vans are fitted with an aerial shaped like a swiss roll!

● More About Television

One correspondent thinks I had too much to say about television last month. He may not be the only one to think so but he is the only one to mention it—others appear to be merely interested. I feel sure that the majority of readers are interested in television, if not in tackling experimental work, at least in its general development. The other day I saw an effective demonstration well outside the service area and recently, in a daily newspaper, a correspondent claimed good reception at 70 miles—indeed, a snap indicating the picture brilliance was reproduced.

It is estimated that about 3,500 television receivers are now in use; the majority out on loan or hire, in restaurants, hotels, public-houses and big stores. While the average person is greatly surprised to see how good the reception is, its popular growth shows no signs of acceleration at the moment.

We undoubtedly lead the world both in design and programme service—in fact William S. Paley, millionaire chief of the Columbia Broadcasting System of America, who made his money out of radio, was recently here studying what he called the B.B.C.s trail-blazing in the matter of television. Incidentally he thinks it will be quite a number of years before television supplants broadcasting, and that even then it will not greatly affect other forms of entertainment. Despite the vague reports you may read or hear, I think you can take it for certain that we in England are well in advance of the rest of the world. Whether that lead is held or not, in view of both lack of Government aid and public interest, is a matter of conjecture. The B.B.C. with justification, cannot very well expend much of the listeners' money on a service they, the listener, of course, cannot afford to look-in to, and so things stand until the Government grant the

subsidy recommended by the Ullswater Committee. Having had my say, I will lay off the subject—for a time.

● The Good Old Days

Another correspondent mentions that he enjoys my occasional references to early broadcast and pre-broadcast experiences. To be quite honest, I delight in recalling, and hearing others recall, our early adventures and misadventures—the latter are both more numerous and amusing. The majority of old hands were lone workers and gained a rather rough and ready knowledge from their own crude experiments. One merely heard from unreliable, and usually highly imaginative sources that a particular thing was done in a certain way, but you had to puzzle out the details for yourself.

Chatting recently with several fans the conversation somehow drifted back to those early days and one story in particular strikes me as well worth repeating. It was told, against himself, by a prominent member of a South London radio club, and I will try to repeat it as related:

"My first inductance coil was wound with enamelled wire on a 5-inch cardboard cylinder about a foot long, similar to the coils used later in the early crystal sets. Tuning was effected by sliding a contact point along the coil, which was attached by terminals to a "detector panel" consisting of a valve, filament resistance and a pencil-line grid leak, mounted on a hefty slab of ebonite. After sliding the arm up and down for many wearisome weeks and still not getting any signals, I came to the conclusion that I had an insufficient number of turns to tune up to, say about 300 or 400 metres, which I thought would be the happy hunting ground.

"To lend colour to this conclusion, I at last actually heard a faint Morse signal and carefully noting the whereabouts of the slider I noticed it was almost at one end of the coil—it is obvious now that it was near the aerial end, but at that time I thought the whole coil had something to do with it as it seemed only natural that plenty of wire would be necessary to tune to a wave about a quarter of a mile long. Being unable to think of anything more suitable I used a mangle roller for the former, around which I proceeded to wind several pounds of wire. Having started on such massive lines I felt the slider must be in proportion, and, believe me, it was a two-handed job getting it up and down that coil. Perhaps the roller shrank or maybe the slider spring was too strong, but I distinctly remember that before many days had passed the slider pushed all the wire in a bunch up to one end."

I think that story well illustrates the enthusiasm and ignorance of amateurs of that period, I did crazier things than that myself, and if you have, or know of an equally amusing "confession," I should love to hear it.

Centre Tap.

WORLD-WIDE UNIVERSITY OF THE AIR

W1XAL completes second year of Radio Lectures

As COMMENCEMENT time brings the college year to a close, educational short-wave radio station W1XAL, "the World University of the Air," at Boston, suspends for the summer the educational broadcasts by which it has pushed out college walls to open a world-wide classroom with student listeners in more than nineteen different countries.

Direct instruction by lecture was offered in regular courses for amateur photographers, for yachtsmen, in physics and on radio mechanics. Diagrams, instructional sheets and lecture outlines were mailed out to many who enrolled for these radio courses so the listeners could follow the lecturer at his blackboard in Boston.

● Unique Library

Electrical transcriptions of the more important lectures were made in a special laboratory constructed at the studio and the lectures thus repeated at an hour when the other half of the world is awake. These recordings now comprise the beginnings of a priceless sound library of the words and voices of present-day leaders in American culture.

Programmes in German, French, Spanish and Italian were presented by faculty and students of neighbouring universities. Boston University and Tufts College made frequent contributions to such programmes. The weekly World Youth broadcasts conducted by young people of various nationalities assembled under the leadership of Prof. Carleton A. Wheeler of Tufts College were a regular feature of the station. These programmes furnished a means of communication among groups of young people in many lands. Their letters and discussions in response to these programmes provide a stimulating indication of the force for enlightenment which the international radio affords when motivated by the single impulse of education and international understanding.

● Increasing Roll of "Students"

Letters from a score of lands appreciating the broadcasts "that are different" from W1XAL testify to the increasing number of persons now equipped to receive these short-wave programmes and the rapidly developing influence of this unique station as a source of educational material to thousands who are far removed from colleges and lecture platforms. The stories of Chaucer, the philsophy of Aristotle, the thoughts of Goethe have been carried to remote farmhouses, huts and mining communities from Australia to the Arctic Circle, making a well-rounded programme of service for this pioneer short-wave "university of the air."

THE NATIONAL RADIO SOCIETY

By LESLIE W. ORTON, Secretary

WELL I CAN hardly express how satisfied I feel upon looking at the list of members. If ever I had felt any doubt as to whether such an organization were required that doubt would have been dispelled by the marvellous response of readers. The National Radio Society is wanted.

One of the most noticeable things is that the fair sex are already joining in moderate numbers, another of man's privileges disappearing before our eyes!

But what of it? So long as the YL's pull in the DX stations why should we mind if they join. It is a well-known fact that most of the leading radio clubs have lady members. The Anglo-American Radio and Television Society has a Ladies' section, the British Short-Wave League has also many YL's among its membership.

It always seems to me that if a lady joins a club of this nature the club (or is it the lady?) must be rather out of the ordinary—in any case the N.R.S. welcomes all classes of the community provided that they are serious enthusiasts.

● Membership

Of course you all remember that our membership fee is 1s. per annum, and that this fee entitles members to a membership card, small quantity of membership paper and many other benefits? Indeed I can assure you of *this*. Your 1s. is repaid to you in material within a week of your joining up! You see, actually your committee is running the club for the pleasure of doing it, the membership fee is to ensure that all joining are interested.

Each county has a representative (or will have shortly) and members in the counties concerned are advised to get at their representatives as soon as possible so that they may receive the full benefit.

A list of representatives appeared in our last issue but once again I will give a very brief outline of it.

Kent Representative: E. B. Chapman, 34, Birkbeck Road, Sidcup.

Northumberland and Durham: G. C. Castle, 10, Henry Street, Gosforth, Newcastle.

Herts: E. W. I. Field, 36, Watford Heath, Watford.

Essex: R. F. Stevens, 43, Pettits Lane, Romford.

Lincolnshire: G. F. Shepperd, 287, Wragley Road, Lincoln.

Warwickshire: Jack Hughes, 11, Nelson Street, Coventry.

South London: C. J. L. Goldsworthy, 185, Mitcham Lane, Streatham, S.W.16.

London: C. F. Biggs, 86, Lordship Lane, Tottenham, N.17.

Middlesex: L. Berry, 24, Allyn Park, Norwood, Southall.

Lancashire: Albert Park, 14, Fairfax Road, Prestwick, Manchester.

And now we propose to outline a scheme whereby we plan to give our members full benefits and our county representatives prizes for their co-operation.

● C.R. Competition

A cup is to be competed for each month by all county representatives. In connection with this contest London and South London will be considered as "counties."

The prize will be held by a county so long as that county provides its members with the best service. Each winner of the cup will receive a souvenir at the same time so that if he loses the cup he has still some consolation!

And now where do the counties stand at the moment? Well, here are the two leaders.

First, LANCASHIRE. Mr. Albert Park is steering his county to victory closely pursued by

Second, LONDON. Mr. Biggs means the south to win,

and there is no third as the other competitors are more or less level.

The cup will be presented to the person leading on SEPTEMBER 30th, 1937, so there is ample time for No. 1 to be other than Lancashire by that time.

● Short-wave Contest

But what about the ordinary member? We are holding a short-wave contest. The member who receives the greatest number of verifications between August 31st and November 30th will be presented with a prize and the N.R.S. DX Championship cup, to be competed for each year.

Judges in the competition will include Mr. F. A. Beane, secretary of the British Short-Wave League, myself and, if he is agreeable, your Editor, Mr. Basil Wardman.

● Some Information

A social meeting (with demonstrations, etc.) will be held in Uxbridge by the N.R.S. at about the middle of August. Will all who would like to attend please communicate with me at 11, Hawthorn Drive, Willowbank, Uxbridge. And why don't you who are not members drop me a card with your name and address and a p.o. for a 1s. along?

● QSL Bureau

In conclusion may we invite members to take advantage of our QSL bureau? To receive the benefits this service offers a fee of 6d. per annum is charged and this, along with four large stamped envelopes, should be sent to Mr. Arthur Park at 14, Fairfax Road, Prestwick, Manchester, our QSL Manager.

PLEASE ADDRESS ALL CORRESPONDENCE IN CONNECTION WITH THE N.R.S. TO "THE SECRETARY, LESLIE ORTON, KINGSTHORPE, WILLOWBANK, UXBRIDGE.

BROADCAST PROGRAMMES FOR AUGUST

(a) W2XE (Wayne) ... ... 21,520 kc, 13.9 m.
(b) ,, ... 15,270 kc, 19.6 m.
(c) W2XAD (Schenectady) ... ... 15,330 kc, 19.5 m.
(d) W3XAU (Philadelphia) ... ... 9,590 kc, 31 2 m.
(e) ,, ... 6,060 kc, 49.5 m.
(f) W3XAL (Bound Book) ... ... 17,780 kc, 16.8 m.
(g) W2XAF (Schenectady) .. ... 9,530 kc, 31.5 m.
(h) 2RO (Rome) ... ... 11,810 kc, 25.40 m.
(i) ,, ... 9,635 kc, 31.13 m.
(j) TPA2 (Paris) ... ... 15,243 kc, 19.68 m
(k) TPA3 ... ... 11,885 kc, 25.27 m.
(l) TPA4 ... ... 11,720 kc, 25.60 m.
(m) W1XAL (Boston) ... ... 11,790 kc, 25.45 m.
(n) ,, ... 6,040 kc, 49 67 m.
(o) OLR4A (Praha) ... ... 11,840 kc, 25.34 m.

SUNDAY

a.m.

9.15 News in French, English and Italian (daily) (k)
11.00 Concert—relayed (daily) (j)
11.43 Various Programmes from Italian Stations (daily) (h)

p.m.

12.00 News in English (daily) (j)
12.15 Concert—relayed (daily) (j)
1.00 Organ Reveille (a)
1.20 Mediterranean Hour (daily) (h)
1.30 Lyric Serenade (a)
1.45 Radio Spotlight—The Week in Preview and News of the Stars (a)
2.00 "Coast to Coast on a Bus"—programme for Children with Milton Cross (e)
2.00 "Sunday at Aunt Susan's"—Children's Programme (a)
2.20 Gramophone Records (daily) (j)
2.30 Concert—relayed (daily) (j)
2.55 Press Radio News (a)
3.00 Russian Melodies, directed by Alexander Kiriloff (f)
3.30 Children's Hour (a)
3.30 "Give us the Funnies"—Variety Programme (f)
4.00 Press Radio News (f)
4.00 The Hour Glass (c)
4.20 Varied Programme for Italian East Africa (h)
4.30 University of Chicago Round Table Discussion (c)
5.00 Dorothy Dreslin—Soprano (c)
5.00 Concert—relayed (daily) (k)
5.30 Dreams of Long Ago (c)
5.30 Radio City Music Hall (f)
5.30 Salt Lake City Tabernacle Choir and Organ (e)
6.00 Church of the Air (e)
6.20 Varied Programme from Italian Stations (i)
6.30 News Report (f)
6.30 Thatcher Colt Mysteries (c)
6.40 Our Neighbours—Jerry Belcher interviewing families in their own homes (f)
7.00 Magic Key Symphony Orchestra, directed by Frank Black (f)
7.30 The Widow's Sons (c)
8.00 Romantic Melodies (c)
8.30 International Broadcast from B.B.C. (f)
8.30 Call Letters (daily) (o)
8.35 News in Czech (daily) (o)
8.40 Dance Music or Gramophone Records (daily) (o)
9.00 News in German and French (daily) (o)
9.25 Variety Programme (o)
9.30 Variety with Jerry Sears and his Orchestra (f)
10.00 News in English (daily) (o)
10.00 Catholic Hour (c and g)
10.05 Military Band (o)
10.30 Guy Lombardo and his Orchestra (b and d)
10.30 A Tale of To-day (c and g)
10.35 Programme Announcement (daily) (o)
11.00 Joe Penner (Comedian) with Gene Austin (Radio and Screen Recording Artiste) and Coco and Malt (Harmony Team) with Jimmy Grier's Orchestra (d)
11.00 Jello Summer Show (from Hollywood) (c and g)
11.00 Echoes of New York Town (f)
11.15 Concert from Radio Paris (l)
11.30 Rubinoff, Jan Peerce, Virginia Rea and Orchestra (d)
11.30 Fireside Recitals (c and g)
11.45 Morin sisters and Ranch boys (c and g)
12.00 Variety Programme with Don Ameche (c and g)
12.00 Columbia Workshop (d)

a.m

12.30 Phil Baker : Oscar Bradley's Orchestra (d)
1.00 "1937 Edition of Twin Stars," Victor Moore & Helen Broderick (e)
1.00 Manhattan Merry-go-Round (c and g)

MONDAY

p.m.

12.30 Organ Reveille (daily except Sunday) (a)
1.00 Morning Almanack (daily except Sunday) (a)
2.00 Near and Far East—News in English and Italian, and Concert of Music (daily, except Sunday) (h or i)
2.00 Metropolitan Parade (a)
2.10 French Women's Chronicle—by Mrs. Decaris (j)
2.30 Richard Maxwell—Songs of Comfort and Cheer (daily, except Sunday) (a)
2.40 Press Radio News (a)
2.45 Bachelors' Children (daily, except Sunday) (a)
2.55 Press Radio News (daily, except Saturday and Sunday) (f)
3.00 Tim Healy—News Commentator (daily, except Sunday) (f)
3.15 "Ma Perkins"—dramatic sketch (f)
4.00 Happy Jack (songs) (c)
4.00 "The O'Neill's"—dramatic sketch (daily, except Sunday and Wednesday) (f)
4.20 Italian East Africa—News in Italian; Orchestral and Vocal Concert (daily, except Sunday) (h)
4.15 Personal Column of the Air, featuring Inez Lopez) (daily, except Saturday and Sunday) (f)
4.30 "Vic and Sade"—Comedy Sketch with Art Van Harvey, Billy Idelson and Bernardine Flynn (f)
4.30 WGY Farm Programme (daily except Sunday) (c)
4.45 Edward McHugh — the Gospel Singer (f)
5.00 Joe White (tenor) (c)
5.00 "The Gumps"—Dramatic Sketch (daily, except Sunday) (d)
5.15 Your News Parade (daily, except Sunday) (d)
5.15 Dan Harding's Wife (daily, except Saturday and Sunday) (c)
5.30 "Romance of Helen Trent"—Dramatic Sketch (daily, except
5.30 Arabian Hour—News in Arabic; Concert of Arabic Music (daily, except Sunday) (h)
5.45 "Our Gal Sunday" — Dramatic Sketch (daily, except Sunday) (d)
6.00 Travelogue of the United States in French (c)
6.00 Five Star Revue—Variety Programme : Morton Bowe (Tenor), Meri Bell (Popular Songstress), Ray Sinatra's Orchestra, and Bill Johnstone (Hollywood Reporter) (d)
6.30 "The Wife Saver"—Allen Prescott (d)
6.40 News in German (daily, except Sunday) (h)
6.45 Aunt Jenny's Real Life Stories daily, except Sunday) (d)
6.55 News in French (daily, except Sunday) (h)
7.00 Pepper Young's Family (daily, except Saturday and Sunday) (c)
7.00 News Through a Woman's Eyes (d)
7.10 Varied Programme from Italian Stations (daily, except Sunday) (i)
7.15 Ma Perkins (daily, except Saturday and Sunday) (c)
7.15 Jack and Loretta—Songs and Patter (daily, except Sunday) (c)
7.30 Vic and Sade (daily, except Saturday and Sunday) (c)
7.45 " Myrt and Marj " — Dramatic Sketch (daily, except Sunday) (d)
8.00 Colonel Jack Major's Variety Show (b and d)
8.00 Lorenzo Jones (daily, except Saturday and Sunday) (c)

8.30 Relay (k)
8.30 "Pop" Concert, directed by Howard Barlow (b and d)
9.00 Club Matinee. Orchestra directed by Harry Kogen; Ransom Sherman, Master of Ceremonies. Sair Lee and Robert Getely, Cadets Quartette (f)
9.15 The Dictators (b and d)
9.30 Playdays (d)
10.05 Popular Concert of Light Music (daily, except Sunday) (o)
10.15 Travelogue of the United States in English (c and g)
10.30 The Singing Lady — Nursery Jingles, Songs and Stories (f)
10.30 Press Radio News (daily, except Sunday) (c and g)
10.35 Three X Sisters (c and g)
11.00 News Reporter (daily, except Sunday) (f)
11.00 American Hour—News in Italian and English; Opera; ZRO Mail Bag (i)
11.05 U.S. Army Band—Capt. Thomas F. Darcy, Conductor (f)
11.15 Gramophone Records (l)
11.15 Four Stars, Girls Vocal Quartette (d)
11.15 News in English (daily, except Sunday) (h)
11.30 Press Radio News (daily, except Sunday) (f)
11.35 Sports Resume—Paul Douglas (daily, except Sunday) (d)
11.45 Lowell Thomas—News (daily, except Sunday) (f)

a.m.

12.00 Poetic Melodies (daily, except Sunday) (d)
12.30 Voice of Fireside Concert (c and g)

TUESDAY

p.m.

2.00 "Dear Columbia" — Fan Mail Dramatization (a)
2.10 Social Topics, by Mr. Rives (j)
2.40 Press Radio News (a)
3.30 Mystery Chef (c)
3.45 The Wife Saver (c)
5.00 Cleo Brown—Songs (c)
6.00 Jack Berch and His Boys (d)
6.30 The Merrymakers (d)
6.30 It's a Women's World (c)
8.00 Theatre Matinee (b and d)
8.45 Have You Heard?—Dramatization of Interesting Facts (f)
9.30 Club Matinee—Variety Show (f)
10.00 Del Casino (b and d)
10.15 Three X Sisters (c and g)
10.30 St. Louis Syncopators (b and d)
10.35 Short Wave Mail Bag (c and g)
11.00 News in English (i)
11.00 Amos 'n' Andy (c and g)
11.15 Vocal Variettes (c and g)
11.20 Latin American Hour (i)

a.m.

12.30 Wayne King's Serenade (c and g)
1.30 Al Jolson Show—with Martha Raye, Parkyakarkus, and Victor Young's Orchestra (from Hollywood) (e)
2.30 Jack Oakie's College—with Benny Goodman's Band, Collegiate Talent and Guest Stars (from Hollywood (e)

WEDNESDAY

p.m.

2.00 Music in the Air (a)
5.00 Three Rancheros (c)
6.00 Make Believe—Ruth Carhart, contralto; Bill Perry, tenor; Novelty Orchestra (d)
6.00 Fantasy in Rhythm (c)
6.45 Music for the Moment (c)
7.00 News Through a Woman's Eyes (d)
8.00 Manhattan Matinee—Variety Programme (b and d)
8.15 Continental Varieties with Celia Branz (Contralto) (f)
8.30 Current Questions Before the House (b and d)
9.00 Chick Webb and His Orchestra (c and g)
9.45 Academy of Medicine (b and d)
10.15 "Four Stars"—Mixed Quartet (b and d)
10.35 Cappy Barra's Swing Harmonicas (c and g)
11.00 North American Hour—News in English (h)
11.00 Del Casino—Songs (d)
11.00 Amos 'n' Andy (c and g)
11.05 Harry Kogen and His Orchestra (f)

a.m.

12.30 Time for Gogo De Lys (d)
12.45 Boake Carter (d)
1.30 "Laugh with Ken Murray"—Ken Murray (Comedian), "Oswald" Shirley Rosee (Vocalist), Marlyn Stuart, and Sud Gluskin's Orchestra (e)

THURSDAY

p.m.

2.00 As You Like It—Variety Programme (a)
2.30 Greenfield Village Chapel (a)
2.10 Life in Paris, by Mr. Henri Bellamy (j)
3.45 The Wife Saver (c)
6.00 Jack Berch and His Boys (d)
6.30 It's a Women's World (c)
7.00 Ramble; in Rhythm (d)
7.45 Piano Recital (f)
8.00 N.B.C. Light Opera Company; Harold Sanford, Conductor (f)
8.00 Theatre Matinee (b and d)
8.30 "Do You Remember"—Old Favourites (b and d)
9.00 Bob Byron—Piano and Patter (b and d)
9.15 Carol Deis, soprano (c and g)
9.30 U.S. Army Band (b and d)
9.30 Smiling Ed. McConnell (c and d)
10.15 All Hands on Deck (b and d)
11.00 Amos 'n' Andy (c and g)
11.00 Patti Chapin—Songs (d)
11.00 North American Hour—News in English (i)
11.05 Harry Kogan and His Orchestra (l)
11.20 Latin American Hour—News in Italian, Spanish and Portuguese (i)
11.35 Chuchu Martinez—Tenor (f)

a.m.

12.00 "Easy Aces" — Comedy Sketch, featuring Jane and Goodman Ace (f)
12.00 Poetic Melodies — Jack Fulton (Tenor), Franklyn MacCormack (Reader), and Carlton Kelsey's Orchestra (d)
12.00 Rudy Vallee's Variety Hour (c and g)
12.45 Boake Carter (d)
1.00 A. and P. Bandwagon—starring Kate Smith, with Jack Miller's Orchestra (e)
2.00 Major's Bowes' Amateur Hour (e)

FRIDAY

p.m.

2.00 Metropolitan Parade (a)
2.10 Events of the Moment (j)
2.40 Press Radio News (a)
3.30 How to be charming (c)
6.00 Make Believe—Ruth Carhart, contralto; Bill Perry, tenor; Novelty Orchestra (d)
6.00 Show Time Matinee (c)
6.30 Tune Twisters (c)
7.00 News Through a Woman's Eyes (d)
9.00 Among our Souvenirs (b and d)
10.00 Salvation Army Staff Band (b and d)
10.15 Barry McKinley—Songs (c and g)
10.30 Doris Kerr—Songs (c and g)
11.05 Harry Kogen and His Orchestra (f)
11.05 North American Hour—News in English and Italian; Concert of Request Numbers (i)
11.15 Hobart Bosworth—Dean of Hollywood (d)

a.m.

12.00 "Poetic Memories"—Jack Fulton (Tenor), Franklyn MacCormack (Reader), and Carlton Kelsey's Orchestra (d)
12.00 Mary Small—Songs (f)
12.30 Hollywood News (d)
12.30 WGY Farm Forum (c and g)
1.00 "Broadway Varieties"—Oscar Shaw (Baritone), Master of Ceremonies, Camela Ponselle (Mezzo Soprano), Elizabeth Lennox (Contralto), Victor Arden's Orchestra, and Guest Stars (e)

SATURDAY

p.m.

2.00 Breakfast Club (f)
2.00 Ray Block at the Piano (a)
2.10 Judicial Talk by Mr. Henri Delmont (j)
2.15 Dalton Brothers—Male trio (a)
2.45 Mellow Moment (a)
2.55 Press Radio News (a)
4.00 Continentals (c)
5.15 Orientale (d)
5.30 Campus Capers (c)
5.30 George Hall and His Orchestra (d)
6.00 Your Host is Buffalo (c)
6.15 Bob and Vera (d)
8.00 "Down by Herman's" (b and d)
8.00 Chick Webb and His Orchestra (f)
8.30 Ricardo and His Caballeros (f)
9.00 The Dictators (b and d)
9.30 The Dancepaters (b and d)
9.30 Ann Leaf at the Organ (b and d)
10.00 Top Hatters (c and g)
10.45 Religion in the News (c and g)
11.00 El Chico—Spanish Revue (c and g)
11.00 North American Hour—News in English (i)
11.20 Latin American Hour (i)

a.m.

12.00 Saturday Jamboree (c and g)
1.30 Johnny Presents—Russ Morgan's Orchestra; Charles Martin's Circumstantial Evidence Thrills, "It Might Have Happened to You" (e)

GUIDE TO THE WORLD'S SHORT-WAVE BROADCASTERS

(listed by Continent)

Compiled for "The Short-Wave Magazine" by F. A. BEANE

All times are given in G.M.T. for convenience. It is suggested that readers file these panels for future reference. Any additional stations, or modifications will be given from time to time to keep the list up-to-date.

LATIN AMERICA

LSX, BUENOS AIRES (Argentina)

Metres: 28.98; Kilocycles: 10,350. Power: 20kw.

Operating schedule: irregular, but recently Mondays and Fridays 22.00 to 23.00 G.M.T.

Standard time: G.M.T. less four hours.

Distance from London: approximately 6,800 miles.

Postal address: Transradio Internacional, San Martin 329, Buenos Aires.

Identification characteristics: the call is usually given as "Estacion Transradio LSX (phon. ellay-essay-ay-kis) en Buenos Aires." (phon. Bwaynos i-rees) and occasionally in English as "Station LSX, Transradio, Buenos Aires, The Argentine Voice." Programmes are terminated with the "San Lorenzo" march.

Verification of reception reports: has been known to request and confirm reports by QSL card, but inclined to be dilatory in replying.

LRX, BUENOS AIRES (Argentina)

Metres: 31.06; Kilocycles: 9,660. Power: 5 kw.

Operating schedule: approximately 21.30 - 02.30; Sundays until 05.00 G.M.T.

Standard time: G.M.T. less four hours.

Distance from London: approximately 6,800 miles.

Postal address: Radioemisora LRX, Calle Maipu 555, Buenos Aires.

Identification characteristics: a signal, consisting of four vibraphone notes, is usually heard at 15 minute intervals, coupled to the call, in Spanish, "LR1 (phon. ellay-erray-uno) y LRX (ellay-erray-ay-kis), Radio El Mundo en Buenos Aires." "El Mundo" illustrated daily newspaper) is mentioned frequently.

Verification of reception reports: verifies with card bearing the call of the medium-wave LR1, from whence its programmes originate.

LRU, BUENOS AIRES (Argentina)

Metres: 19.62; Kilocycles: 15,280. Power: 5 kw.

Operating schedule: normally 12.00 - 22.00 G.M.T., but, apparently, temporarily discontinued. When operating is best heard around 21.00.

Standard time: G.M.T. less four hours.

Distance from London: approximately 6,800 miles.

Postal address: Radioemisora LRU, Calle Maipu 555, Buenos Aires.

Identification characteristics: four vibraphone notes struck at approximately 15 minute intervals, and coupled to the call "LR1 (phon. ellay-erray-uno) y LRU (ellay-erray-oo), Radio El Mundo, en Buenos Aires." "El Mundo" is mentioned frequently.

Verification of reception reports: verifies with card bearing the call of the medium-wave LR1, from whence LRU derives its programmes.

PRF5, RIO DE JANEIRO (Brazil)

Metres: 31.58. Kilocycles: 9,501. Power: 6 to 50kw

Operating schedule: 21.45 - 22.45 G.M.T. daily.

Standard time: G.M.T. less three hours.

Distance from London: approximately 5,650 miles.

Postal address: either P.O. Box 709, or Departamento de Propaganda do Brazil, Avenida Presidente Wilson 305, Rio de Janeiro.

Identification characteristics: programmes are commenced and concluded with the Brazilian National Anthem. Mention is frequently made of "Departamento de Propaganda do Brasil"; "Hora do Brazil"; "Radio Nacional" (when relaying a M.W. station); and "A Voz do Brazil." The first 45 minutes of the programme is usually given in Portuguese, and the remaining 15 minutes in either English, French, Italian, Spanish, German, or Esparanto. The call is given in Portuguese as (phon.) "pay-air-effe-sinko." Occasionally a three note gong is used.

Verification of reception reports: verifies with card. International Reply Coupons are invalid in Brazil.

VP3MR, GEORGETOWN (Br. Guiana)

Metres: 49.42; Kilocycles: 6,070. Power: 150 w.

Operating schedule: 21.15 - 01.15 weekdays and 12.45 - 15.15 Sundays (G.M.T.).
N.B.—This schedule is not strictly adhered to.

Standard time: G.M.T. less 3 hours, 45 minutes.

Distance from London: approximately 4,200 miles.

Postal address: The British Guiana Broadcasting Company, Georgetown, British Guiana.

Identification characteristics: announce almost exclusively in English; slogan "The Voice of Guiana"; programmes concluded with National Anthem and Ted Lewis "Goodnight" Song. Programmes of local amateur talent are a feature of this station, and also the numerous 'drug store' advertisements.

Verification of reception reports: confirms reception with neat card, but is inclined to be slow in replying.

VP3BG, GEORGETOWN (Br. Guiana)

Metres: 48.94; Kilocycles: 6,132. Power: unknown.

Operating schedule: 16.15 - 17.15 and 20.00 - 00.45 G.M.T. daily.

Standard time: G.M.T. less 3 hours, 45 minutes.

Distance from London: approximately 4,200 miles.

Postal address: J. L. Kerr, 1, Wellington Street, Georgetown, Br. Guiana.

Identification characteristics: English used almost exclusively. Station announcement usually given as "VP3BG, Georgetown, British Guiana." Programmes concluded with the National Anthem.

Verification of reception reports: very difficult to obtain, despite a recent request for additional reports.

COCQ, HAVANA (Cuba)

Metres: 30.77; Kilocycles: 9,750. Power: 4 kw.

Operating schedule: Mon. to Sat. 11.55 - 06.00; Sun. 11.55 - 05.00 (Mon. morning). (G.M.T.)

Standard time: G.M.T. less 5 hours.

Distance from London: approximately 4,200 miles.

Postal address: Calle 25, No. 445, Havana, Cuba.

Identification characteristics: employs a miscellany of signals, including the cry of a baby; a man's laughter; the roar of a rapidly accelerating motor car; a bugle call and, usually, two chimes every fifteen minutes. All of these, excepting the chimes, are used in conjunction with advertisements. The call, in Spanish, is given as "CMQ (phon. say-emmay-koo) del Jabon Candado, y COCQ (phon. say-o-say-koo) de la Crema dental Colgate y el Jabon Embellecedor Palmolive, en Habana, Cuba." Occasionally mention is made of "La Fabrica de la R.C.A. Victor." Relays CMQ (880 kcs.).

Verification of reception reports: confirms promptly with attractive card and photo of equipment.

COCX, HAVANA (Cuba)

Metres: 25.75; Kcs: 11.650. Power: unknown.

Operating schedule: Sunday 13.00 - 02.00 (Mon. morning) and weekdays 13.00 - 06.00 G.M.T.

Standard time: G.M.T. less 5 hours.

Distance from London: approximately 4,200 miles.

Postal address: Apartado 32, Havana, Cuba.

Identification characteristics: slogan "La Voz del Radio Philco"; relays CMX "Cigarros y tabacos la Corona" (920 kcs.); uses single chime between announcements; 4 every fifteen minutes; bugle call, and occasionally 3 cuckoo calls; man's laughter; mention of "Casa Lopez"; car engine accelerating; noise of train and at times a recording of Big Ben is heard striking the hour.

Verification of reception reports: confirms accurate reports with pictorial card.

COCD, HAVANA (Cuba)

Metres: 48.92; Kilocycles: 6,130. Power: 250 w.

Operating schedule: Sunday 15.00 - 03.00 (Mon. morning) and weekdays 14.00 - 06.00; Sunday with special English programme until 08.00 G.M.T.

Standard time: G.M.T. less 5 hours.

Distance from London: approximately 4,200 miles.

Postal address: Apartado 2294, Havana, Cuba.

Identification characteristics: employs four chime signal every fifteen minutes, coupled to the call "CMCD (phon. say-emmay-say-day) y COCD (phon. say-o-say-day), La Voz del Aire, en Habana, Cuba," or in English "Short-Wave Station COCD, the Voice of the Air, in Havana, Cuba." Programmes are concluded with the Ted Lewis "Goodnight" song.

Verification of reception reports: reports are requested and promptly confirmed if correct. Their card is well worth possessing.

COCH, HAVANA (Cuba)

Metres: 31.8; Kilocycles: 9,428. Power: unknown.

Operating schedule: Sunday 12.30 - 04.00 (Mon. morning) and weekdays 12.30 - 06.00 G.M.T.

Standard time: G.M.T. less 5 hours.

Distance from London: approximately 4,200 miles.

Postal address: General Electric Co. of Cuba, Calle B, Num. 2 - Vedado, Havana, Cuba.

Identification characteristics: occasionally announces in English as "This is the General Electric station COCH in Havana, Cuba," and either followed or preceded by one, or more, of its signals which include a bugle call; church organ recording; cock-crow; roar of the sea-shore; chimes and occasionally a recording of Big Ben to strike certain hours. "General Electric" is mentioned frequently. Sometimes relays CMBC (630 kcs.).

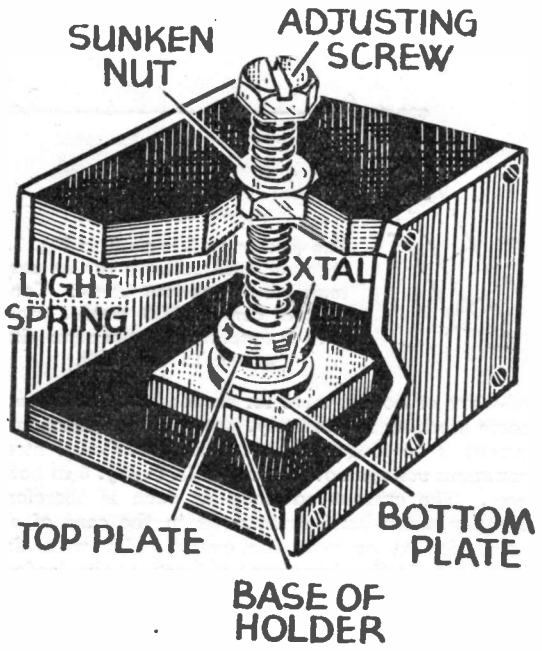
Verification of reception reports: verifies with card of unusual design.

STEADYING AN OPEN-TYPE CRYSTAL HOLDER

and Reasons for Crystal Failure

By J. S. T. RUDDOCK (2CDL)

WHEN USING open type crystal holders it is often found that either the crystal is apt to move about on the bottom electrode or that owing to insufficient weight of the top electrode the drive from this stage falls off. The author has found that by using the crystal in the holder as shown in the sketch these difficulties have been to a great extent overcome.



The illustration shows the crystal enclosed by the addition of sides instead of two pillars.

The holder actually consists of the open holder, with the handle of the top electrode removed, and in place of this a very light spring, the pressure of which is adjusted by a screw.

● Construction Details

A piece of plywood about 4 ins. x 1 in. x ¼-in. is supported upon two 1½-ins. pillars over the crystal holder, and into the centre of this piece is sunk a nut to carry the 2B.A. bolt as shown in the figure. A very light spring, actually a few turns of No. 26-gauge enamelled wire wound on a ⅛-in. diameter rod, is slipped over the screw of the top electrode of the crystal holder and allowed to come into contact with the end tang of the 2B.A. bolt. By screwing this bolt down pressure is increased on the crystal, so making it steady and free from side movement.

A little difficulty may be experienced at first when setting the screw and getting the crystal to oscillate. This can be overcome by moving the crystal out a little so that the top plate is not completely covering it. However, once the screw has been set the holder will stand a lot of vibration before the drive therefrom begins to drop.

● Crystal Heating

One often attributes falling-off of drive to valve or component failure without suspecting the crystal, and it is not until after much time and trouble in inspecting the P.A. and F.D. stages that the correct source is discovered. A further cause of failure in this stage is crystal heating, which can usually be detected by measuring the crystal current and finding that it is of a high value, or upon touching the plates of the holder they are found to be quite warm. The only way of keeping this heating at a minimum is to keep the plate voltage of the oscillator low: in the case of a triode at about 250 volts and pentode at about 300-350 volts, when its screen voltage is 100 volts.

It is for this reason that it is often debated whether by using the double-triode valve as a combined C.O. and F.D. is more preferable to the tritet oscillator when using ordinary type crystals.

The crystal must never be allowed to become warm as it will not only crack in time, but the frequency will vary and the drive decrease.

QUERIES

Answers to any problem relating to short-wave radio are offered free to our readers.

All enquiries must be sent with the coupon cut from page 40 and addressed to "The Editor, The Short-Wave Magazine, 84-86 Tabernacle Street, London, E.C.2." A stamped addressed envelope must accompany all correspondence.

Energising the Aerial

Some Practical Feeder Systems and their Applications

By AUSTIN FORSYTH (G6FO)

PART II.

This feeder system has long been a favourite and it has considerable utility and advantages, chief of which is the fact that the aerial can be harmonically operated whether it is fed at the centre or one end. See *Figs.* 5 and 5A.

● Zepp-Fed Hertz

The point to grasp about the Zepp system is that the two feeder arms are resonant and tunable. Types of feeder so far dealt with have all been non-resonant and this has been an essential factor in their operation. The Zepp differs by reason of the fact that while the feeders do resonate they do not

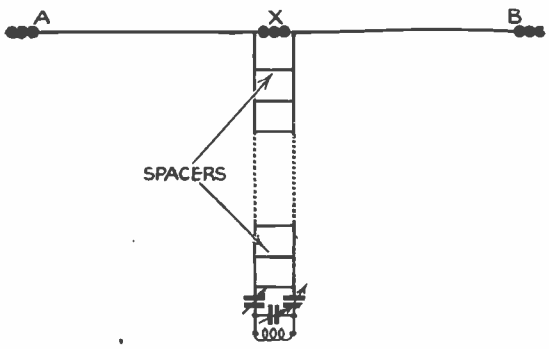


FIG. 5.

Current-Fed Zepp.

(in the perfect case) radiate, and this is achieved by what can be described as a trick in construction. For a Zepp feeder system is only a Hertz aerial bent back on itself, and it is this bending back effect which renders the line as a whole non-radiating, since the electrical length is so adjusted by tuning that the radiation off one arm is cancelled by the equal and opposite effect of the other. The easiest way to see this is to think of a half-wave wire suspended in space. It is radiating. Now, bend it into a U-shape about the middle with the two arms only a few inches apart, just as is shown in *Fig.* 5. Under these conditions, the radiation from one quarter-wave arm is cancelled by the other, hence the system draws power but does not radiate it, thereby providing a transmission line to carry energy from the transmitter to a suitably connected aerial.

Coming back to the question of impedance matching, it will be evident that it is still necessary to attach the feeders to the roof in such a way that the latter is correctly excited on the working frequency. In the case of the Zepp, there are two different points at which this is possible—at the centre or either of the two ends. Due to the fact that the impedance is a minimum at the centre of any half-wave wire, RF current is a maximum, and so if the Zepp feeders are attached to the centre, the system is called "current-fed with Zepp feeders," or, shortly, "current-fed Zepp."

For harmonic operation, a different set of conditions exist, because as soon as the roof is made

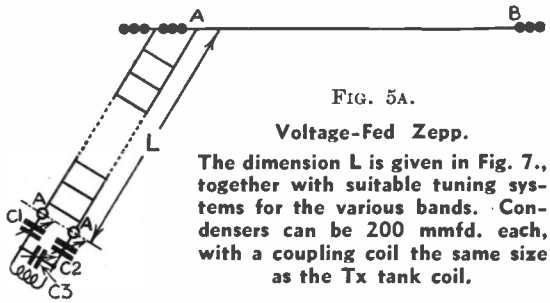


FIG. 5A.

Voltage-Fed Zepp.

The dimension L is given in Fig. 7., together with suitable tuning systems for the various bands. Condensers can be 200 mmfd. each, with a coupling coil the same size as the Tx tank coil.

full-wave or double-wave for second and fourth harmonic working respectively, the point of maximum current is no longer at the middle, but off centre, maximum *voltage* now coming at X in *Fig.* 5 in both cases. The current-fed Zepp as such is therefore virtually a one-band system, as in the case of all aerials fed at or near the centre. But with the Zepp there is this important difference—the feeders work the same way under either current or voltage feed conditions, so that when operating on harmonics it is only a matter of tuning the feeders differently to conform to the change of impedance at X, because, as has been said, Zepp feeders can be matched in whether the impedance termination at the aerial is high or low.

Actually, therefore, the aerial AB in *Fig.* 5, if cut for 7 mc., would be half-wave current-fed on that band, full-wave voltage-fed with two half-waves back-to-back on 14 mc., and double-wave voltage-fed with two full waves back-to-back on 28 mc.

There is, however, not much advantage in operating the system in this way, unless it is difficult to get a feeder connection at either end due to site considerations. A Zepp gives the best results if the point of maximum current on the feeders can

be kept at the centre of the coupling coil (*Fig.* 5A), since then losses due to having the resonant feeders in the transmitting room are at a minimum. With centre-fed Zepps working at voltage on harmonics, this cannot always be arranged, and so operation may not be at best efficiency; moreover, the radiation pattern (polar diagram) is considerably affected by centre-feeding.

With a properly designed end-fed system, no such difficulties occur, so that the arrangement shown in *Fig.* 5A is preferable. This is described as a voltage-fed Zepp, because the feeder termination is at a point of maximum voltage (high impedance). If it is understood that in any aerial there is always maximum voltage at one end—and in the Hertz always at both—it is evident that the feeders can be attached to whichever end of the roof AB that is most convenient, while the tuning of the feeders must always be such as to produce a point of maximum voltage at X in *Fig.* 5A.

In view of the fact that the feeders are resonant and tunable, and have been likened to a U-shaped Hertz, it is obvious that some finite length is involved for them. Further, as some means of coupling is required at the transmitter end, and the feeder system has to be tuned, the effect of this

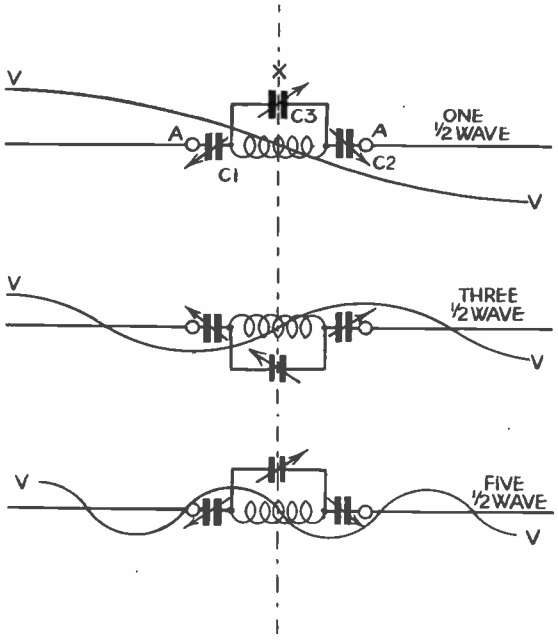


FIG. 6.

Showing Zepp feeders "opened out" with wave-form to give voltage feed. The distance VX in each case corresponds to the dimension L in Fig. 5A. Suitable values for L and tuning systems required are given by the table Fig. 7. Note that in each case the point of maximum current comes at the centre of the coupling coil. The position of the current indicators A.A. in relation to the points of maximum current is also shown to change as the tuning system is varied, as explained in the text, thus causing different readings on different bands.

added inductance and capacity must be allowed for when designing to suit any particular set of conditions.

All this sounds very complicated, but is actually quite simple if it is understood that the wave-form on the feeders must be symmetrical about the centre of the coupling coil. In other words, if the feeder system was opened out flat, the wave-form produced by the tuning arrangement should appear balanced about the middle. The sketches in *Fig.* 6 illustrate this. There is always maximum current at the centre X and maximum voltage at the two ends V, while the length VX in any of the three diagrams is equal to L in *Fig.* 5A. Note that the only way to get the desired symmetry is to tune the feeders to ½-wave, three ½-wave and five ½-wave, considered in relation to the frequency-band being used. Putting it another way, 30 feet feeders would be tuned ½-wave for 7 mc, 3 ½-wave on 14 mc. and 5 ½-wave on 28 mc.

Whether series or parallel tuning is required depends on the band used and the length of the feeders in relation to the frequency, while the feeder lengths must be chosen such that good definition of the wave-form is possible at the frequencies employed. For instance, feeders 8 feet long, which

Length of each wire in feet. (L in Fig. 5A.)	Tuning System. 3.5	7	14	28 Mc.
60 (5)	S	P	P	S/P
40 (3)	P	S	P	P
30 (2)	—	S	P	S/P
15 (1)	—	P	S	P
8 (½)	—	—	P	S

FIG. 7.

Lengths are not critical. Figures in brackets give allowable tolerances plus or minus. S indicates "series tuning," P "parallel," S/P series or parallel. Space shows feeder length unsuitable for that particular band.

are suitable for 28 mc. and fairly good on 14 mc., would be quite useless on 3.5 mc. owing to the enormous amount of added capacity and inductance which would be required to load up 16 feet of wire (the two 2 feet arms) to be half-wave on 3.5 mc. The 30 feet feeder length already quoted is in itself too short for half-wave tuning on 7 mc. (the two arms add up to 60 feet only) but this is adjusted electrically by the addition of the coupling coil, and to permit exact resonating, condensers are used in series to make the feeder length equal to 66 feet electrically; the coupling coil also serves to draw power into the system from the transmitter tank.

The choice of feeder length and tuning system is simplified by reference to *Fig.* 7, which shows the usually accepted values for Zepp feeders, and applies equally to current or voltage feed. These figures are not critical to a foot or two either way, as tuning will take up small variations.

The feeder length, calculated from the aerial to the series condensers, should be within reason made of secondary importance to the height and disposition of the aerial proper. If the required feeder length is found to come between the suggested values, the greater of the two should be used and the spare section looped up in the transmitting room or taken up outside by staying. The feeder wires should be about 6 inches apart, of exactly equal length, and the spacers (which can be as described for the Y-matched aerial) kept sufficiently close to one another—two feet is ample if everything is kept taut—to prevent independent movement of the wires.

The arrangement of Zepp feeders is rather more important than in the case of non-resonant transmission lines, because if voltage loops happen to come too near wall-piping, a wet-roof or similar conducting surfaces, losses are likely to be high. To be on the safe side, the feeleds should be run not less than 3 feet away from any earthed object. If they can be taken off the roof at an obtuse angle, as shown in *Fig.* 5A, so much the better.

The tuning at the transmitter end is quite simple; the object of the adjustments is to get equal current readings at the points A,A, in the feeder arms. Note that these readings, while they should be equal, will not necessarily be high or the same for all bands on which the aerial may be used, because it is possible that with a particular tuning arrangement and feeder length, A,A, will be nearer points of maximum voltage than maximum current. In other words, because a high reading is obtained on 7 mc., it does not necessarily follow that the same value should occur on 14 mc., nor does it mean that radiation is not so effective on 14 mc. if a lower reading results on that band.

As in the case of all output arrangements, tuning should be to exact resonance with coupling as loose as possible consistent with a good transfer from PA tank to load. A neat way of arranging the coupling circuit is to have a separate feeder tuning panel, with the coil L link-coupled to the PA tank. Condensers C1, C2, C3, are mounted such that the two series condensers can be shorted out for parallel tuning and the parallel condenser cut out entirely when series operation is required. SPST switches on porcelain are very suitable for this. There are various points to watch in connection with the aerial ammeter. It is of course best to have a pair of thermo-couple instruments for the purpose, reading 0-1.5 amps., but one can be used if switching is arranged so that it can be changed over from one feeder to the other. Hot-wire ammeters are unreliable, as few pairs read the same on equal currents even if they are by the same manufacturer, so here again it is better to use one only (though for a different reason!) and switch it from one arm to the other. A third and quite practicable method of checking feeder current is by means of a pair of flash-lamp bulbs at A,A. These should be matched visually on a dry battery beforehand (this can also be done easily on a home-made photometer) as the manufacturing tolerances are wide and a pair bought at random probably will not match. If the current obtained is too high for ½-amp. bulbs, motor side-lamp bulbs can be used in the same way. Whatever type of indicator is used at A,A, except a thermo-couple RF ammeter, it should be shorted out for actual transmission.

If it is found difficult to balance the feeders, particularly with parallel tuning, the roof length is probably not correct for the operating frequency, but owing to the fact that one arm of the feeder system, sometimes called the "neutralising arm," is free and unloaded, a certain amount of assymmetry is inevitable and unequal feeder currents with parallel tuning are the rule rather than the exception, particularly with short feeders, while it also happens that the roof length of a Zepp aerial is very much less critical for the operating frequency than any other type of Hertz, i.e., the roof is not likely to be at fault if unequal feeder currents are encountered.

Conversely, if the feeders are balanced with series tuning, it does not necessarily mean that the system as a whole is balanced. The point to look for here is whether approximately the same amount of capacity is present in each of the two series condensers, this being the correct setting for them. If it is found that equal currents are only obtainable with one condenser nearly all in and the other well towards minimum, either the roof length is much out for the transmitting frequency, or the feeders are passing too close to earthed objects—assuming of course that they are of equal length and otherwise properly constructed, and that the feeder tuning panel is symmetrical.

It should be said here that it is in practice almost impossible to ensure absolute non-radiation off the feeders, but in a reasonably good installation it should not be more than 10% of the radiation off the aerial proper. The feeders can be checked for this by disconnecting the roof and then noting, in co-operation with a station local for the band in use, whether radiation is present. This is a rough method only; on the HF bands, a field strength meter would give a more useful indication.

While the Zepp is not perhaps as efficient as the properly adjusted single-wire aerial and is not as easily built, it has the advantages of good over-all performance, greater tolerance as regards dimensions and ready adaptability for working above the fundamental, while operation is fully under control at the station end and meter readings mean something.

ERRATUM

July, p. 30.—*"FREQUENCY METER MONITOR."*

In the front panel drawing the dimension between the ⅜-in. diameter hole and that of ¾-in. diameter immediately above should be 17/32 in., and not as given.

July, p. 34.—*"ENERGISING THE AERIAL."*

The three lines immediately below the second formula should read: "giving a length of 69.0 feet. On 7 mc. this aerial resonates at 6,779 kc., or 271 kc. below the crystal frequency."

CRYSTAL GRINDING FOR AMATEURS

By PAUL STEIN (G8NV)

THE COMMERCIAL process of crystal grinding is not very far advanced, so far, only one firm has been able to produce a crystal for 56 megacycles. The advantages of grinding your own crystal are many: firstly, one may begin with a crystal on a certain frequency and then, if not satisfied with this frequency, the crystal can be ground again. Secondly, if a set of crystals is used which can be switched in and out at will QRM will be more easily avoided. There is thus a large field for experimenters.

Before the crystal can be used in a transmitter it is necessary to obtain a Calibration Certificate. The R.S.G.B.'s Calibration Service will do this for the modest sum of 1s. 6d. per crystal. The G.P.O. will, of course, accept this certificate providing the frequency is within the stated amateur band.

● Obtaining the Quartz

The local oculist will probably have a few so-called "pebble" lenses, which he will most likely call perpendicular-cut; these, however, are the same as X-cut crystals, and should be very efficient. Many firms will sell ready-cut discs or squares of quartz, and these will also serve for grinding down.

To calculate the thickness of the crystal required, the following formulæ are useful:

For X-cut, perpendicular or Curie cut crystals:

The thickness in thousandths of an inch multiplied by the frequency in megacycles = 112.6.

For Y-cut or parallel-cut crystals:

The thickness in thousandths of an inch multiplied by the frequency in megacycles = 77.0.

e.g., The thickness of a crystal for 3.5 mcs. using an X-cut plate $= \frac{112.6}{3.5} = 32.17$ thousandths of an inch.

● Requirements

It is best to begin with a crystal for the 1.7 mcs. band. A micrometer, reading to one ten-thousandth part of an inch, should be used for all measurements. This should be padded as any sharp pressure on the crystal will crack it. Crystals for any frequency higher than 3.5 mcs. should be very carefully ground, with constant checking with the micrometer for bumps or recesses.

One can usually get the crystal ground to a few thousandths of an inch thicker than the required thickness by the oculist or manufacturer, but if this is not possible a piece of thick plate glass should have a fine grade of carborundum sprinkled over it, and then a little paraffin added. The crystal is then rubbed round on this plate until the thickness is very near that required. After this the crystal should be ground very carefully indeed, with constant checking in an oscillator to make sure it is oscillating freely.

The above grinding may be done mechanically, and there are many methods by which this may be carried out. The crystal can be placed in a special chuck, this consisting of a small plate of brass with a shaft attached so that it may be held in a drill; the plate is recessed similar in shape to the back plate of a single button microphone and should be slightly greater in diameter or width than the crystal and about 10-thousandths of an inch shallower than the thickness of the finished crystal. The crystal is then placed in the chuck and the space between the crystal and the edge of the recess filled with plasticine or a similar substance. The method is as follows: place the chuck with crystal in a bench drill and lower it on to the plate of flat glass prepared with carborundum and paraffin. The glass should be moved about during grinding so as not to wear out any one part. Checks should, of course, be made frequently during the process.

● Measuring

As an example: for a 3.5 mc. crystal, grind to about 44-thousandths of an inch and check carefully for perfect evenness with the micrometer. The crystal is now placed in a valve oscillator, which must be carefully screened, and a screened lead taken from this to a carefully screened receiver in order to listen for any spurious oscillations. If any are found, re-check for recesses or bumps and grind them out. Finish by grinding to 32.17-thousandths of an inch by hand on a new plate with the finest grade of carborundum and water as the grinding mixture. Finally, polish with cotton wool dipped in carborundum powder.

For grinding to 7 mc. one should obtain a 3.5 mc. crystal and grind this *by hand* to the required thickness. The reason for not using mechanical grinding is that the crystal is so thin that errors could not be corrected without risk to the crystal. Greater care should be taken on higher frequencies to see that there are no spurious oscillations, as these would weaken the output from the crystal

● Summary

(1) Never use the same patch of glass on grinding plate, but move the crystal about on it.

(2) Check constantly for recesses and bumps, these must be eliminated or the crystal will fail to oscillate.

(3) Check constantly in the test oscillator.

Success is easily obtained on the 1.7 and 3.5 mc. bands but on 7 mc. difficulty is to be expected.

THE POWER SUPPLY

Points for the Transmitter and Ideas for the Beginner

By A. J. DEVON

OF THE THREE sources of transmitter power which may be available—batteries, D.C. mains or an A.C. supply—the latter is the most usual and, be it said, the most convenient. In fact, in considering the question of power, the amateur who is connected to company's A.C. can regard himself as being in a fortunate position, as all who have had experience of the various systems will confirm.

While it is the purpose of this article to deal with the type of A.C. operated HT supply unit the beginner will find most useful, the other methods deserve some attention, as there are one or two points in connection with the use of batteries and operation from D.C. mains which are worth mentioning.

There is also a fourth but now little-used and almost forgotten means of obtaining transmitter HT, and that is (or was) the hand-generator. Of the older school of amateurs, many did very well with these machines, which one actually worked by hand while operating the key at the same time! In those days, when self-excited oscillators were in vogue, it meant steady turning to keep the signal stable, as variations in speed—the generator was a geared arrangement giving perhaps 30 watts maximum output at 600 volts—caused both creep and chirp, while the labour of turning was considerable due to the high gear-ratio. 'Phone working was very difficult—one could hear the operator panting as he turned the handle—though one ingenious soul rigged up a treadle affair with a flywheel, which gave surprisingly good results. So much for history!

● Battery Operation

Where there are no mains, low-power working from batteries, either triple-capacity dry or HT accumulator, is quite possible and in country districts there are still those who must use this type of supply. Where dry batteries are employed, they should be kept in a cool, dry place (even if it means running long leads) and the blocks making up the bank insulated from one another and the ground. This is more important than it appears, because a fairly high voltage unit, say 450 volts, simply lying on the ground very often shows a measurable leakage current, which increases in damp weather. This is due among other things to deterioration of the cardboard bottoms of the blocks, never very thick even in expensive batteries. They should therefore be stacked up off the ground such that there is ample clearance between them; the simplest way of doing this is to use marine-type or "reel" insulators, which lie flat.

If no meter is available, earth leakages can often be detected by the fact that one gets mysterious and apparently inexplicable shocks from the apparatus when it is supposed to be switched off. It is worth noting here—as an example of how much power can be wasted—that at one battery-operated station the earth leakage in wet weather was found to be nearly 10 ma. on a 500-volt supply.

Another point in connection with battery working is that if the unit is tapped for the supply of receiver or oscillator-doubler stages, the blocks should be changed round periodically so that the loading is more or less equal. This prevents one battery going dead before the others, thereby introducing a high resistance link in the chain.

● Accumulator Supply

In using HT accumulators, the same safeguards are called for as regards insulation, and it is as well to make sure that the charging—if it is not done at home—is properly carried out at the service station. The writer, visiting a strange garage on one occasion, found HT accumulators (somebody else's) on charge at three amps! At another, the 10-volt blocks of a 240-volt assembly were paralleled and the charge-rate adjusted to ¼-amp. which, while it was a step in the right direction, meant that . . . . well, work it out!

A third method of getting battery power is the well-known Milnes unit, where all the charging can be done in the station if a low-voltage D.C. supply is available. The disadvantage of this type of battery is the rather high first cost, but Milnes units when used correctly are probably the best answer to the problem of battery working. For those who may not know, they consist of nickel-iron cells—therefore practically indestructible—made up in standard voltages, and the charging is done from a 6-volt LT accumulator simply by paralleling the cells, switching being arranged for the purpose. That this method of charging is possible is due to the fact that the voltage of a Ni-Fe cell is 1.5.

● D.C. Mains Supply

The standard pressure is 230 volts, and for low-power work with simple gear, D.C. mains are ideal, for the obvious reason that one need never worry

about the milliamps, which are an ever-present anxiety with batteries. Smoothing is, however, very necessary and there are various precautions which must be taken. The most important one is that the gear should always be earthed through a large condenser, 4 mfd. or more, in case either the positive side of the mains is at ground potential or the supply leads become crossed accidentally. The best way to ensure that mistakes do not happen is to run the earth lead to one side of the condenser, fixed somewhere well out of reach, the other side going to a large terminal or bus-bar, conveniently placed, to which all earth connections are taken.

Fig. 1 shows the arrangement of a D.C. mains filter, delivering a hum- and ripple-free PDC supply and preventing RF feed-back from the transmitter into the mains.

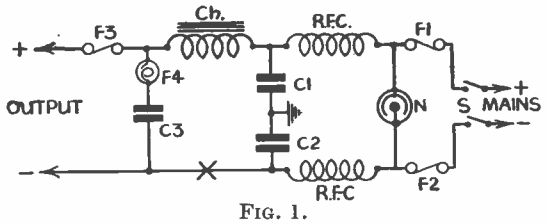


FIG. 1.

D.C. POWER SUPPLY PARTS.

S—DPST main switch. Bulgin S.126.

F1, F2—Mains fuse. Bulgin F.14.

N—230v. Neon pilot.

RFC—Mains RF chokes. Bulgin H.F. 17 (two).

C1, C2—2 mfd. 250v. DC working or Bulgin unit A.30.

C3—8 mfd. electrolytic. Dubilier type 02S1 or T.C.C. type 902.

Ch—150 ma. 20-henry smoothing choke. Epoch E1031.

F3—150 ma. fuse. Bulgin F.17/R.

F4—60 ma. fuse. Bulgin F.5/B.206.

X—Try choke Ch. in this lead, as best results depend upon which side of mains is earthed.

NOTE.—Suitable components are specified above, but similar items of good quality will give satisfactory performance.

Two further points. The polarity of the supply is easily determined by dipping leads connected to the mains in a glass of water. The side which gasses freely is negative. A precaution to take for this test is to put a house-lamp in series in case the bare wires touch in the water, while the gassing effect can be stimulated by adding a little accumulator acid.

The other point is in connection with the three-wire system of D.C. supply. In this, the potential across the two outers is 460 volts, the third wire—the neutral—being earthed, so that there is 230 volts between each outer and the neutral. The house-lighting may be connected to one half and the heating to the other or, even if it is all on one leg, the third wire *may* have been brought in as far as the main switch. Anyway, it is well worth getting under the stairs with a test-lamp because if all three wires are there, an almost perfect 460-volt supply immediately becomes available for the transmitter.

Before leaving D.C., it should also be remembered that it is possible to boost up the voltage by putting HT accumulators in series with the mains, and the charging of the latter becomes a very simple matter.

● A.C. Units

The requirements of most readers will fall under this head and the design and construction of a suitable unit will be dealt with in detail.

Though, as has been said, good work can be done with a comparatively low-voltage supply, if a power unit is to be installed for transmission, it is as well to put in one giving 500 volts at about 150 ma. The reason for this is that transformers and other apparatus up to this rating are in general use and are therefore standardised, which means that they are reasonably priced and easily obtainable. Supplies above 500 volts come into the "special" category, with a consequent sharp rise in cost. Even if the power required initially is only 25 watts or so, a 75-watt unit will take care of future requirements, thereby saving expense on the HT side till really high voltage becomes necessary.

Advertisers in this paper offer transformers of the rating suggested, and it is wise to select one having as many LT windings as possible, as they are always useful, even if not required at first.

A complete wiring diagram of a suitable unit is shown in *Fig.* 2. Note that, as in *Fig.* 1, an RF filter is incorporated, as with certain transmitter arrangements and types of aerial coupling, there is a tendency for RF to get back to the power supply and so into the mains, causing unnecessary and avoidable BCL interference. The condensers C1, C2 and RF chokes are as described under *Fig.* 1, or the latter can be home-made by winding a paxolin tube 3 inches long by 2 inches in diameter full of No. 26. DCC, with 0.5 mfd. condensers at C1, C2. The main switch S1 should be conveniently placed on the bench so that it can be reached quickly if fireworks suddenly start; the neon pilot N, showing whether the gear is live, should be mounted such that it can be easily seen. The valve V is a full-wave rectifier and various makes are suggested under the diagram. Note that these are all indirectly-heated or are of the type having slow-heating filaments. This is an important point, as it prevents high surge voltages due to switching; some of the cheaper rectifiers, particularly those of continental make, have quick-acting cathode elements. If such a rectifier is used,

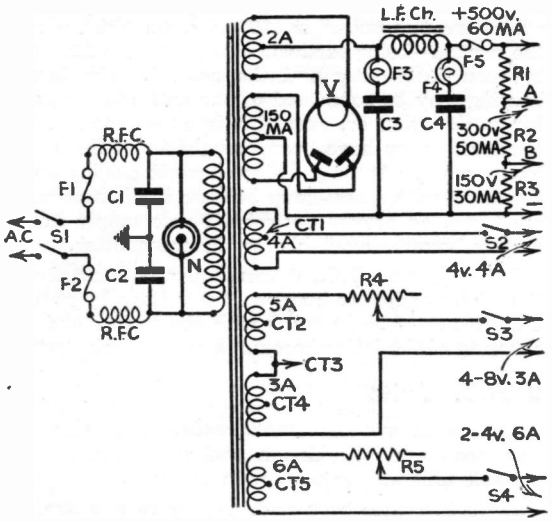


FIG. 2.

A.C. SUPPLY COMPONENTS.

V—Full wave rectifier. Mazda UU120/500, Mullard I.W.4, Hivac UU 120/500, "362" R.B.120/500, Tungsram PV 4201.

S1—DPST mains switch. Bulgin S.126.

F1, F2—Mains fuses. Bulgin F.14.

F3, F4, F5—See text, and under *Fig.* 1 for suitable types.

RFC—See text, or as under *Fig.* 1.

C1, C2—0.5 mfd. 250v. DC working, or Bulgin unit A.21.

N—230v. Neon pilot.

C3-C4—4 mfd. 600v. D.C. working. Epoch E1136.

Ch—150 ma. 20-henry smoothing choke. Epoch E1031.

R1—2,000 ohms 20-watt resistor. Bulgin P.R.7.

R2—4,000 ohms 10-watt resistor. Bulgin A.R.1K (four).

R3—30,000 ohms 5-watt resistor. Dubilier "Spirohm."

R4, R5—See text.

S2, S3, S4—SPST toggle switches. Bulgin S.80.

CT1, CT3, CT5 should be earthed when their respective windings are not in use. If two windings are joined to provide extra LT voltage, as shown, note that CT2 and CT4, the centre-taps of the two individual windings, must at all times be left free as there is a p.d. between them.

NOTE.—Suitable components are specified above, but similar items of good quality will give satisfactory performance.

the fuse F3 will blow when switching on, as the input condenser C3 would charge up suddenly.

The function of the fuses F3, F4 and F5 is partly to save the unit in the case of a condenser breakdown or external short, and partly to give an indication of, and protection from, RF feed-back from the transmitter. F3 and F4 should therefore be of the 60 ma. bulb type, and F5 can either be a 200 ma. bulb or a cartridge fuse. This fusing gives complete protection of the HT supply, and is therefore well worth incorporating.

The point about RF feed-back is interesting; under some conditions—particularly when any type of single-wire aerial feed is used—various adjustments of the coupling network will cause the RF return to find an easy earth path through the power supply to the mains, and this can happen even if good RF chokes are used in the positive feed leads. The reasons are a variety of coupling and capacity effects which depend on the lay-out of the transmitter and the disposition of the supply leads, and RF feed-back is very prone to occur where a long transmitter earth is necessary.

The result is that a sudden surge of RF energy pushes its way through C4, and even with quite low power can amount momentarily to several amps. This weakens, if it does not destroy, the smoothing condenser, leading at first to insufficient smoothing and finally to complete breakdown. Hence the fuse F4, which covers the power pack in the event of normal failure and also shows visually the presence of feed-back, though it should be said here that a 60 ma. bulb will only give a single bright flash before expiring.

Readers operating transmitting apparatus and having continual trouble with smoothing condenser failures should investigate this point, as the insertion of a bulb at F4 may explain the reason. Ordinary smoothing condensers are not designed to carry several amps. of RF!

The resistance network R1, R2, R3 has been calculated to give the outputs shown in the diagram under load conditions. These are convenient values for normal working and assume good regulation, but it should be noted that the voltage at taps A and B will be affected by varying loads at these points. The total resistance R1, R2, R3 forms a bleeder passing a steady 10-15 ma. to keep the voltage constant under CW conditions. If the transmitter or other load to be put on the power pack already includes voltage-dropping resistors, or if for any reason the taps A and B are not required, R1, R2, R3 can be replaced by a single 40,000-ohm 10-watt resistor, which will be passing about 12 ma. and dissipating 6 watts continuously.

As shown in *Fig.* 2 the power transformer has five LT windings—leaving four for feeding the transmitter, and assumed to be the usual 2-0-2 volts. If 6 or 8 volt supplies are required, two windings can be put in "series." This is done quite simply by taking the two ends of one winding and testing

them in turn against one side of the winding next adjacent. The right way round will be shown by a reading of anything up to 10 volts across the two outers. In phase opposition—the wrong way—the voltage will be practically nil. The current load on two such windings in "series" must not, of course, exceed the rated capacity of the lowest of the two.

The rheostats R4 and R5 will depend upon the output required, but maximum values of 5 ohms, with a current-carrying capacity up to 5 amps. or so, will be ample. Such items can usually be obtained for a few pence from junk shops, while those who ever used bright-emitter valves should have some on hand!

As regards the lay-out and construction of the power unit, the best thing to do it to mount all the parts on a varnished board about 9 inches by 12 inches, such that there is ample ventilation for the rectifier and resistors. A small panel 6 inches by 6 inches carries the output terminals, control rheostats, and heater circuit switches S2, S3, S4, while if an AC ammeter is available, it can also be mounted on this panel and arranged for switching into the LT circuit required. Note, however, that it is better to adjust the rheostats by connecting a good voltmeter across the valve socket, as the ordinary moving-iron type of AC ammeter is usually somewhat unreliable.

After completion and testing, the power pack can be placed under the bench out of the way, and it is advisable to provide it with an earthed sheet-metal cover, with plenty of ventilation holes, which will minimise the effect of dust, prevent the possibility of shocks (or shorts due to tools falling in!) and also restrict the field from the apparatus. Much hum trouble can be obviated by this simple means. A further point to watch in this connection is that of earthing the centre-taps of the LT windings not loaded. These centre-taps should not be otherwise used, as it is always more satisfactory to centre-tap at the valve socket in the usual way.

Finally, if long LT leads are necessary, use heavy cable, as the voltage drop in a few feet of light flex carrying several amps. is quite considerable.

G2NO COMES SOUTH.

On the back page of our cover will be found an announcement of especial interest to London and southern readers. Mr. H. R. Adams (G2NO), lately with Eves Radio, is now associated with G2CY and G6VA at Webbs Radio Stores in Soho Street, W.1. An entensive range of receiving and transmitting gear, American and English, is now available as well as the complete Eddystone range. Readers who visit the premises are assured of attention by one of the three amateurs mentioned. Soho Street is adjacent to Tottenham Court Road Tube Station.

HIGHER EFFICIENCY IN BAND SPREADING

By E. H. JONES (B.R.S. 770)

THE CONVENTIONAL method of band spreading, as most readers will be aware, consists of using a very small variable condenser, usually of the order of 30-40 mmfd. capacity as band spreader in parallel with a much larger one—usually .0002 to .0003 mfd. capacity—as band-setter (*Fig.* 1). This scheme has several good points, probably the chief of which are that, with a given coil, a large frequency range may be covered by setting the larger condenser at various points and tuning on the band spreader, and also that, by the use of a high total capacity across the coil, and varying only a small fraction of this for tuning purposes, a high degree of stability is obtained, making the receiver less susceptible to tuning variations due to the aerial swinging, and to "pulling" between grid and reaction circuits, than if only a small capacity were used. This scheme however has a big fault in that as the capacity of the band-setting condenser is increased, the efficiency of the circuit falls off rapidly. This is explained as follows. The impedance of a tuned circuit to an alternating voltage across it of the same frequency as the resonant frequency of the circuit is obtained from the ratio L/CR where

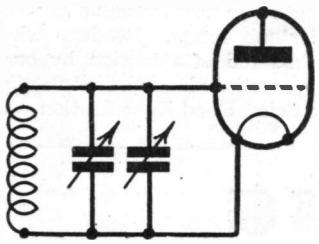


Fig. 1.

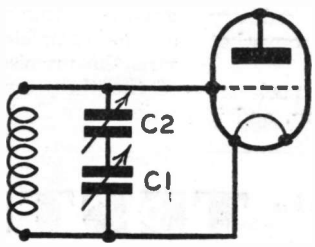


Fig. 2.

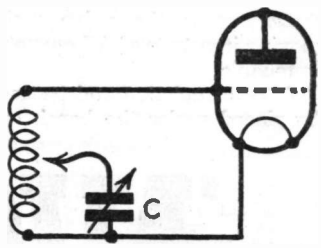


Fig. 3.

L = inductance of circuit (supplied chiefly by the coil).

C = capacitance of circuit (supplied chiefly by condensers).

R = resistance of circuit.

Hence if C becomes relatively large, as it does when the band-set condenser increases in capacity, the ratio L/CR decreases. This lower impedance between grid and filament of the detector means that the voltage developed across the grid and filament by incoming signals will also be small and hence signal strengths will be low. Thus, in order to obtain maximum efficiency the ratio L/CR must be kept high. This can be achieved by making L as large as possible by using as large a coil as is practicable and by making C and R as small as possible by using small tuning condensers and low self-capacity coils, and by using thick wire. The two types of band-spreading used by the writer are illustrated in *Figs.* 2 and 3.

In the former the condenser C2 is of very small capacity whilst C1 may be of almost any value up to .0005 mfd. The method of operation is to use C2 as band-set condenser and then to use C1 alone for tuning. In the other method (*Fig.* 3) the condenser C may be conveniently of .0002 to .0003 mfd. capacity; this method however limits the frequency range covered, but is quite useful when the method of *Fig.* 2 will not quite tune to a sufficiently high frequency, since with a given coil it is usually possible to tune to a lower wavelength with the arrangement of *Fig.* 3. Considering the impedance of the latter circuit, it is equivalent to the arrangement of *Fig.* 4. The impedance Z2 of the tapped portion plus condenser is low, but that (Z1) of the remainder of the circuit is high, due to its low capacity which is only that of the coil itself, and since the two are in series, the total Z1 + Z2 is high and hence the efficiency is good.

The actual tuning arrangements used by the writer in a straight detector and pentode circuit are shown in *Fig.* 5.

C1 is the main tuning condenser, of .0002 to .0003 mfd. capacity, L1 the grid coil, L2C3 the usual reaction circuit and C2 a special low capacity condenser (described later). Both C1 and C2 are fitted with a flexible connection and crocodile clip at D and E respectively, which permits of both the arrangements of *Figs.* 2 and 3 being used at will; the former by clipping D on to A and E on to B, and the latter by clipping D on to the coil near the earthed end, leaving B, E and A unconnected.

The small condenser C2, shown in *Fig.* 6 consists of one moving plate and two fixed ones, the former having on each side a piece of thin mica attached by means of shellac varnish, the spacing between the fixed plates being only just sufficient to permit the moving plates to pass between. The plates themselves are just simply old semi-circular condenser plates cut down to half, but, if desired, larger plates may be used. The object of using the mica is to obtain a sufficiently high maximum capacity without using a lot of metal, in order to keep the minimum capacity very low. Using this arrangement (connected as *Fig.* 2) the writer has been able to use a tuning condenser (C1) of as high as .0005 mfd. capacity on the ten-metre band with excellent results, the band being spread over 170 degrees on the dial, and the received signal strengths considerably higher than when using a .0001 mfd. tuning condenser with parallel band-spread condenser in the usual way. In order to get the best out of this scheme the coils have to be carefully made, and it is advisable to make them a little too large at first, and reduce them until the desired waveband is covered.

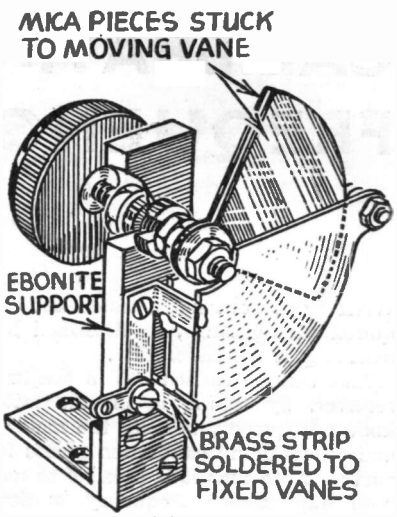


Fig. 6.

Those used by the writer on the amateur bands are as follows:— The ten-metre coil consists of four turns of No. 21 D.S.C. on a valve-base former 1.3 inch in diameter, the turns being spaced 1/10 inch and the aerial tapped direct on to the coil 1½ turns from the earthed end, with four turns reaction winding.

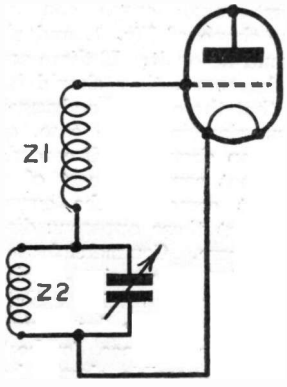


Fig. 4.

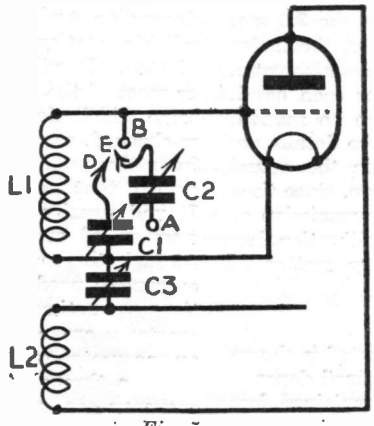


Fig. 5.

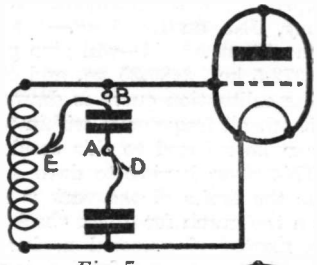


Fig. 7.

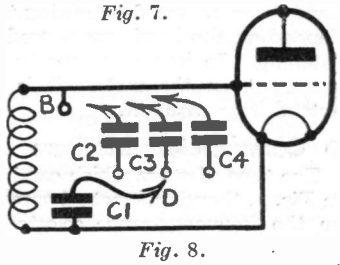


Fig. 8.

The twenty-metre coil has seven turns of No. 18 tinned copper wire on a ribbed ebonite former of outside diameter (rib to rib) of three inches, the turns being spaced 0.4 inch in shallow saw cuts, with reaction winding of five turns No. 21 D.S.C. wound in one saw cut. The aerial in this case is tapped on three turns from the grid end of the coil, and on both ten and twenty metres the arrangement of *Fig.* 2 is used. On forty metres thirteen turns of No. 18 bare tinned wire are used, on a paxolin tube three inches in diameter, tapped at the middle, the turns being spaced one quarter inch. In this case the circuit is that of *Fig.* 7, both the aerial and the connection E being clipped on to the centre tap of the coil. In this case the reaction winding consists of six turns of No. 21 D.S.C. closely wound. On the eighty-metre band the arrangement of *Fig.* 3 is used, the small condenser being disconnected, whilst on the top band the whole of the .0002 mfd. condenser is used across the coil, the connection D being clipped on to B (see *Fig.* 5).

The tuning procedure is to set C1 at maximum capacity and vary C2 until the low-frequency edge of the required waveband is reached, when C2 is left set and C1 used for tuning purposes, as it should then cover the desired waveband. If, however, after the above procedure, C1 does not reach the high-frequency edge of the band when in the minimum capacity position, either the clip E must be removed from B and tapped down the coil until the band is covered or the self-capacity of the coil must be reduced by spacing the turns more, or else wire must be taken off.

Should it be required to avoid altering C2 each time a different waveband is used, the arrangement

(*Continued on page* 34).

CALIBRATING AND USING THE FREQUENCY METER-MONITOR

By A. J. DEVON

WITH THE METER built, tested and covering the required tuning range, as described last month, the next step is the calibration.

This can be carried out in conjunction with the receiver, by tuning in on the latter stations of known frequency, beating the meter against them, and so obtaining calibration points for plotting the curve. Note that it is possible to use for this purpose *any* known frequency station which falls within the meter tuning range; since the instrument operates on the harmonic principle, it follows that, say, JNJ on 13945 kc.—the "marker station" for the 14 mc. band—will give points corresponding to 6972.5 kc., 3486.25 kc. and 1743.125 kc., so that if the calibration curve is drawn to cover the 3.5 mc. band, all frequencies within the range of the meter can be referred to this band by simple arithmetic. This saves having to draw a curve for each band, as the limits of the various ranges can be marked on the graph for quick checking. These details are a matter of personal preference, as is the actual band to be chosen for drawing the curve, since they depend on the bands most used for transmission or listening. In any case, once a full calibration has been put on the meter, it is an easy matter to extend it as required.

● Commercial Markers

The type of curve which can be expected is shown in *Fig.* 1, though the actual spread obtained depends on the frequency-range selected, as explained last month. If the full range L to H is used, there will be a large number of commercial stations available for calibration purposes, as the 1.7 mc. band overlaps so much commercial territory; this can be seen in the diagram *Fig.* 1 on p. 28 of the July issue, which gives the bands in their frequency relationship. The range M-J, while obviously not covering as many commercial stations, will yet bring in a sufficient number to enable a good curve to be made.

For the accurate drawing of the curve, as many points as possible are required, and the best stations to use are the commercials of known frequency listed in the first few pages of the latest Amateur Call Book Magazine. Crystal-controlled amateur stations whose frequencies are obtainable will also give points in the various bands, while the W9XAN-W6XK standard frequency transmissions, which are made in the amateur bands for calibration purposes, are a further help. Their schedule is published monthly in "QST," and convenient times and frequencies for August are given on page 34.

The method of using the frequency meter with the receiver is to tune in a station on the latter and then adjust to zero-beat or silent point; heterodyne the meter with the receiver, likewise tuning the meter beat-note to silent point. Receiver and meter are then set on the same frequency, say WEM on 7400 kc., giving a meter dial reading of perhaps 30 degrees, and corresponding to 3700 kc. on 3.5 mc., the band on which we assume the curve is to be drawn. All available stations of known frequency are logged in the same way—frequency against meter dial reading.

When about twenty points have been obtained—an operation which may take a matter of days, depending upon the time spent on listening for reliable stations—the first rough graph can be plotted. It will have the shape of *Fig.* 1, and all or most of the points should lie on it. If there are some which do not fit the curve, they should be re-checked, remembering that there may be changes from the published frequencies, in which case, of course, that particular station should be discarded. It will usually be found that some at least of a number of stations do not come on the curve through the majority, so that these apparent discrepancies need not cause alarm. Commercial stations sometimes alter their frequencies, while amateurs are not always reliable; the point is that an accurate curve is easily obtainable by taking the line through the majority, and hence, for best accuracy, as many checks as possible should be obtained.

● Making the Curve

The rough graph will settle which stations can be used for the final plotting, and the frequencies so chosen should be re-checked to make certain they are correctly logged. Then on good quality squared paper, carefully "spot" each point and draw a smooth curve through them, using if possible a draughtsman's set of curves for the purpose, as the line is usually not straight, but bulges slightly in the middle. Condenser dial readings and frequencies should be neatly marked along the bottom and up the left-hand side of the paper respectively, using if possible one division per condenser degree and not more than 5 kc. per division for frequency. This can easily be managed on a large piece of graph paper squared in inches and tenths, and would give an accuracy of 2.5 kc. per dial division—on the "J.B." dial specified—on the band for which the curve is plotted.

So much for the method of calibration. After the curve has been drawn, the same valve must always be used in the meter—changing it will affect the calibration—and it is also best always to operate the instrument with the same H.T. and L.T. supplies, though there is latitude in this respect as the e-c circuit is not liable to much variation over wide supply-voltage changes. For instance, insertion of the 'phones should not alter the pitch of the beat-note more than a few cycles, and this is a good test of stability.

● Receiver Coupling

With regard to coupling the frequency meter to the receiver, some mention of this was made last month. The output condenser Co enables R.F. energy either to be fed to the receiver or picked up from the transmitter, and in practice it will be found that about two feet of wire attached to the stand-off insulator on the back of the cabinet will provide all the coupling required. The end of this lead

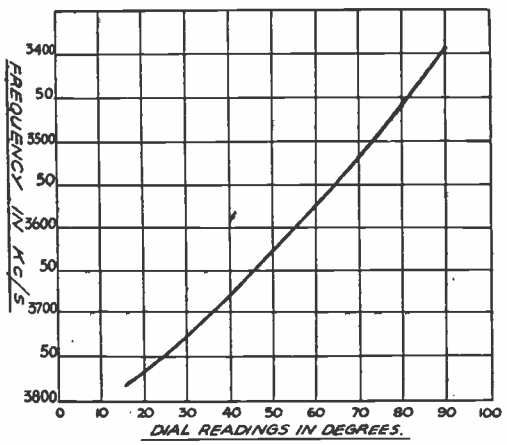


Fig. 1.

CURVE OBTAINED WITH HETERODYNE FREQUENCY METER.

A dial reading of 60 degrees corresponds to frequencies of 1787.5, 3575, 7150 and 14300 kc., and the 3.5 mc. band lies between 30 and 75 degrees on the dial. The calibration spread on this band is therefore 5 kc. per dial division, and accurate readings of 2.5 kc. are possible. The accuracy on the other bands would be 1.25 kc. on 1.7 mc., 5 kc. on 7 mc. and 10 kc. on 14 mc.

should be wrapped round the aerial lead to the receiver, and the degree of transfer can be adjusted by using more or less wire. The harmonics will be found to be quite strong right down to the 28 mc. band, giving a good beat-note in the receiver, but for accurate work, the coupling should not be made too tight. It will be necessary to adjust the coupling lead both to give the required beat with the receiver and adequate pick-up from the transmitter, and this should be done before calibration is commenced—and the lead kept in this position afterwards—as handling it and changing the position will have a slight effect on the frequency.

● Transmitter Monitoring

Monitoring of the transmitter can be carried out either by jacking a pair of 'phones into the meter when changing over to "send," or by taking the audio output from the meter through the change-over switch to the L.F. stage in the receiver, such that the 'phones or speaker are automatically brought in on both "send" and "receive" positions. This switching is simply a matter of ingenuity and depends on the type of L.F. coupling in the receiver. It makes for a quick, snappy change-over and, what is more important, continuous monitoring of the transmitter.

The calibration curve can obviously be checked from the transmitter—if the latter is crystal-controlled—by reason of the fact that when monitoring, the meter must be tuned to the known transmitter frequency. If several crystals are available, a very good curve can be drawn from them alone, with two or three commercial stations to fix the ends of the bands.

To check the frequency of an incoming signal, it is tuned to zero-beat on the receiver and the meter accurately adjusted to the same frequency by heterodyning it against the receiver. The meter tuning dial is then read, and the corresponding frequency taken off the graph. If the curve is plotted to cover 3.5 mc., and the receiver is on 7 mc., the figure given by the graph must be multiplied by 2 to obtain the frequency of the station being checked. Similarly, with the receiver on 14 mc., the multiplying factor would be 4, while for 1.7 mc., the figure given by the graph is divided by 2.

● Other Uses

The discussion above deals with the most usual applications of such a frequency-meter monitor. What is not so well known is its great value as a separate heterodyne or beat-oscillator when receiving through heavy interference. The desired signal is tuned in on the receiver in the usual way, and then reaction is backed off till oscillation just ceases. The meter tuning dial is then adjusted till a beat-note is obtained with the incoming signal, the result being that much better discrimination in the receiver tuned circuit is possible, and so a great improvement in apparent selectivity. Further, the pitch of an incoming signal can be varied by altering the meter dial setting—in exactly the same way as one does when tuning C.W. signals under normal conditions—to clear any interference still existing, and this alteration of pitch does not bring in some other station, as is often the case when using the ordinary method on a crowded band.

In simple systems, this function of the meter only applies to C.W. reception, as the introduction of a beat-note on a telephony signal would be the same as trying to receive it with the detector valve oscillating.

It is not until a frequency-meter monitor of this type described has been built, calibrated and used for a bit that one realises its immense value as a piece of equipment in the station, and this is true whether for transmission or reception. On the transmitting side, it is possible to carry out practically every adjustment and all normal tests with the aid of a monitor, relying only on the distant station for reports on strength. The outgoing signal can be checked at all times, and with variable-frequency oscillators, the frequency can be set accurately in any part of any band. For the listener, reports on amateur signals can be made more complete if a frequency check can be included, but the limits of accuracy should be worked out and stated, while the meter will be found to make things very much easier and more certain if and when transmission is started.

STANDARD FREQUENCY TRANSMISSIONS

W9XAN.			W6XK.		
Date. August	Time. G.M.T.	Freq. Kc.	Date. August	Time. G.M.T.	Freq. Kc.
7	02.00	3500	7	00.00	7000
	02.08	3600		00.08	7100
	02.16	3700		00.16	7200
	02.24	3800		00.24	7300
21	02.00	7000	9	00.00	14000
	20.08	7100		00.08	14100
	02.16	7200		00.16	14200
	02.24	7300		00.24	14300
25	22.00	14000		00.32	14400
	22.08	14100	21	04.00	7000
	22.16	14200		04.08	7100
	22.24	14300		04.16	7200
	22.32	14400		04.24	7300
28	02.00	7000			
	02.08	7100			
	02.16	7200			
	02.24	7300			

Procedure.

W9XAN, Elgin Observatory, Elgin, Illinois, U.S.A.

2 mins.—QST QST QST de W9XAN.
3 mins.—Letter "O," call W9XAN and transmitting freq.
1 min. —Transmitting freq. and announcement of next.
2 mins.—Time to change to next frequency.

W6XK, Don Lee Broadcast, Los Angeles, Calif., U.S.A.

2 mins.—QST QST QST de W6XK.
3 mins.—Letter "M," call W6XK and transmitting freq.
1 min. —Transmitting freq. and announcement of next.
2 mins.—Time to change to next frequency.

(N.B.—All transmissions are in Morse, and accurate timing is essential. Both stations welcome reports from this country.)

"DX CORNER"—(*continued from page* 11).

up. Here it is: W4DLH, W4QJ, W4BYY, W4DFB, W4IS, W4EGO, W4DAA, W4DXP, W4BNR, W4DSY, W4CRA, W4EHG, W5DNV, W5EMD, W5CYC, W5FPO, W5XIY, W5BA, W5ADA, W5XDP, W5SDI, W6KMD, W6ADF, W6EPT, W6AM, W6OCH, W6MZQ, W6AH, W6ABF, W6GCP, W6AL, W6AY, W7JO, W7AMQ and W7CEO in Wyoming. Others include 15 PY's, an interesting catch being PY1DS making his first contact with England (G5BJ). Getting a bit tied up with his English he got PY1DC to come to the mike for him!

The pick of this log are: XE3AR, CX2AK, HI5X, HI7I, PK6PI, TI2KP, HH5PA, CE1AO, KA1ME, OQ5AA (a doctor in Belgian Congo). How's that for one valve?

Well, we've come to the end of our page for the month. Please let me hear from you early next month as we have to go to press early for the exhibition. 73 and DX.

"BAND SPREADING"—(*continued from p.* 31).

of *Fig.* 8 may be used, in which C2, C3 and C4 are separate condensers of the type shown in *Fig.* 6 which are left set at the correct positions for the ten, twenty and forty metre bands, and each used only for its own particular waveband.

The arrangement of *Figs.* 5 and 8 is an extremely flexible one, and if the coils are so chosen as to need very little capacity across them a very noticeable increase in signal strength over the conventional arrangement is obtained. It will be noticed that the tuning condenser C1—the larger of the two—is on the earthed side of the circuit; if the two are reversed and the smaller one is on the earthed side, trouble will probably be experienced with hand-capacity when tuning with C1.

Background noise as well as signal-strength is somewhat increased by the use of this low-capacity circuit, but this can be considerably offset by the use of a fixed condenser of about .003 mfd. capacity across the phones or loudspeaker, without detriment to signal strength.

This method of band spreading is undoubtedly a little more difficult to put into operation than the conventional one, but in the writer's opinion the increased sensitivity of the receiver easily justifies the additional trouble.

The Hiram Percy Maxim Memorial award for the outstanding record of the year made by an amateur under 21 years of age has been awarded to Victor Clark, W6KFC, of Phœnix, Arizona. The award is made annually by the son and daughter of the A.R.R.L.'s founder in memory of his interest in the welfare and advancement of promising radio amateurs. The award consists of $100 and a miniature of the Wouff Hong.

The S.-W.M. STRAIGHT RECEIVER

The main requirement in any amateur receiver is QSA, and not mere strength as such. This receiver will very definitely give readability, and by virtue of its own particular features, it can be said to represent the utmost in its class.

By THE DESIGNER

THE SEARCH for the " Ideal Receiver " having resolved itself into an evenly balanced demand for straight and superhet types, it will probably be of interest to all readers if this month some details are given of the straight receiver to be described in the next issue.

The set will be primarily an amateur communication job, embodying every refinement that it is possible—and worth while—to include within the limitations of a straight circuit. As such, the receiver will be unlike anything hitherto published. The basic circuit is a battery-operated three-stage arrangement, with the R.F. and detector stages ganged and full spreading of all amateur bands from 28 to 1.7 mc. The tuning range is continuous between approximately 9 and 200 metres, which means that short-wave broadcast reception is equally well catered for. Coils are 7-pin plug-in type—there is no manufactured assembly which permits full band-spread with coil-switching—and operation on the wave-range below 9 metres is possible with a further set of coils.

● R.F. Regeneration

As this description concerns the battery version —the mains-operated receiver will be slightly different, though the same chassis and major components will be used—careful design has been necessary in order to get the utmost from the set, and to this end regeneration is provided for in the R.F. stage. The inclusion of this is optional and means another control, but in some cases may be the means of improving performance; no two constructors seem to build exactly alike, even when the specification is "cast-iron"! The point of this is that though complete screening is obtained of all three stages both above and below the chassis, the ability to apply regeneration to the R.F. stage may in the individual case yield just that little something extra which those who do not include the regeneration control will not get.

Reaction in the detector stage is by means of a variable potentiometer controlling the screen voltage of the Hivac SG220SW detector valve—also used in the R.F. stage—combined with the usual slow-motion condenser and reaction winding, thus enabling very close and "sweet" regeneration to be obtained. The detector circuit is not electron-coupled, as with battery valves this very desirable feature is not easily arranged, though in the mains version of the receiver it will be used. The detector is coupled into a Hivac Z220 output stage by means of a parallel-fed transformer, with a multi-ratio transformer for matching speaker or phones.

● Monitor and Oscillator

Coming now to one of the special features, a fourth "stage" is provided in the shape of a combined listening monitor and beat oscillator, the dial of which can be calibrated to a fair degree of accuracy. The monitor, which is an entirely separate unit and optional, uses another Hivac SG220SW oscillator valve and the circuit is electron coupled. It performs two separate functions; by means of a "send-receive" switch, on transmission the R.F. and detector stages of the receiver are cut out, and the audio output of the monitor is fed into the L.F. stage, thus permitting continuous checking of the transmission. Monitoring of either C.W. or 'phone is arranged by means of a variable resistor in the plate of the valve, which can be adjusted to set it oscillating for C.W. listening or out of oscillation for a telephony check. Since the audio output of the monitor is in either case amplified by the receiver L.F. stage, a good strong signal is obtainable without having to overload the monitor valve.

By means of a second switch, the monitor can be used as a beat-oscillator in conjunction with the detector, thus improving considerably the discrimination in the detector circuit and thereby making it much easier to work through heavy interference.

Since the monitor is also intended as a listening check on the station transmitter, it is obviously impracticable to gang it with the R.F. and detector stages, since it is all too seldom that one is transmitting on exactly the same frequency as the other party to the QSO, which would mean that the dial setting of the monitor would have to be altered when changing over.

Finally, it may safely be said that the design and performance of this receiver puts it in the amateur communication class and that in results it compares favourably with many commercial superhets, though naturally no great claims are made as regards selectivity and audio output; the former depends on a large number of tuned circuits, and a crystal filter, which are obviously impracticable in a straight receiver of this type, while as regards the latter, it is only a matter of adding an amplifier to increase noise!

AN ECONOMICAL MULTI-PURPOSE AMPLIFIER

FOR GRAMOPHONE, MICROPHONE OR MODULATION USE

By G5GQ

ON THE FEW occasions telephony has been used at G5GQ many amateurs have asked questions about the speech amplifier used. Surprise has been expressed at the low cost of these amplifiers and of the excellent quality which they produce. As so many queries have been raised regarding the design and construction of high-gain amplifiers it was decided to construct one especially for THE SHORT-WAVE MAGAZINE. Here is the story of its development and the reason for the design used.

High quality transmission or reproduction is the ambition of most of us, but cost increases as quality improves, and expense must be kept low.

The first attempts at speech transmission are usually made with one of the cheaper varieties of carbon microphone, often of the P.O. solid back type. These mikes have a comparatively large output and can be connected direct to a pentode, or to the gramophone pick-up terminals of a broadcast receiver to provide two or three watts of audio, a simple enough method but hardly B.B.C. quality!

Sooner or later comes the wish for improvement. For two or three pounds a microphone capable of the highest fidelity can be purchased, but this is only the beginning of expense. The higher the quality of a microphone the lower its output, and it is impossible to obtain any power by connecting this type to a pentode or broadcast set. A special amplifier, having two or three valves has to be used, and this may cost many times the price of the mike.

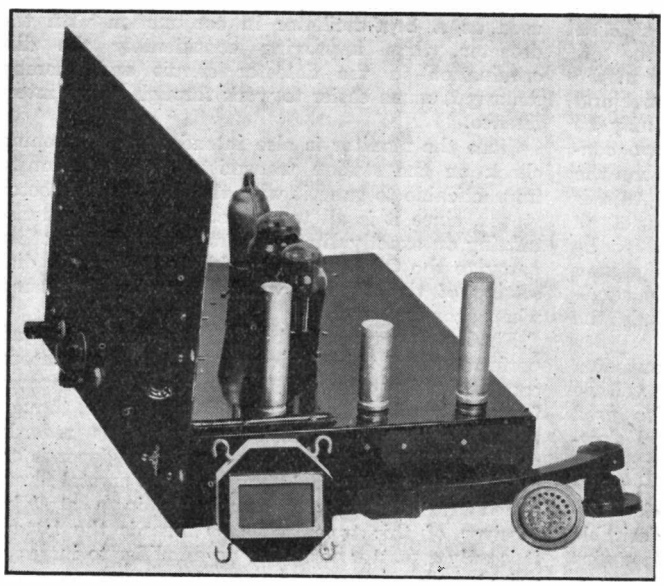
● Problems

I had at my disposal a number of Reisz and condenser microphones and was faced with this amplifier problem. An output of three watts was required. Suppressor modulation was used.

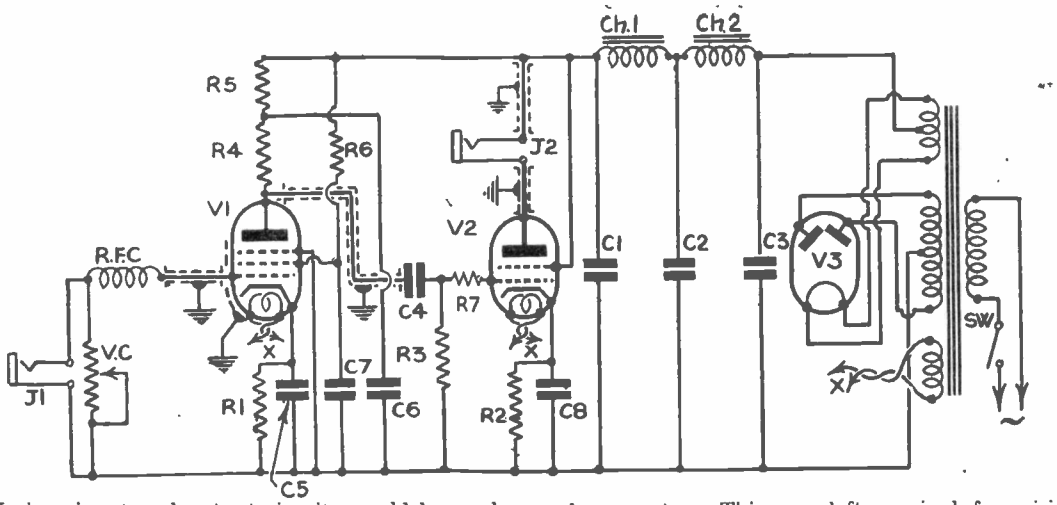
The output stage was first settled. A search among output valves showed that the Hivac AC/Z needed a maximum of only 5 volts at the grid for an output of 3 watts; this valve was therefore selected.

The lowest output from any microphone could be assumed to be between 1/50th and 1/100th volt. This had to be amplified to produce 5 volts at the grid of the AC/Z. It would require at least two triode stages to do this. Could it be done with only one stage, using an R.F. pentode with a high magnification factor? If so it would cut out the cost of one valve with its associated equipment and also reduce valve noise. Experiments were accordingly started and proved successful.

Actually very little difficulty was encountered after discarding certain fixed ideas, only two things proving troublesome in the circuit—the values of the resistances in the anode and screen of the R.F. pentode. A high value of anode resistance (½-1 megohm) was tried, but unless a very high anode voltage was used (500 volts) the gain was poor. 250 volts was a convenient figure for the AC/Z, and so the R.F. pentode had to work at this voltage. The final values used were 50,000 ohms for the anode resistance, and 500,000 ohms for the screen. With these values the power-handling capacity of the R.F. pentode is reduced but it will operate on a much smaller input, in fact with a high output mike it is easily overloaded.



The circuit being decided upon the construction had to be considered. To use the amplifier for transmitting only was not enough, it must be capable of wider application: record reproduction or cutting, as an amplifier after a detector, or to drive a larger output amplifier, and so provision was made to allow it to be used for any other purpose.



Various input and output circuits would be used, so it was not considered necessary to include these in the amplifier proper. If an input transformer is used do not place within two feet of the unit, otherwise hum will be picked up.

The final arrangement can be seen in the photographs. On the left of the panel is the input jack to which any transformer, microphone or pick-up may be connected. The other jack is the output for a speaker, cutting head, or transmitter coupling. Thus the amplifier may readily be used for a variety of purposes.

● Construction

Use was made of a standard 17½ in. x 12 in. steel chassis, bolted to a 19 in. x 12 in. rack panel. The use of a steel chassis is imperative. Wood "breadboard" construction was tried, but stability could not be attained. The chassis may appear rather empty, but it is an advantage to keep the rectifier and amplifier sections as far apart as possible.

Looking at the circuit an R.F. choke will be seen between the grid of the first valve and the input jack. This is only required when the amplifier is used for transmitting, its purpose being to prevent R.F. reaching the grid, for should this occur every conceivable trouble will arise.

The anode and grid leads of both valves are run in metal (earthed) sleeving, a necessary precaution for all uses.

The rectifier portion uses a Partridge transformer, and two Eddystone 50-henry smoothing chokes, the dimensions of these components allow comfortable fitting under the chassis. The double-section filter ensures perfect smoothing, there being absolutely no trace of hum on the speaker when the gain is turned full on.

On the rear side of the chassis will be seen an Eddystone 6-pin socket and connector. This was left unwired for wiring simplicity in the photograph, but it is intended to connect this to H.T. and L.T. to supply a condenser microphone head-amplifier (to be described later).

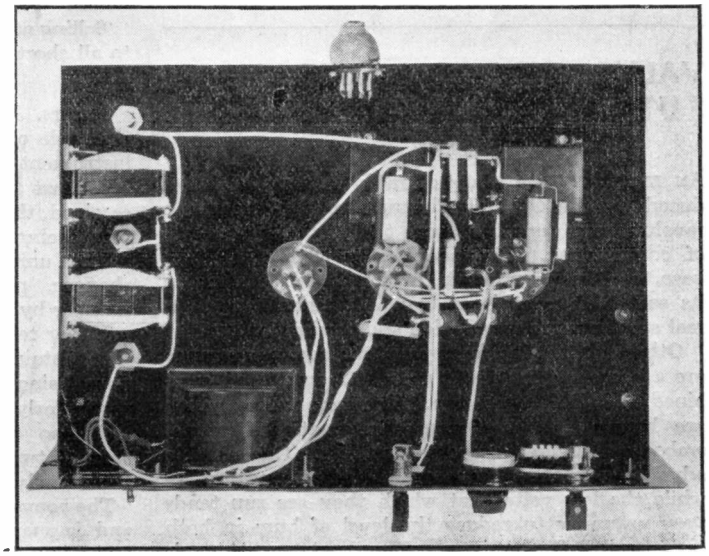
● Notes

It is most important that earthed shielded cable be used for the input circuit. Too much emphasis cannot be placed on this because any hum picked up here will be amplified up enormously.

No tone correction circuits are shown because these will vary with individual use. For gramophone use, as an example, it will be necessary to reduce top response to cut down needle scratch, while in many cases no tone correction will be needed.

● Performance

Quantitative measurements are rather misleading owing to various factors such as frequency, match-



ing, etc., but to give some idea of the amplification possible a Marconi-Reisz microphone was used, and overload occurred with the volume control half on. With a B.T.S. microphone, and the gain just on 3 watts audio was obtained speaking in a normal voice ten feet from the mike.

Thus, by carefully choosing components and circuit it is possible to build a high-gain amplifier for quality microphones as cheaply as one for the more sensitive, inferior quality types. It is a real pleasure to be able to use a high quality microphone and be able to talk ten or twenty feet away and still have plenty of reserve gain. And, in addition, when required for any other purposes it is only a matter of two plugs and sockets.

COMPONENTS USED IN THE ORIGINAL

C1, C3—8 mfd. T.C.C. type 502, electrolytic.
C2—4 mfd. T.C.C. type 502, electrolytic.
C4—.05 mfd. T.C.C. type 50.
C5, C8—50 mfd. T.C.C. type 12FT.
C6, C7—2 mfd. T.C.C. type 50.
RFC—Formo S.W. H.F. Choke.
J1, J2—Bulgin J2 and P38 Plugs.
R1, 1,000 ohms; R2, 200; R3 and R6, 500,000; R4, 50,000; R5, 10,000; R7, 1,000 (Bulgin, 1 w.).
Ch 1, Ch 2—50 h. Eddystone 980.
Valveholders—2 7-pin, Clix type V2; 1 4-pin, Clix type V1.
VC—10,000 ohms, Bulgin type VC 45.
SW—On-off Switch, Bulgin S80T.
Chassis—Standard 17½ in. x 12 in., Eves Radio.
Panel—19 in. x 12 in. x ⅛-in. Aluminium, Eves Radio.
Transformer—250-0-250, 60 ma., Partridge.
Valves—V1, AC/HP; V2, AC/2; V3, UU60/250 (Hivac).

VALVE STANDARDISATION FURTHERED BY NEW G.E.C. RANGE

AN ENTIRELY new range of radio valves just introduced by the General Electric Company marks a revolutionary departure from the usual British style of construction. The adoption of the octal type base, of American origin, which is self-locating in its socket, is considered by radio technicians as a real step towards world-wide standardisation.

Other outstanding features of the new valve range are a heater rating of 6.3 volts, 0.3 amp., and combined A.C.-D.C. operation. The new valves which are known as the Osram "International" type, embody many modern developments. One notable advantage is their economy in heater consumption while the low voltage at which they are run tends very naturally to reduce the level of hum in both A.C. and D.C. receivers. The heater wattage is only 1.9, compared with 4 watts for British mains valves in the past.

The octal base, which is gradually being accepted as standard throughout the world, is self-locating by means of a moulded key which slips into a groove in the socket. This greatly simplifies the insertion of a multi-pin valve into sockets situated in inaccessible parts of a chassis. Slightly smaller socket pins and metal top caps are fitted on the new valves and help to reduce their overall dimensions considerably.

The types introduced cover a wide range and have been designed and constructed with all the knowledge and technical experience that goes behind years of work in the radio field. They include two screen pentodes (straight and variable-mu), a heptode frequency changer, a high "m" triode, a double diode with separate cathodes, a double diode-triode, two output tetrodes, a full-wave rectifier, and a "Tuneray" indicator. The extreme sensitivity and accuracy of the last mentioned, which operates on the cathode-ray principle, gives the most precise visual tuning even with weak stations.

ON TEST AND CATALOGUES RECEIVED

DIRECTIONAL AERIALS

From A. W. Mann, 62, Costa Street, Middlesborough, we have received a leaflet dealing with a new type of his Variable Directional Aerial, which has been produced to meet the demand for a cheaper model. The aerial loses none of the efficiency of the more expensive types.

Model C1, as the type is called, is not fully rotating, but can be arranged for reception from any two diametrically opposed points, such as east and west, and the direction of reception from either of these points can be controlled by a switch inside the house.

Selling at 12s. 6d. the new model will be of interest to all short-wave listeners.

EELEX CONVERTOR

Messrs. J. J. Eastick and Co. have forwarded us a sample of their type A2 converter for test. This instrument is intended to be connected to a standard broadcast receiver so that short waves may be received, the additional range provided by the instrument being from 13-55 metres.

The unit comprises a triode-hexode frequency changer, power for which is obtained from the receiver by means of a special plug.

Under test with various receivers excellent results were obtained, all the usual distant short-wave stations being picked up with ease, the tuning being particularly easy.

As no pre-selector stage is included, second channel tuning is present, but even so selectivity is surprisingly good.

The converter for A.C. operation sells at £4 14s. 6d. and is manufactured by J. J. Eastick and Sons, Ltd., 118, Bunhill Row, London, E.C.1.

On the Amateur Bands

"Ham" News by G5GQ

TAKING A FEW days' holiday during the month I visited the Bournemouth amateurs. One of the advantages of being a ham is that wherever you go there are friends. The ball started with a meet at 2NS's place where we all tried to find out the trouble with a crystal mike. A broken lead was suspected but although it was completely taken to pieces no fault was apparent, so we concluded that the crystal itself was at fault. What happens to them: do they age?

The Bournemouth crowd consists of 5PB, 2NS, 5OH, and 8KX; a visitor was F8WL who is studying radio engineering at Radio Toulouse.

An interesting effort was 2NS's receiver, a Hammarlund Comet Pro rebuilt by 8KX. A built-in stage of regenerative R.F. and regeneration in one I.F. stage had cut out all trace of second channel.

Twenty-metre phone is the latest craze there, all vying for phone W.A.C., W.B.E. 8KX has done very well with his ten-watt phone (yes, a real ten watts, I measured it!) having already worked VS6, VS2, and VK.

5OH, running combined BCL/Ham gear shop, "Radioparts" complained of the difficulty of obtaining components, especially those sold by the junk shops of the larger cities. I seem to remember a group of London hams offering to scour London for provincials on a commission basis, but I think the scheme died out.

● Aerials

Erected a doublet for 7 mc. in place of my usual aerial (see March number), but immediately had reports of severe fading. Measurements showed everything O.K. so think fading is probably due to radiation taking place only from the horizontal, instead of the horizontal and vertical radiation with my usual aerial. Others have also noticed this phenomenon, so mine isn't an isolated case. Changing to horizontal and vertical radiation brought things back to normal—no fading.

● Old Hands

Had an interesting QSO with G2ZV the other night. He used to be PE6ZK (Palestine) way back 1926, and it was great to have a chat about the old crowd. Calls were quite different in those days, such as U for USA (later NU then W). To get back to the subject, we yarned about the two DX goals of those days: India, represented by YDCR, and S. America by the Argentine station CB8. YDCR was the call of Captain Drudge Coates, now a British ham, and CB8 that of Carlos Braggio. I have not heard anything of the latter for years, does anyone know what has happened to him? The other old S. American reliable was then SB1AW, now well known as PY1AW, Vasco Abreu.

London hams will remember Duncan Scott, ex G2SC-G5UP, who went out to Uganda. The day after working 2ZV I received a letter from him saying that he had just turned on an all-waver to the 7 mc. band and that my QSO with 2ZV was the first thing he heard. He was intensely interested in our conversation regarding the old days as he remembered so many of the calls we mentioned. A few days later he rang me up during a visit to town so we had a spot of tea together and his remarks about some of the forty-metre fone stations would have made their owners blush. However, the comments were justified because, as he remarked, even in 1926 we used to put out better quality than many of the present-day hams, and certainly did not conduct drinking parties on the air! Now he knows that some of the old crowd are still active he is going to stage a comeback so some of you will soon be able to renew your acquaintance with him.

● Receivers

Playing round with some of the new all-wave receivers I was surprised to find that they were more sensitive than many of the American communication receivers. The tests were crude but effective—tuning in W3XAL and switching the aerial from one set to the other. One British all-waver selling at under £20 gave an R9 signal to the R4 of the Yank double the price. When time permits I want to try the effect of a beat oscillator for ham use. An enterprising ham dealer could do well modifying a standard chassis by adding a beat oscillator, band spread, and if necessary substituting a variable for one of the fixed I.F. transformers.

● Fire!

Had a letter from G5LK whom I met at G5XH's house last year. 5LK is blind and finds amateur radio a great hobby. At present he is using 20-metre phone and although he has only been on this band for two months has already worked all W districts except W7, the input to an 801 not exceeding 18 watts. He writes regarding the reception of W9UEL in Colorado, mentioned in "Listeners' DX Corner" last month, and states that he was W9UEL's first European contact, receiving him at R7-8 and getting R8-9 himself, on June 5. FB going for 18 watts. W9UEL said that he had only heard three G stations during the past twelve months.

The occasion on which I met him was when I tuned up XH's transmitter so well that it caught fire. My version of the affair is that I got it so efficient that the aerial fused, but XH doesn't agree. Still, that's another story!

CLUB ACTIVITIES

ANGLO-AMERICAN RADIO AND TELEVISION SOCIETY

Meetings of members at Porthcawl, Maesteg and Uxbridge have been held during the month, Leslie W. Orton, president, attending all. The society took an active part in the recent cross-country test, listeners in all parts of the country picking up many of the transmissions.—Secretary: Miss E. G. Harris, "Plemont," Greenway, Uxbridge.

GUERNSEY

A high spot in the July programme of the Guernsey Chapter of the International Short-Wave Club was the visit of Mr. Arthur E. Bear, European and Colonial representative of the I.S.W.C. and Secretary of the London Chapter. This occurred on July 9, when Guernsey members were able to reciprocate in some small measure for hospitality accorded them when visiting London. During the afternoon Mr. Bear, accompanied by G8DO and 2BTP, was shown over the ultra short-wave radio telephone station at Fort George. The gear at this station is very compact and business-like, and the imposing array of 5- and 8-metre beam aerials evinced much comment. A visit is being arranged for the members en bloc and this event will probably take place during August.

After the visit to Fort George, Mr. Bear gave a long and interesting lecture before the members at Mrs. Luscombe's, "The Marine" Boarding Establishment, during the evening meeting, which was well attended. The subject was a topical and appropriate one—"Amateur Radio."

The Guernsey Chapter meets weekly on Tuesdays at 5, Well Road, St. Peter-Port, with Morse instruction every alternate week, and full details of an extensive summer programme may be obtained from the Secretary: F. S. Le Pavoux (2BTP), 8, Upper Canichers, St. Peter-Port, Guernsey, C.I.

INTERNATIONAL SHORT-WAVE CLUB

A special broadcast, dedicated to I.S.W.C. membership will take place at 20.30 B.S.T. on August 7th, 1937, from short-wave station DJD, Zeesen, Germany, on 25.49 metres (11.77 mcs).

The station officials say "it is always an especial pleasure to us to further friendly associations of an international character over the air" and are *most anxious* to receive reports on reception from members and non-members.—From Geo. W. King, Programme Arranger, I.S.W.C., 116, Sheil Road, Newsham Park, Liverpool, 6.

NEWCASTLE

Excellent commodious headquarters have been obtained at 2, Duke Street, Newcastle-on-Tyne, where prospective members will be welcomed at the meetings held on Thursdays at 7 to 10 p.m.; Sundays, 6 to 9.30 p.m. A programme has been arranged for newcomers to radio, which is also a refresher course for the experienced and ranges from the crystal set to the multi-valve broadcast and short-wave receiver. Practical construction is followed by a talk on theory and design. Morse instruction is given in the final half-hour of each meeting. Visitors are invited to gain knowledge of club activities. A visit is to be arranged to the B.B.C. Newcastle studios and transmitter shortly. Additions to the party can be arranged.—Hon. Secretary: Geo. C. Castle, 10, Henry Street, Gosforth.

SOUTHEND

The Society held a very successful direction-finding contest on June 27 when 23 members scoured Essex with portable receivers in an endeavour to trace a hidden transmitter, operating on a wavelength of 155.8 metres. On this occasion the transmitter was well concealed and only one competitor —Mr. Maurice Tapson, G6IF—succeeded in finding it, arriving only a few moments before the conclusion of the transmission.

A series of similar events will be held during the summer months and the Hon. Secretary, Mr. F. S. Adams, of 27, Eastern Avenue, Southend-on-Sea will be pleased to hear from any members of other societies who would like to take part. Indoor meetings are also being held at intervals during the summer and the full programme of lectures will be resumed in September.

SUTTON-IN-ASHFIELD

Harold Dove, G8MR, of 10, Welbeck Street, Sutton-in-Ashfield, Notts., is the County Representative for Notts. of the World Friendship Society, and would appreciate Notts. members communicating with him.

THAMES VALLEY

Appreciating the value of close observation on the 5-metre amateur band from summer to winter conditions, the 56-mcs. group of the Thames Valley Amateur Radio and Television Society have organised a listening contest to take place over a period of six months commencing on August 1. Reports will be sent to amateur transmitters active on these frequencies and their co-operation in confirming reception will be appreciated. All the members of the society's experimental group interested in ultra high frequency work are holders of transmitting licenses.

WELLINGTON (Shropshire)

Mr. T. Leonard Stevens, Post Office, Donnington Wood, Wellington, Shropshire writes: "We have not a club in this district yet, seven of us meet at our various QRA's every fortnight to carry out experiments and test. There are G6KR, G5YP, 2CJO, 2COB, 2BDC, 2CCS, and the other member hopes to receive his A.A. this month."

QUERY COUPON	
S.-W.M.	8/37.

BROADCAST STATIONS

Station	Call	Wave	Freq.
PITTSBURG	W8XK	13.93	21.54
DAVENTRY	GSJ	13.93	21.53
WAYNE	W2XE	13.94	21.52
DAVENTRY	GSH	13.97	21.47
BANGKOK	HS8PJ	15.77	19.02
BANDOENG	PLE	15.93	18.83
DAVENTRY	GSG	16.86	17.79
BOUNDBROOK	W3XAL	16.87	17.78
ZEESEN	DJE	16.89	17.76
WAYNE	W2XE	16.89	17.76
BUDAPEST	HAS3	19.52	15.37
ZEESEN	DJT	19.53	15.36
ZEESEN	DJR	19.56	15.34
SCHENECTADY	W2XAD	19.57	15.33
DAVENTRY	GSP	19.60	15.31
BUENOS AIRES	LRU	19.62	15.29
ZEESEN	DJQ	19.63	15.28
WAYNE	W2XE	19.65	15.27
DAVENTRY	GSI	19.66	15.26
RADIO COLONIAL (Paris)	TPA2	19.68	15.24
PODEBRADY	OLR5A	19.71	15.23
EINDHOVEN	PCJ	19.71	15.22
PITTSBURG	W8XK	19.72	15.21
ZEESEN	DJB	19.74	15.20
DAVENTRY	GSO	19.76	15.18
TOKIO	JZK	19.80	15.16
SOURABAYA	YDC	19.80	15.15
DAVENTRY	GSF	19.82	15.14
VATICAN CITY	HVJ	19.84	15.12
ZEESEN	DJL	19.85	15.11
SOFIA	LZA	20.24	14.88
WARSAW	SPW	22.00	13.63
REYKJAVIK	TFJ	24 52	12.23
MOSCOW	RNE	25.00	12.00
RADIO COLONIAL (Paris)	TPA3	25.23	11.88
PITTSBURG	W8XK	25.27	11.87
PODEBRADY	OLR4A	25.34	11.84
WAYNE	W2XE	25.36	11.83
LISBON	CT1AA	25.36	11.83
ROME	2RO	25.40	11.81
TOKIO	JZJ	25.42	11.80
BOSTON	W1XAL	25.45	11.79
ZEESEN	DJD	25.49	11.77
PODEBRADY	OLR4B	25.51	11.76
DAVENTRY	GSD	25.53	11.75
WINNIPEG	CJRX	25.60	11.72
RADIO COLONIAL (Paris)	TPA4	25.60	11.72
HAVANA (CUBA)	COCX	26.24	11.43
TOKIO (not for Europe)	JVM	27.93	10.74
BUENOS AIRES	LSX	28.99	10.35
RUYSSELEDE	ORK	29.04	10.33
MADRID	EAQ1	30.43	9.86
HAVANA (CUBA)	COCQ	30.77	9.75
BEUNOS AIRES	LRX	31.06	9.66
LISBON	CT1AA	31.09	9.65
ROME	2RO	31.13	9.63
CARTAGENA (COLOMBIA)	HJ1ABP	31.25	9.62
MOSCOW	RV96	31.25	9.60
RADIO NATIONS	HBL	31.27	9.59
PHILADELPHIA	W3XAU	31.28	9.59
SYDNEY	VK2ME	31.28	9.59
EINDHOVEN	PCJ	31.28	9.59
LYNDHURST	VK3LR	31.32	9.58
BOMBAY (temporarily closed down)	VUB	31.35	9.57
MILLIS	W1XK	31.35	9.57
ZEESEN	DJA	31.38	9.56
PODEBRADY	OLR3A	31.41	9.55
ZEESEN	DJN	31.45	9.54
JELOY	LKJ1	31.48	9.53
TOKIO (not for Europe)	JZI	31.48	9.53
SCHENECTADY	W2XAF	31.48	9.53
MELBOURNE	VK3ME	31.55	9.51
DAVENTRY	GSB	31.55	9.51
CARTAGENA (COLOMBIA)	HJ1ABE	31.58	9.50
RIO DE JANEIRO	PRF5	31.58	9.50
MEXICO CITY	XEWW	31.58	9.50
HAVANA (CUBA)	COCH	31.82	9.43
BANGKOK	HS8PJ	31.85	9.35
LIMA	OAX4I	32.12	9.34
BUDAPEST	HAT4	32.88	9.12
RADIO NATIONS	HBP	38.48	7.78
TOKIO	JVP	39.95	7.51
SAN DOMINGO	HIT	45.25	6.63
VENEZUELA	YV4RB	46.01	6.52
MARACAIBO	YV5RP	47.84	6.27
HAVANA	COKG	48.39	6.20
MARACAIBO	YV5RD	48.78	6.16
WINNIPEG	CJRO	48.78	6.15
PITTSBURG	W8XK	48.86	6.14
JELOY	LKJ1	48.94	6.13
HAVANA (CUBA)	COCD	48.94	6.13
GEORGETOWN	VP3BG	48.94	6.13
BOGOTA	HJ3ABX	48.96	6.13
MEXICO CITY	XEUZ	49.02	6.12
WAYNE	W2XE	49.02	6.12
CHICAGO	W9XF	49.18	6.10
BOUNDBROOK	W3XAL	49.18	6.10
BELGRADE	YUA	49.18	6.10
LIMA	OAX4Z	49.24	6.09
HONG KONG	ZBW2	49.26	6.09
NAIROBI	VQ7LO	49.32	6.08
CHICAGO	W9XAA	49.34	6.08
MARACAIBO	YV1RD	49.42	6.07
PHILADELPHIA	W3XAU	49.50	6.06
CINCINNATI	W8XAL	49.50	6.06
COPENHAGEN	OXY	49.50	6.06
MOTALA	SBG	49.50	6.06
BOGOTA	HJ3ABD	49.59	6.05
BOSTON	W1XAL	49.67	6.04
ZEESEN	DJC	49.83	6.02
BOGOTA	HJ3ABH	49.85	6.01
HAVANA (CUBA)	COCO	49.85	6.01
PODEBRADY	OLR2A	49.92	6.01
GEORGETOWN	VP3MR	49.92	6.01
MONTREAL	CFCX	49.96	6.00
MEXICO CITY	XEBT	50.00	6.00
MOSCOW	RW59	50.00	6.00
VATICAN CITY	HVJ	50.26	5.97
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