

SHORT WAVE NEWS

Vol. 1.
No. 1.
JANUARY, 1946

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A
SHORT WAVE PRESS
PUBLICATION.

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Vol. I. No. 1.

Annual Subscription. 16/-.

January, 1946.

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We Introduce Ourselves—

EDITORIAL

It is with great pleasure that we are at last able to produce the first number of the "Short Wave News." For us the appearance of the magazine is the fulfilment of a long-felt wish to present a periodical which will help to bring together those with a common interest in short wave radio, be it listening, transmitting or experimenting.

As this is the first issue of the magazine, it may be as well to say a little about its policy. During the lean war years we have often whiled away the long hours discussing amateur radio and all that goes with it. Amateur radio has "grown up" since the days twenty-five or thirty years ago when it was essentially an *experimentalist's* hobby. Just before the war put "finis" to amateur radio for the time being, quite an energetic discussion was taking place in the radio press about the future status of amateur

activity, particularly in respect of the transmitting side. There were those who felt that amateur radio was essentially a serious scientific study, with the responsibility of adding to the common pool of knowledge in the realm of radio communications. On the other hand, there were those who felt that amateur radio could stand on its own feet, and that it was not necessary to excuse its existence on the grounds that it provided valuable scientific research material.

Without reviving this discussion, we feel that there is a deal of truth in both opinions. Amateur radio enthusiasts have advanced the science of radio communications enormously in the past, and will continue to do so in the future. But apart from the value of the work of these experimenters, another aspect of amateur radio has, we feel, become even more important. We believe that amateur radio has a definite part to play in our present day communal life. We live in a technical age in which radio assumes an ever-increasing role. If full benefit is to be obtained from the rapid technical advances which the past few years have brought, the mass of the community must be made receptive to these developments. The community must become more radio minded. We can best encourage this by making the principles and practice of radio more familiar to the man in the street. And in what better way can this be done, than by enabling him

NOTICES

THE EDITORS invite original contributions on short wave radio subjects. All material used will be paid for. Articles should be clearly written, preferably typewritten, and photographs should be clear and sharp. Diagrams need not be large or perfectly drawn, as our draughtsman will redraw in most cases, but relevant information should be included. All MSS must be accompanied by a stamped addressed envelope for reply or return. Each item must bear the sender's name and address.

CLUB SECRETARIES are invited to submit details of activities for insertion in our monthly club notes, which must arrive at this office by the 1st of each month.

COMPONENT REVIEW. Manufacturers, publishers, etc., are invited to submit samples or information of new products for review in this section.

ALL CORRESPONDENCE should be addressed to "Short Wave News," 57 Maida Vale, Paddington, London, W.9.

to experiment with and to handle radio equipment. Particularly is this so with the rising generation. They must become as familiar with radio gear as our generation is with locomotives and automobiles. Radio as a hobby has a great part to play in helping to raise the level of culture in the community.

There are a number of rather more practical reasons why radio reception and transmission can stand on its own feet as a hobby. One of the most important of these is the value to the Services of a body of men—and women—who have had some training in operating radio apparatus. There can be no doubt that the number of trained or partly-trained radio operators and technicians which the ranks of amateur radio were able to provide in 1939 helped the country to turn a very nasty corner. There seems to be no doubt that the Government's very sympathetic attention to our requests for an early resumption of transmitting facilities is due to their appreciation of the services rendered to the country during these past war years. This world is by no means a "Kingdom of Heaven on earth" yet, and in spite of atomic bomb possibilities the Services may well need a reserve of radio operators in a hurry at some future date. This, then, is one truly utilitarian service our hobby can give to the community.

Probably the greatest boon which amateur radio can bestow on the world is in a more peaceful sphere. In the long run, war and disputes will cease only when there is complete agreement between all the peoples of the earth. What better way of distributing the thoughts and feelings of the ordinary man is there than through the interest of his hobbies? And our hobby is particularly well suited to doing so in that our communications spread out to the whole of the world. Every contact, every OSO made in a friendly, thoughtful manner binds together just a little tighter the persons taking part, no

matter in what part of the globe they may be. Every gathering of radio enthusiasts helps to cement those participating into a more friendly group. What better agent could there be for distributing the British way of life to the world than Amateur Radio?

We believe, then, that our hobby is well justified. We feel too that the experimental and technical aspects of amateur radio, particularly in the higher spheres, are well covered by other publications, perhaps almost to the exclusion of the more humanitarian considerations. We shall endeavour in this magazine to keep the latter aspect of amateur radio well to the fore. We hope to make the magazine essentially practical. We shall leave the more involved technical considerations to those journals which already cover this aspect, and shall ourselves concentrate chiefly on constructional articles for the listener and transmitter, and on news of amateur radio activity throughout the world. We are fortunate in having quite wide contacts, and we are personally acquainted with some of the best writers in the country on amateur radio topics, who have promised us their support. We would like to mention that we are ourselves radio amateurs, writing for radio amateurs, and we hope that you will write us and tell us what you would like to see in these pages. This is *your magazine*, and we hope in time, with your help, to build it up into a journal of which we can all be justly proud. A.C.G.

FLASH!

According to latest information, we hear that British amateurs will be going back on the air as from January 1st. It is stated that pre-war licensed hams will be allowed to operate on 28-29 Mcs. with a power of 100 watts, phone and CW and on 58.5-60 Mcs. with a power of 25 watts, phone and CW. Although nothing definite has been settled regarding the issue of new licences it is said that power will be limited to 25 watts for a "probationary" period and that CW only will be permitted during this time.

Around the Shacks.

This is the first of a series in which we hope to present every month a description of a receiving or transmitting station operated by one of our readers. We therefore invite articles on this matter, not exceeding 1,000 words in length, and accompanied by a photograph. The latter should if possible be one taken recently, and should not be smaller than postcard size. The printing block will be presented gratis to the reader concerned, and can be used to make a very effective QSL card.

This month, we are pleased to present "Bob" Halsey, B.S.W.L. 285. He first became initiated into the mysteries of radio, as did so many of us, after watching a friend build an O-v-1 receiver (way back in 1931). A start was made with a 1-v-1 kit of parts, which functioned perfectly on the first test, after a whole night spent on the building. Novice's luck, Bob! Since then B.S.W.L. 285 has never possessed a commercial rx. Then followed an interest in DX reception, leading to the taking of radio magazines and subsequent alterations to the receiver. Then came a series of mains receivers ending in a radiogram which is still in use for local medium wave work, and which uses a pair of PX4's in push-pull in the final.

Reception of a local Ham on this rx led to an interest in the shorter wave-

lengths, and the building of a converter. It was decided that a short wave receiver is best built solely for this purpose, the outcome being a 1-v-1 rx. In the same year, 1936, Bob became a member of the British Short Wave League, and started putting in some good work in the realm of QSL card collecting. Construction did not take a back seat, however, and in 1939 came the designing and building of an 8 valve communications type receiver, which covered the television wavelengths.

The war years have to some extent curtailed activities, but some useful test gear has been made, including such items as Multi-Range Meter, Resistance-Capacitance Bridge, and Signal Generator. At present a 9 valve receiver is under construction, to replace that illustrated here, and with which it is hoped to gather in a few more QSL cards.

(Continued on page 4).



The Short Wave Listener in the Home.

By W. Welsman.

Short wave listeners are, of course, curious people, but it is particularly strange that they should be so often lone explorers of the ether, when they are in an ideal position to act as foremost apostles of the twentieth century. More often than not, the short wave enthusiast is a unique personage in his home; his family view him as a queer specimen whose doings are quite beyond consideration except on the rarest occasions, when he produces some remarkable relay of a speech or public event happening on the other side of the globe.

Even after all these years of three- and four-waveband sets, the fact remains that, for the man-in-the-street, the short waves are a mystery, and they show little sign of becoming a real part of the normal household living equipment. The chief reason is lack of patience in tuning. As every listener knows, the ordinary person dither-twiddles on the SW bands at the same rate and with the same carelessness as on the MW and LW bands, and, as a result, gives up in disgust at the lack of results after a few minutes. It is impossible to produce a remarkable log of world-wide reception, either on his own or the family's set, unless he quite seriously embarks upon a course of tuning tuition for his comrades at home. Even demonstration is inadequate by itself; supervised practice is essential.

"To what end?" the short wave listener may well ask; content to capture Suva or Paramaribo single-handed—if he can. Simply this: that half the troubles of the world are due to people being too narrow-minded. SW listening is one of the very finest mind-broadening occupations ever known. The short wave listener has the chance of being a primary protagonist for the new world that we shall, not be granted many more chances to obtain; can he, in all commonsense, afford to throw it away? At the very least, he will be obtaining recruits for his favourite hobby all the time; at the best, he will be truly civilising people who have never known what real world civilisation implies.

It is all very well to read travel books

and newspaper reports from foreign countries, but to pretend that they have a tenth the effect in a year as half-an-hour's SW listening is to indulge in idle dreams. Foreigners are—just foreigners, if you read about them; but if you listen to their talks and concerts, they become human beings in your mind; the short wave enthusiast's foreign correspondence is proof enough of that. World War 2 produced an exceptional state of affairs on the short waves in that most countries spent much of their transmission time below 50 metres in propagandist news bulletins ad nauseam, but even so, there were exceptions, if one looked for them, especially from that mecca of listeners, South America. Now that peace reigns, there is no limit to the human interest to be derived from these same wavelengths and doubtless many others.

The ideal state of affairs in a home owning a three-waveband radio is one in which the SW band is used at least as much as the others, unless, of course, MW or LW programmes demand that it be reasonably otherwise for a time. This does not mean that one specialist should do as much listening on the short waves as everyone else combined does on the other bands put together. It means that one specialist should cease from his uniqueness and by means of his adroit knowledge of programmes and frequencies used by transmitters in other countries, should enlarge the outlook of his relations and friends to a truly world-wide level of appreciation. In these days, no particularly remarkable equipment is required for this purpose, as was the case in the past, and if, in any particular instance, technical improvements are necessary, it is up to the enthusiast to provide them for the good of all concerned, whether by his own efforts or by suitably subtle agitation.

Admittedly, all this refers to telephony only; but if he wants to teach morse to his family, there is nothing to stop an enlargement of vision in the home even to fields of telegraphy—except a probable unwillingness of a rather more serious character on the part of those concerned!

AROUND THE SHACKS—(cont. from p. 3)

At the moment the 20 metre band is the happy hunting ground, but in the future more attention will be paid to the higher frequencies, and it is hoped that enough spare room may possibly be found to house some transmitting gear in the not too dis-

tant future. The most prized QSL's are those from stations using low power, among them VK7CM, VK5SW, VK4JP, XZ2BH, LU1QA, YV4AC, HH2X, YN1IP, and K6NYD. Bob ends by stressing the pleasure derived from contacts with other radio enthusiasts.

Around the Broadcast Bands.

Monthly survey by "Monitor."

All times are given in G.M.T.

Reception during the month has, on the whole, been fairly good, though the frequencies below 12,000 kcs. have often suffered a fade-out after darkness. Flutter, too, has affected reception during the hours of darkness on numerous occasions and on most frequencies, this phenomena usually being present during the winter months. Daylight reception has been particularly good, especially from North America, India and Australia.

● Europe

Programmes broadcast by "Radiodiffusion Française," Paris, specially for listeners in Great Britain are radiated daily from 1830-2000 G.M.T. on the frequency of 9560 kcs. (31.38m.), 9620 kcs. (31.19m.) and the medium wavelength of 463m. (648kcs.). These programmes are designed, in the words of the Station Director, "... to present our British friends with a true picture of the present life in France under all its aspects; political, social and cultural." Special feature broadcasts are as follows:—

Daily: Concert and Magazine "France day by day." Mondays: "French Provinces." Tuesdays: "Reconstruction and Youth." Wednesdays: Paris Magazine. Thursdays: Literary Chronicle. Fridays: Womens Magazine.

Saturdays: Life in Paris. Sundays: Anglo-French discussion and Symphony Concert.

Other English programmes from European short wave stations include: "Radio Nacional de Espana," Madrid, on 9320 kcs. (31.2m.) from 2100-2130 on weekdays and 2145-2151 on Sundays. The American Expeditionary Station in Rome gives newscasts at 1230, 1800, and 2100 daily, with an additional bulletin at 0800 on Sundays. Frequency is 6135 kcs. (48.9m.). The station at Prague gives an English programme at 2030 on the frequency of 9559 kcs. (31.39m.). The Swiss stations frequently oblige with English programmes; HEO4, 10338 kcs. (29.02m.) at 1930, being recommended Belgrade can be heard at the following times:—at 2030 on 6100 kcs. (49.18m.), 1315 on 9520 kcs. (31.51m.) and at 1915 on 6100 kcs.

● "The Happy Station."

Readers who have had pre-war listening experience will be delighted to hear that PCJ at Eindhoven, has now made a re-appearance on the short wave bands. It may be recalled that PCJ had the honour

to be the first European short wave broadcasting station (it then used the call PCJJ) making its debut in 1927. Despite the primitive conditions under which the initial tests were conducted, the results were highly satisfactory, so successful in fact that PCJJ undertook the task of radiating the BBC's Daventry programmes to the world. In 1932 the new callsign of PCJ was used and the whole service reorganised. From that day onwards PCJ steadily increased in popularity and the cheery and highly entertaining programmes that emanated from the Eindhoven studios were known amongst short wave listeners the world over. PCJ became known as the "Happy Station" the title being in no small measure due to the friendly microphone style of the ubiquitous Eddie Startz who was the announcer on the English (and other) programmes. Incidentally Mr. Startz spoke, fluently, an amazing number of languages—about a dozen I believe. The frequencies used now appear to be the same as in pre-war days, i.e., 9590 kcs. and 15220 kcs. (31.28m. and 19.71m.). No activity has as yet been noted in the 16m. metre band channel, but the 19m. band channel is being strongly received during the afternoons. The station can also be heard between 1900-2000 and 0100-0200.

● The Aussies.

Latest schedules for the Australian stations, still being heard with persistent regularity, appear to be as follows:—The Forces Programme, which is directed to Asia, may be heard from 1400-1500 over VLC6 (9615 kcs. 31.2m.), VLG (9580 kcs. 31.32m.) and VLA (7280 kcs. 41.21m.). World News is given at 1400 and news for the Forces at 1435, the remainder of the programme consisting of talks and records. The programmes directed to Great Britain may be heard over VLA, VLC2 (9680 kcs. 30.99m.) and VLG5 (11870 kcs. 25.25m.) from 1515-1545. The broadcast from 0700-0800 is best heard over VLG3 (11710 kcs. 25.72m.) and VLQ3 (15315 kcs. 19.59m.).

● Latin America

Now that the winter evenings are with us, the Latin Americans are reaching their peak strengths and many of them are providing most consistent and reliable reception.

HCJB, Quito, Ecuador, is perhaps one of the most popular ones, and is now using 12445 kcs. (24.28m.), 9960 kcs. (30.10m.) and 4107 kcs. (73.05m.). It broadcasts many programmes in English, including a special broadcast for DX-ers every Friday at 2215-2230. At the time of writing, the 9960 kcs. channel is providing the most reliable signals.

The Dominicans, though many of them are of comparatively low power, may be relied upon to provide some interesting signals. HI1N, Trujillo City, 6246 kcs. (48.04m.) is one of the best and can be heard with typical West Indian programmes from 2230 onwards, using the slogan of "Broadcasting Nacional" and chimes. HIT, Trujillo, on 6630 kcs. (45.2m.) and HI1R, "la Voz de Santacion" in San Cristobal on 6420 kcs. (48.07m.) appear to be the best of the remaining 16 or more HI's.

Cuba is well represented on the short wave bands and listeners may find that the Cuban stations are easier to identify than their neighbours from the Dominican Republic. Undoubtedly the star Cuban is COCX on 9273 kcs. (32.3m.) which can be heard most evenings from about 2200 onwards. It uses the slogans of "Emisora El Pueblo" and "Pasta Gravi," and relays the medium wave CMX. COCL Havana, on 9833 kcs. (30.5m.) is also well received and uses the slogan "Radio Cadena Suaritos." Relays CMBL. Another Cuban station is COKG in Havana which is operating on 8955 kcs. (33.3m.) and may be heard with the call "Cadena Oriental CMKW, CMKB y COKG." Other Cubans to search for are COCW, Havana, (6322 kcs.) "La Voz de las Antillas"; COCY, Havana (11740 kcs.) "R.H.C. Cadena Azul"; COCH, Havana, 9437 kcs.; COHI, Santa Clara, 6450 kcs., "R.H.C. Cadena Azul on Habana."

Before leaving the West Indies mention must be made of the other half of the island of San Domingo, otherwise known as the Republic of Haiti. This country has, in the past, boasted very few short wave stations that could be relied upon for consistent reception, but much progress has been made during the past year or so. The best station appears to be HH3W, Port au Prince, which can be heard nightly on 10130 kcs (29.62m.) relaying the medium wave HHW. An aid to identification, apart from the fact that Haiti is the only French speaking country in Latin America (with the exception of French Guiana), is that on some occasions Big Ben chimes are used at the half hour. HH2S, also at Port au Prince, can often be heard with surprising strength on 5950 kcs. (50.3m.), being best around midnight. HHBM, a

comparative newcomer, is now being well heard on 6175 kcs. giving call every half hour, with three chime note, and mentioning "NBC Pan American network."

Turning our attentions to the South American continent we find literally hundreds of stations, some very weak, some fair and others at fine strengths. Doubtless every reader has, at some time or other heard the Brazilian stations PRL8, PRL7, ZYC8, and so on, with their strong reliable signals and so it would be pointless in lingering here and so we will pass on to some of the lesser known stations.

Uruguay is well represented on the air, particularly from CXA19, Montevideo. For some time this station has been operating on 11705 kcs. (25.62m.) but a recent communication from that station mentioned that, owing to the priority rights of SBP, Motola, they would have to eventually shift frequency. This has now taken effect and the new channel appears to be about 11825 kcs. (25.37m.). CXA19 is owned and operated by "Difusoras del Uruguay," and relays CX14 on 810 kcs., using the slogan "El Espectador." Other stations owned by D.D.U. include "Radio Libertad," CXA9 (15345 kcs.)CX18 (890 kcs.). Incidentally the transmitter at CXA19 consists of a one kW exciter unit, plate modulated Class B, followed by a power amplifier of two CAT9s', which delivers a power of 5 kW to the aerial. The aerial is current fed, one wave long and running ENE/WSW.

Uruguay can also be heard over CXA30, "Radio Nacional de Montevideo" on 6035 kcs. (49.7m.), which gives the calls "CXA30/CX30" every quarter-hour. CXA2 (9570 kcs.) and CXA6 (9550 kcs.), although not so reliable may also be heard at fair strength.

Argentina is another prolific country in the short wave world, and doubtless most readers have heard some, if not all, of the many stations now on the air. However, may we note that LRY is now by far the best signal from Argentine and can be heard at really fine strength from as early as 2130 on 9630 kcs. (31.14m.) relaying LR3, and using the slogan of "Radio Belgrano." Later on the sister station LRY1 on 6085 kcs. (49.3m.) may be well heard, though with not the same strength as the 31 metre channel. "Radio Splendide" can be heard over LRS on 9360 kcs. (32m.) at fair strength. It may be of interest to note that LRA5 "The Voice of the Argentine Republic" is now transmitting a programme in English every Friday at 2115 on 17720 kcs. (16.94m.). Other Argentine stations noted have been LRX "Radio El Mundo" on 9660 kcs. (31.06m.) a very weak station despite its 50 kW power; and

LRR, "Ovidios Lagos," Rosario, on 11887 kcs. (25.23m.) with multi-chime identification signal.

Colombian Republic is always a "safe bet" where short wave reception is concerned, and just now is certainly keeping up its tradition. HJDE in Medellin is one of the best and closes and 0330 with the English announcement "You are listening to La Voz de Antioquia. Stations HJBK 1260 kcs. and HJDE 6145 kcs. in Medellin, Colombia." HJCP, relays HJCR, and is very consistent on its frequency of 6200 kcs., closing at 0420. HJCX, Bogota, on 6018 kcs. (49.85m.) is another station that provides surprising signals at times. Is part of a network called "Radiodifusion Nacional de Colombia," which includes HJCT, 9680 kcs. and HJCO, 4955 kcs.

The remaining countries of Latin America abound with stations, many of which can be heard at good strength in this country. Station TGWA is living up to its slogan of "The Voice of Guatemala." It most definitely is—and a loud voice too! Is best heard on 9740 kcs. (30.8m.) and is at its best around 2230. Chile is well heard over CE1180 (11960 kcs. 25.08m.), although quality is usually very poor, and CE970 (970 kcs., 30.9m.). HRN is the best signal from Honduras and is situated at Tegucigalpa. Uses the slogan "La Voz de Honduras" and is fairly consistent on 5875 kcs. Panama should present no difficulties to the average listener as there are many outlets from this country. "Radio Pan-Americana" is the slogan of HP5G, Panama City, which is fair, though weak, on 11780 kcs. (25.47m.). HP5A, 11692 kcs. (25.66m.) is fairly reliable and uses the slogan "Cadena Radiodifusion de Panama." Others include HP5K, Colon (6005 kcs. 49.96m.) and HP5J "La Voz de Panama" on 9605 kcs. There are many Peruvians, but most of them are very difficult to hear in this country, although OAX4Z can usually be heard at good strength. The slogan is "Radio Nacional del Peru" and the frequency is 5870 kcs. (51.1m.). Uses a three-chime signal and signs on with "Anchors Aweigh."

The small republics of Paraguay and Nicaragua are both fairly well represented on the air, particularly the former, which operates several stations in the 25 metre band, ZPA5 (11960 kcs., 25.08m.) at Encarnacion is about the best one and it relays ZP5. Another to try for is ZPA1 on approximately 25m. which gives the impressive call of "ZPI/ZPA1 Radio Nacional del Paraguay de Departansendo de Imprensa y Propaganda de Paramav"! The best Nicaraguan station is YNQW on 7070 kcs. (42.7m.), and is heard around midnight with the call "YNQW, Radio Sport,

Managua." YNDS, Managua, can also be heard when conditions are favourable with the call "La Voz de Nicaragua" on 6760 kcs. (42.4m.).

Mexican stations are never particularly easy to log but if any listener has the opportunity to listen between 0500-0600 he will usually be rewarded by strong signals from XEWW, Mexico City, on 9500 kcs. (31.58m.). The call, which includes that of the medium-wave relay XEW, is, however, given only each hour. Again, if the "midnight oil" is to be burnt, good signals may be heard from XEFT, Vera Cruz on the frequency of 9543 kcs. (31.44m.). Uses four descending chimes as identification signal and announces as "XEU-XEFT, Vera Cruz." The announcements are always spoken in very rapid Spanish, but frequent mention of "Una programa Mexico" may aid identification. Signs off at 0440.

Before we leave Latin America, mention must be made of the "60 metre" band. From about 2330 onwards, this band is alive with Latin American signals, mostly from Venezuela and Colombia. Venezuela is best heard from YV5RN, "Radio Caracas" on 4920 kcs. (60.98m.); YV5RM, "Radio - Venezuela" on 4890 kcs. (61.35m.); and YV3RN, Barquisemeto, "Radio Barquisemeto" on 4990 kcs. (60.12m.). YV1RX, Maracaibo, is also most reliable and can be identified by its slogan "Ondas del Lago." Frequency is 4800 kcs. (62.5m.). The Colombians are headed by HJGB, "Radio Bucaramanga," on 4775 kcs. (62.81m.), HJDU, "Emisora Universidad Antioquia," Medellin on 4805 kcs. (62.4m.); and HJDP, "Emisora Claridad," Medellin, on 4885 kcs. (61.41m.).

Besides very many YV's and HJ's there are one or two other oddments that may be heard on this band. For example, PRJ4, Belam, is being heard at excellent strength on 4850 kcs. (61.86m.), and on occasions FZR, Saigon, French Indo-China, is surprisingly good on its 60 metre band channel.

● The East

The most interesting development from the East is possibly the appearance of Rangoon, announcing as "Headquarters Radio S.E.A.C. calling from Rangoon." Announces frequency as 11845 kcs. (25.33m.) and has been heard with news in English at 1450, signing off at approximately 1500. The station states that channels also exist in the 31 and 49 metre bands, but these have not been heard to date. Neighbouring India, is being so well heard over the 100 kW stations at Delhi that comment is hardly necessary!

Chinese stations are being received very well throughout the afternoon and evening and particular note was made of XGOY on 11900 kcs. (25.21m.) with terrific signals at 2300, when giving news despatches. Singapore, using the call "Singapore calling in the Malaya Regional broadcasts of the British Administration Malaya" is coming in well during the early afternoon on a frequency of 9555 kcs. (31.4m.).

The Near East is becoming increasingly interesting and the latest station is "The Near East Broadcasting Station" at Jaffa. It is now testing on 6135, 6710 and 6790 kcs. simultaneously (48.9m., 44.7m. and 44.2m.) on Saturdays from 1830-2100. Arabic programmes have been heard on other days between 1700-1930. Listeners reports are solicited and QSL's promised. The "Paiforce" programme from Radio Baghdad (7085 kcs.) is not so well heard recently as in the past, but nevertheless is sometimes of quite good strength, though subject to severe QRM. For those who wish to look for this station the times are 1610 to 1700. Iran, too, is not so easily heard but the English news from EQC, Teheran, on 9680 kcs (30.99m.)* is often heard at good strength at 1830. The station is not very reliable and the quality is poor.

● Africa

Latest details from ZOY, Accra, Gold Coast, show that the station is now operating on 4915 kcs. and 7295 kcs. (61m. and

41.13m.) daily from 1600-1800, with the power of 5 kW. The station authorities are particularly anxious to obtain listeners reports on the 4915 kcs. transmissions.

The Forces Programme from Khartoum, over "Radio Omdurman" (13330 kcs., 22.52m.) is now broadcast from 1800-1900 and from 1930-2100. The present power of this station is 250 watts, but according to the station authorities a more powerful transmitter is being constructed and should be in operation early in 1946.

The Forces Programmes from Cairo (7190 kcs.) is well heard in this country, the station being on the air from 0330-0530 and 0700-2000. News bulletins are given at 0730, 1030, 1530, 1630 and 1930.

The ever present Radio Brazzaville is now radiating English programmes to the following schedule:—At 1215 on 15595 kcs. (19.2m.); 11970 kcs. (25.06m.) and 17527 kcs. (17.11m.); at 1845 on 9449 kcs. (31.75m.), 17527 kcs. and 11970 kcs.; at 2045 on 9449 kcs., 17527 kcs. and 11970 kcs.; and at 2215 and 2330 on 9440 kcs. and 11970 kcs. Incidentally, it may be of interest to know that 50 kW is used on 15595 and 9440 kcs., 6 kW on 11970 kcs. and 600 watts on 17527 kcs.

Readers may be interested to know that after VQ7LO, Nairobi, signs off on 10739 kcs. (27.96m.) at 1600 it resumes transmission on 4950 kcs. (60.61m.). It is sometimes quite good on the latter channel but usually it is engulfed in severe W/T QRM.

Official List of Dominican Short Wave Stations.

We are indebted to T. B. Williamson, BSWL 1635, for the following list of Dominican Republic short wave stations which is the official list as received from the Director General of Communications.

Call	Frequency	Location	Slogan
HI1J	6025	San Pedro de Macoris	"La Voz de la Hispaniola."
HI1G	6124	Trujillo City	"Radio la Opinion."
HI9T	6170	Puerto Plata	
HI1A	6182	Santiago de las Caballeros	"La Voz del Yaque."
HIL	6187	Trujillo City	
HI1N	6246	Trujillo City	"Broadcasting Nacional."
HI1Z	6312	Trujillo City	"Broadcasting Nacional."
HI1X	6350	Trujillo City	
HI9B	6393	Santiago de las Caballeros	"Broadcasting Hotel Mercedes"
HI1R	6420	San Cristobal	"La Voz de Santacion."
HI2T	6480	Monsenor Nouel	"La Voz de Yuna."
HIT	6630	Trujillo City	"El Hit del Aire."
HI3C	6660	La Romana	"La Voz del Papagayo."
HI9U	7205	Puerto Plata	
HI2A	7215	Santiago de las Caballeros	
HI2G	9290	Santiago de las Caballeros	"Radio la Opinion."
HI3X	11860	Trujillo City	

My Favourite Short Wave Receiver.

By BSWL 1574

We are all interested in the sort of receiver used by the other fellow, but too seldom have the chance to gain much idea of it, apart from the bald statement that it is a 1-v-1 or 6v. S'het, as the case may be. We are therefore presenting a series of articles in which readers are invited to describe their favourite receivers. By this is meant, not the dream ideal cherished by each one of us yet never somehow realised, but a receiver that is now actually in use. Contributions are invited on this subject, consisting of approximately 750 words and circuit and/or photograph. The block will be presented to the contributor each month, and can be used by him on the back of QSL and SWL cards, etc. This month we are indebted to BSWL 1574 for the following account of his O-v-1 rx.

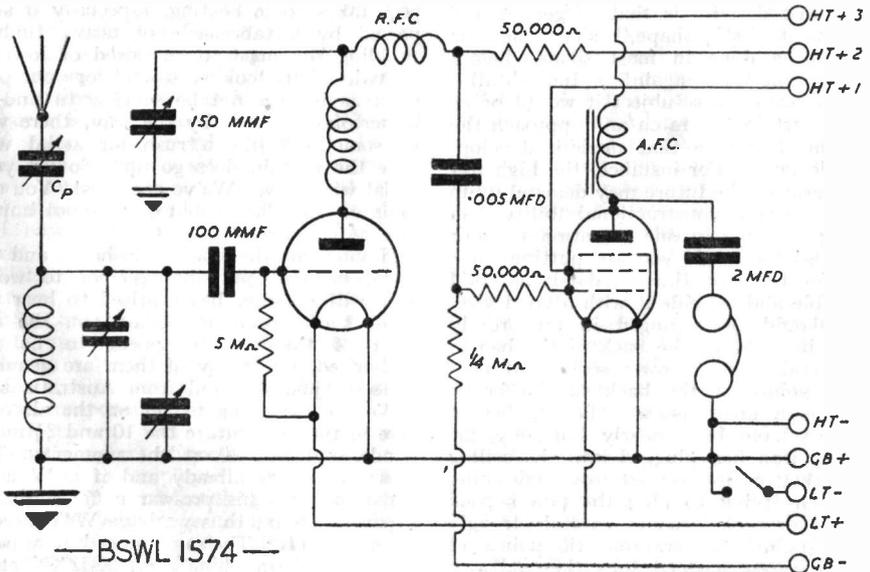
My favourite short wave receiver is a simple O-v-1 battery set, and the circuit shown here needs little explaining. CP is a pre-set aerial series capacitor of the postage-stamp trimmer type. Eddystone and Raymart 4-pin tuning coils give a wavelength coverage of 10 to 100 metres. A Mullard PM2HL triode valve is used

as a leaky grid detector, with "throttle" reaction. Tuning is by the well-known Eddystone Bandsread Unit.

The detector is resistance-capacitance coupled to the pentode output valve, a Mullard PM22A. The headphones are fed from an output choke, thus preventing any possibility of the phones burning out through carrying an excessive current, and at the same time obviating headphone capacity effects.

The receiver is built on the usual type inverted box chassis, and like the panel is constructed from 3-ply wood, covered with perforated zinc. The chassis is painted battleship grey, and the panel is varnish stained and finished off by polishing with salad oil. The complete set is housed in a grey painted zinc cabinet.

World-wide reception is obtained, though the cost of construction was very moderate. Upkeep, too, is very low, the present H.T. battery having been in use for over four months, although quite a lot of listening time has been put in during this period. For comfortable loudspeaker reception, a simple one valve amplifier is added.



GETTING STARTED.

It should not be very long now before we are on the air. At a meeting of the Radio Society of Great Britain, held on the 19th of October at the Institution of Electrical Engineers, London; the statement was made that 'permission is likely to be granted within a few weeks for amateur operation to commence on certain National Frequency Bands.' Reference to 'National' frequency bands presumably indicates some such 'local' band as 56 Mcs. It was also stated that 'a delay from four to six months' may occur before transmission on the International amateur bands can be authorised. From this it would appear that those who want to get off to a quick start will have to direct their energies into preparation for operating on the higher frequencies. With this in mind, we hope to publish in our next issue particulars of a receiver suitable for operating on these frequencies. Full constructional details will be given and only those components that are readily obtainable at present will be specified. The receiver will be followed by constructional articles of a 56 Mcs. transmitter and suitable aerial systems, and we also intend to publish data on frequency measurement on this band.

But there is no reason why we should wait until such gear has been built before starting up again, and, in fact, we advocate that the first step to be taken in preparation for renewed activity is that of getting the shack itself "ship-shape," since there is much to be done in most shacks before they are habitable again! Incidentally, while we are on the subject it would be as well to start from scratch and approach the job from the angle that modern developments demand. For instance, the high frequency gear of the future may demand quite a good deal more constructional ability than in the past, so pay due attention to your bench and tools. If you are putting up a bench for the first time, make it as solid as possible and provide it with a good vice. Tools should be arranged in an orderly manner in racks at the back of the bench, and several electric power sockets at convenient points at the back of the bench would be a great asset. The number of times we have been nearly hung by the soldering iron flex plugged into the ceiling light socket or electrocuted grovelling under the bench trying to plug the power pack into a floor socket makes us feel strongly on this point! Several electric points of different types screwed into the wall, or

fixed on a wooden panel, at the rear of the bench and wired up to a length of heavy duty flex leading to the main power plug in the shack can prove extremely useful.

Judging from the appearance of some of the high frequency gear to be seen these days, it would appear that a lathe would be a most handy piece of shack equipment, although we appreciate that not many hams will feel inclined to spend money in this direction. Another useful tool, which however is not too expensive, is a vertical drilling machine, of which even the lighter varieties can prove to be well worth the initial cost.

Every individual ham will have his own idea as to the type of transmitter and receiver he will want, and so no advice will be given in this respect. We would suggest, however, that if a steel frame is used, good facilities are provided for earthing it. Several 'earth points' can be provided at convenient points in the shack, and connected to good earth systems outside the shack by heavy bare wire. Talking of earths, brings us to aerials. We will still need an efficient high aerial of the conventional type for general listening and for our lower frequency bands when we do eventually get back on the air. You have, no doubt, your own ideas on the type of aerial mast you want, but we suggest that the good hefty scaffold or flag-mast type of pole takes some beating, especially if supported by a tabernacle of heavy timber, enabling the mast to be raised or lowered at will. Start looking around for your pole now, as it may not be so easy to find as hithertofore. And, by the way, there will be something like a rush for aerial wire once the curtain does go up. So get your aerial wire now. We've got ours! You can improvise insulators, but you cannot improvise aerial wire.*

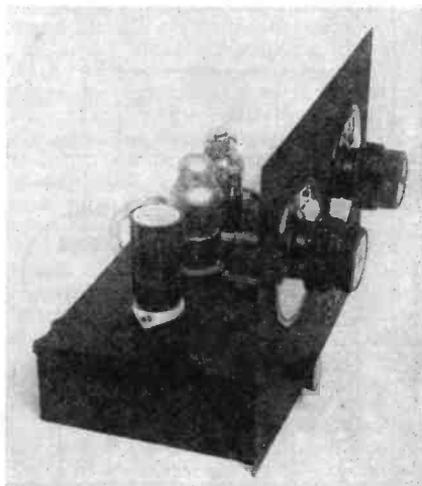
Having got the shack shipshape, and the aerial erected, put the receiver to work. You will possibly be surprised to hear the number of 'amateur signals' on the air. Most of these hams appear to be unauthorised, but many of them are genuine. A letter just to hand from Australia says "We are expecting to get on the air over here in the near future the 10 and 2½ metre bands, but not 20 at the moment. The W's are on 20 already and if a W is in Japan he uses his pre-war suffix with the Japanese prefix, thus we have W4TK using the call J4TK. The same procedure appears to be in use in China, i.e., XU2XX etc."

(Cont. on page 14).

The Short Wave News

O.v.1.

Receiver.



(Editorial Note)

(We have deliberately chosen a somewhat simple type of receiver for our first constructional feature, as we feel that it will appeal to the greater proportion of our readers. This receiver can be built up quite quickly, and all the components specified are readily obtainable. It will give excellent results, and is in every way suitable to form the nucleus of an amateur station. As suggested in the text, when more time and materials are available and a more ambitious receiver can be built, this one can be delegated to fill the role of "stand-by" in case of emergency. Nothing is more annoying than a failure of apparatus in a station, which somehow always seems to occur bang in the middle of a DX contact which may never be repeated! In the meantime, here is a set for the constructor who wants to build something without delay, a receiver which will fetch in DX amateur and broadcast stations from all over the world.)

Although designed and built for stand-by purposes, this receiver has a performance that is capable of satisfying all the requirements usually demanded of the main receiver in a listening station. For the convenience of constructors, a list is appended of the components used, together with the manufacturers and retailers concerned. Alternative parts of good manufacture can, of course, be employed. Features which add to the ease of handling, and so enable the utmost advantage to be taken of the simple circuit employed, include continuous electrical bandspread, the use of a reduction drive on the reaction control, and the taking of the detector grid leak to a potentiometer across the filament of the valve.

CIRCUIT. A theoretical circuit of the receiver is given at Figure 1. The aerial is inductively coupled via a series capacitor C1 and an inductor L1 to a tuned circuit consisting of L3, C2, and C3. C2 is the bandset, and C3 the bandspread capacitor. V1 is a triode acting as a leaky grid detector, C5 being the grid capacitor, and R1 the grid leak. The latter is returned, not direct to the HT-line, but to the centre of a potentiometer across the filament, a point which aids the obtaining of smooth reaction. The regenerative feedback is via L2 and a variable capacitor C4. The HT supply to the anode of V1 is decoupled by a resistance/capacitance filter R4/C7.

Parallel-fed transformer coupling is employed between V1 and V2. This avoids any tendency to threshold howl due to the use of an inductive anode load, while at the same time retaining the extra amplification afforded by transformer coupling. R5 is the anode impedance of V1, the audio signal being passed on via C6 to the transformer L4/L5. An R.F. stopper (R7) is included in the control grid circuit of V2, the output triode, and the bias potential is obtained by virtue of the voltage drop across a resistor R6 in the H.T.-line, this potential being decoupled at audio frequencies by a large capacitor C7. Another large capacitor, C8, decouples the H.T. supply to the whole receiver.

CONSTRUCTION. The receiver is built on a chassis measuring 11 inches by 6½ inches by 2½ inches. The panel used measured 12 inches by 9 inches, obtained by cutting down a standard rack size panel, but alternatively a panel 12 inches by 7 inches can be utilised, and is available from the same firm. Figures 2 and 3 give the layout of the components, and the first step is to mark

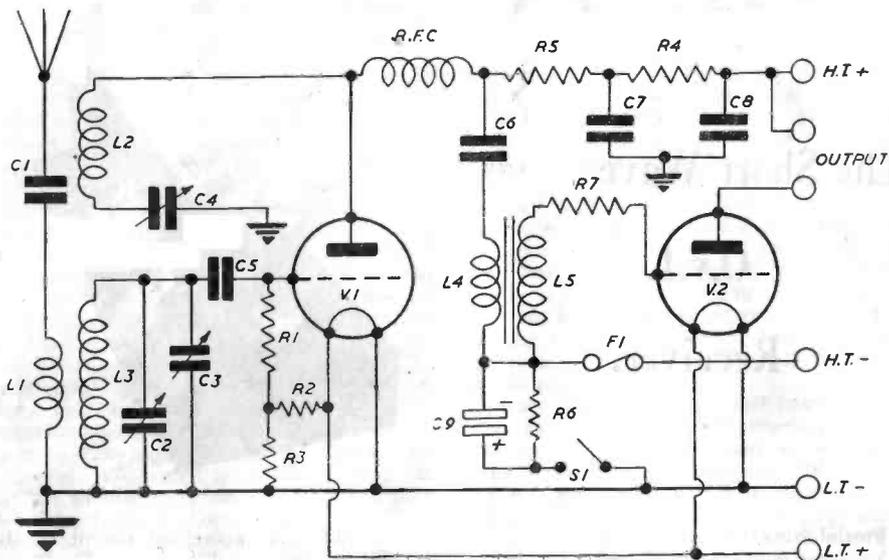


Fig. 1: Theoretical circuit.

out and drill the necessary holes. Those for the valveholders are 1 inch in diameter, while the coilholder requires a $1\frac{1}{4}$ inch diameter hole. The holders themselves are of ceramic, and to obviate any risk of fracture are mounted on rubber grommets. The tuning capacitors require holes $\frac{7}{16}$ inch diameter, and in order to get the drives to "seat" properly, it may be necessary to use one or two spacing washers, fitted between the capacitors and the panel. It should be noted that the Utility dials are so marked that the readings can be arranged to increase, or decrease, with any particular direction of rotation. As the modern tendency is to think in terms of kilocycles, or frequency, this point should be borne in mind. The dial is therefore mounted so that it reads from zero to 180 degrees, from right to left when looking at the panel from in front, the capacitor set fully opened, and the knob grub screw tightened up with the cursor set at 180 degrees. The dial readings will then increase as the frequency rises.

The aerial and earth terminals require $\frac{5}{16}$ inch diameter holes, and a small nick should be made in each with a triangular file, into which fits a projection moulded in base of the terminal, to prevent rotation of the latter. Note that the earth terminal is not grounded direct to the chassis, but instead a wire is taken to a soldering tag on the chassis which is used as a common earth point for the R.F.

stage, thus avoiding any earth "loops" through the chassis.

The reaction capacitor is mounted on a bracket, and the distance this is set back from the front of the chassis should be determined by experiment. The epicyclic reduction drive is supported solely on the spindle of the capacitor, and projects through a $\frac{3}{8}$ inch diameter hole in the panel. The drive locator is positioned by a countersunk 6 BA screw, which is put through the chassis front before the panel is mounted. The phone jack, it should be noted, is so constructed that it is automatically insulated from the panel, and needs a $\frac{7}{16}$ inch diameter hole. The parafeed A.F. transformer should be located as shown in Figure 4, and is mounted so that the lead-out wires are on the side facing the valveholders. The panel-mounting fuseholder needs a hole $\frac{5}{8}$ inch in diameter, and another one $\frac{3}{8}$ inch diameter is required on the back of the chassis for a rubber grommet through which the battery leads are brought out. This completes the mounting of components, the remainder being supported in the wiring.

WIRING. Above chassis, the only wiring is that connecting the two tuning capacitors, and a lead running from them through the chassis. In order to keep the stray capacitance low, this last lead is passed through the chassis by means of a ceramic bush. All the above-chassis wiring is carried out in 16 swg tinned copper wire.

Below chassis, it is best to use some sort of system when wiring, otherwise there is a possibility of connections being omitted, and it is not always an easy matter to spot such errors. A good idea is to re-draw the theoretical circuit as one goes along, starting off with the components already mounted, and adding the remainder, with the wiring, as the work progresses. In this case, the filament wiring and the battery leads should be put in first. The next step is to put in an earth line in heavy gauge wire, 16 or 14 swg, as shown in Fig. 3. The output valve is then wired up, and here a note should be made that the bias smoothing capacitor is of the electrolytic type, and polarity must be correctly observed. The positive side does not go to a positive point, but to the earth line, and, with the bias resistor, is taken to the supply side of the on-off switch. This last is most important, as otherwise there would be a constant drain on the H.T. battery, due to the leakage current of the smoothing capacitor C8, which is normal in any electrolytic capacitor. The phone jack is of the switch type, but no advantage is taken of this feature in the receiver, and the switch contacts are therefore ignored. Care should be taken to see that the jack is *really* insulated from the panel and

chassis. In order that the detector anode components are firmly mounted, use is made of an H.T. line running between the phone jack and a mounting strip fixed to the back of the chassis. This section of the wiring is fairly congested, and it is suggested that it be tackled in the following manner. The filaments are first wired up, and then the lead connecting the earth terminal and the chassis soldering tag. Next wired are the grid capacitor and leak, and the filament potentiometer. This is followed by the wire connecting the anode and the coil holder, the R.F. choke, coupling and decoupling resistors, and coupling and decoupling capacitors in that order. There now only remains the wiring of the coilholder and the aerial terminal. This is carried out in 16 swg tinned copper wire to ensure rigidity and constancy of calibration.

OPERATION. Before going any further, a check should be made of the whole of the wiring, preferably with an ohmmeter if this is available. When satisfied that the construction has been correctly carried out, the valves can be inserted in the sockets, the batteries connected up, and one of the coils plugged in. Although this receiver will operate a speaker on the more powerful stations under favourable conditions, the preliminary tests should be, made on

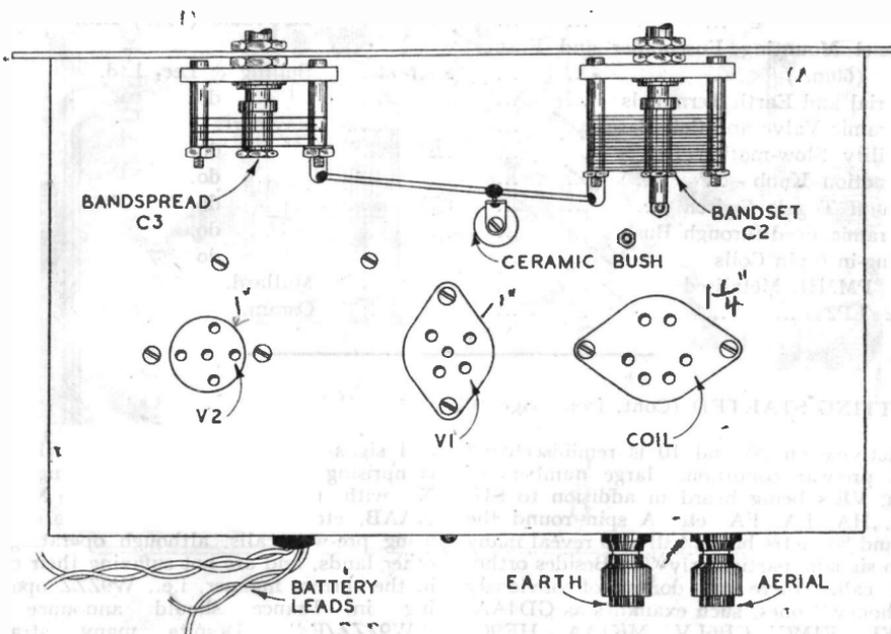


Fig. 2: Top of chassis layout.

phones. The receiver should work straight away, the only trouble that might be experienced being dead spots, that is, parts

of the tuning range where it is found that reaction cannot be obtained, and this is almost certainly due to aerial damping.

THE COMPONENTS USED

Resistors

R1	...	Grid Leak	...	...	4 megohms	...	Erie, Dubilier, etc.
R2 & 3	...	Filament Potentiometer	...	...	200 ohms	...	do.
R4	...	Anode Decoupling	...	..?	25,000 ohms	...	do.
R5	...	Anode Load	...	...	50,000 ohms	...	do.
R6	...	V2 Bias	...	...	1,000 ohms	...	do.
R7	...	R.F. Stopper	...	...	50,000 ohms	...	do.

Capacitors

C1	...	Aerial Series	...	...	100 uF	...	T.C.C.
C2	...	Bandset Tuning	...	...	160 uF	...	Raymart
C3	...	Bandsread Tuning	...	...	20 uF	...	do.
C4	...	Reaction	...	...	250 uF	...	do.
C5	...	V1 Grid	...	...	100 uF	...	T.C.C.
C6	...	Anode Coupling	...	...	0.01 uF	...	do.
C7	...	Anode Decoupling	...	...	0.25 uF	...	do.
C8	...	Battery (H.T.) Decoupling	...	...	2.0 uF	...	do.
C9	...	Bias Decoupling	...	...	25.0 uF	...	do.

Other Components

Panel and Chassis	...	...	...	...	...	Tele-radio (1943) Ltd.
R.F. Choke	...	...	...	...	...	do.
A.F Transformer	...	...	...	...	...	do.
Phone Plug and Jack	...	...	...	...	...	Igranic.
Epicyclic Drive	...	...	...	...	...	Tele-radio (1943) Ltd.
Panel Mounting Fuseholder and Fuse (60mA)	...	...	...	...	...	Belling & Lee, Ltd.
Aerial and Earth Terminals	...	...	...	...	...	do.
Ceramic Valve and Coil Bases	...	...	...	...	...	Raymart.
Utility Slow-motion Drives	...	...	...	...	...	do.
Reaction Knob	...	...	...	...	...	do.
On-off Toggle Switch	...	...	...	...	...	do.
Ceramic Feed-through Bush	...	...	...	...	...	do.
Plug-in 6-pin Coils	...	...	...	...	...	do.
V1 PM2HL Metalised	...	...	...	...	...	Mullard.
V2 LP2	...	...	...	...	...	Osram.

GETTING STARTED (Cont. from page 10).

Activity on 20 and 10 is reminiscent of real pre-war conditions, large numbers of W's, VE's being heard in addition to SU, HB, HA, LA, FA, etc. A spin round the 40 and 80 metre bands will also reveal many ham signals, particularly 40. Besides orthodox calls, there are dozens of obviously "phony" ones, such examples as GD4AA, G9YL, F1MC, CB6LV, MK1AA, HE9Q, R4AB, ZZZZ(!), Y17A and others. Most of these are hams using service gear, and some of them have official sanction to operate,

call signs being allocated temporarily and comprising of four letters beginning with X, with no numerals, such as XA&A, XAAB, etc. Many servicemen are openly using pre-war calls, although operating in other lands, and are not suffixing their calls in the correct manner, i.e., W9ZZZ operating in France should announce as "W9ZZZ/F." Despite many strange happenings there is plenty to hear on the ham bands. Yes, it's certainly time you were "getting started."

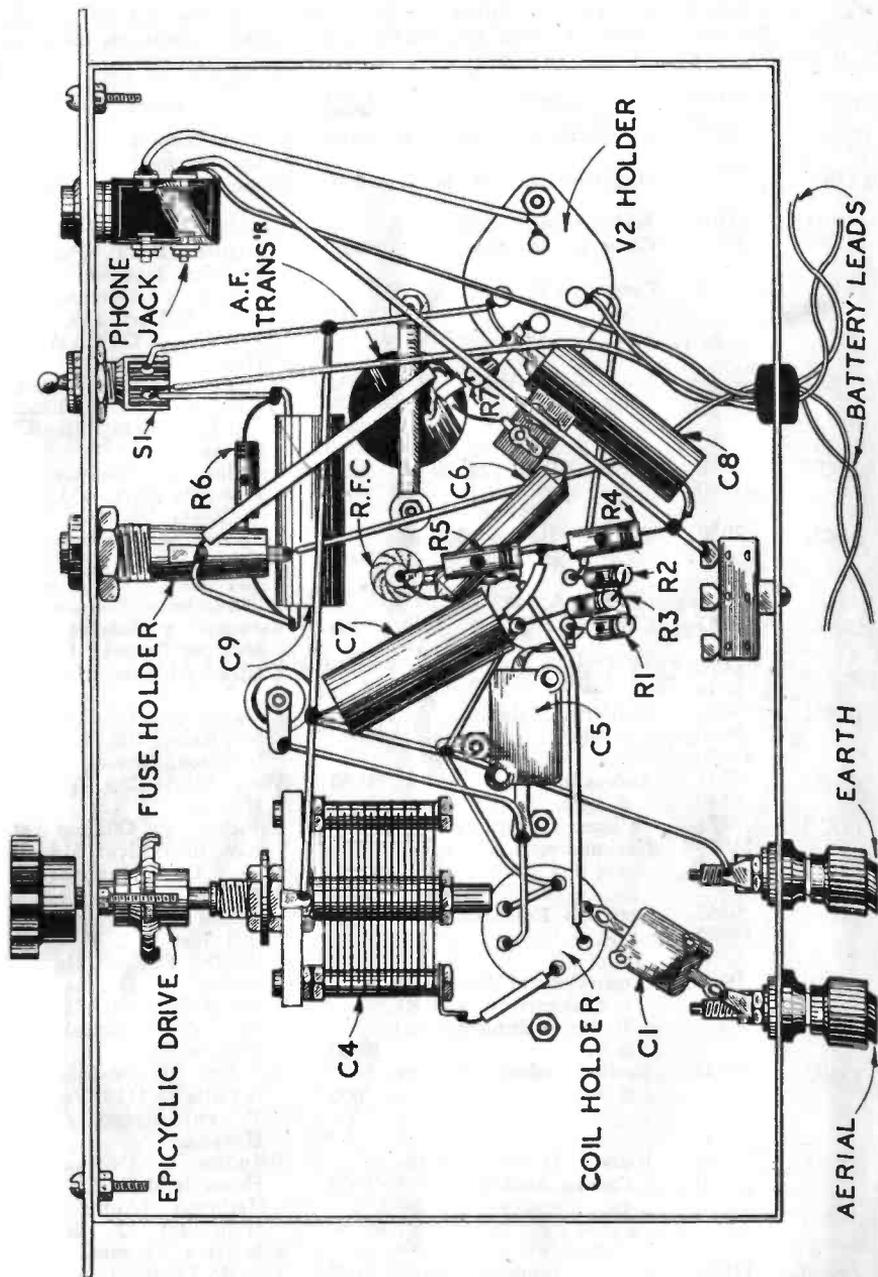


Fig. 3: Underchassis layout.

Official List of Cuban S.W. Stations.

The Signal Survey Section of the BSWL sends us the following list of Cuban short wave stations as received from the Radio and Telecommunications Department of the Republic of Cuba.

Call Sign	Frequency	Operating Authority	Power (Watts)	Address
COX-7	4290	Ministerio de Educacion	5000	Consejo Corporativo Columbia, Havana
COX-4	6390	Ministerio de Educacion	5000	Consejo Corporativo Columbia, Havana
COCO	6010 8700	Radio America S.A., ARR Casas y Compania.	5000	Estudios y Oficinas en San Miguel 314 T. Puentes Grandes, Havana.
COBF	6040	Compania Radio Universal S.A.	... 1000	Estudios y Oficinas en Paseo de Marti 159, T en Peuntes - Grandes, Havana.
COCD	6130	La Voz del Aire	... 1000	Estudios y Oficinas Calle G y 25, Vedado, T. Finca "El Tamarindo," Regla, Havana.
COCW	6322 21740	Adolfo Gil Izquierdo	... 1000	Estudios y Oficinas en Paseo de Marti 553, T., en Regla, Havana.
COCL	7050	Capitan Rafael Gonzalez Cobo, S.D.	... 1000	Estudios y Oficinas en Calle 13 y Ave. 11, Marianao, Ampliacion Almendares, Havana.
COCQ	8825 *9060 9670 9740	Circuite CMQ, S.A.	... 5000	Estudios y Oficinas en Maximo Gomez 103 T., Rpto, Aldecoa, Havana.
COBZ	9026 9030 17820	Guillermo Salas	... 1000	Estudios y Oficinas en San Rafael 108, T. Finca Infanzon, Havana.
COBQ	9235 9540	Andres Martinez	... 1000	Vista Alegre 269, Vibora, Havana.
COCX	9273 11650	Talleres Tipograficos Nacionales, S.A.	... 1000	Estudios y Oficinas en Ave. de Bolivar 314, T en C. Guanabacoa, Havana.
COBC	9362 17850	Domingo Fernandez Cruz	1000	Estudios y Oficinas en San Jose 104, T. en C. Rancho Boyeres, Havana
COCH	9437	Prop General Broadcast- ing Company (ARR), Radio Internacional, S.A.	... 5000	Estudios y Oficinas en Paseo de Marti, 107, T. en C. Guanabacoa, Havana.
COBL	9833	Radio Cadena Suaritos, S.A.	... 1000	Estudios y Oficinas en la Calle 25-1113, Vedado, T. en Arroyo Apolo, Havana.
COCY	11740 21620	Radio Habana Cuba, Cadena Azul, S.A.	... 1000	Estudios y Oficinas en Paseo de Marti 53, T. en Marianao (Autoriza de traslado) C. Rancho Boyeros, Havana.
COBH	11800	Jose C. Rumbaut, Autori- zado Translado para la Finca "El Dragado Luyano."	1000	Edificio Cooperative de O. Aliados, San Jose y Belancoain, Havana

COHI	6450 11775	Radio Habana, Cadena Azul, S.A. ...	5000	Estudios y Oficinas en Paseo de Marti 53, La Habana, T. en C. Central entre los Kms. 303 y 304, Santa Clara, Las Villas.
COJK	8663	Jones Castrillen y Com- pania ...	1000	Estudios y Oficinas en Finlay 4, T. Tte, Cnel. Mola entre Fdo. Cnel. Zayas y G. de Quesada, Rpto. Carmona, Cama- guey.
COCQ	**6345	(Equipo Adicional) Cir- cuite CMQ, S.A. ...	5000	Estudios y Oficinas en Maximo Gomez 103, La Habana, T. Finca San Matias Km, 966, C. Central, Santiago de Cuba.
COKG	8955	Emilio Grau Medina, 3ra No. 456 Reparto Fomento, Santiago de Cuba (Ote). ...	1200	Estudios y Oficinas en E Palma 658, T. Finca San Matias Km 966 C. Central, Santiago de Cuba.
†COCB	9115	Guillermo Garcia Navarro	1000	La Habana.

* Suspended for the time being.

** Additional equipment.

† Under construction.

DISTORTED OUTPUT.

A form of distortion often occurs in the output stage of a receiver which the beginner or embryo service engineer finds extremely difficult to trace.

When first switched on, the receiver functions normally, but after an interval of a few minutes the output becomes "scratchy," rather indicative of loose turns on the speech coil of the loudspeaker. After a few more minutes the speech sounds as if the announcer has a cold in the head. In extreme cases, speech becomes so broken up that it is almost impossible to understand it.

The trouble, which seems to occur most frequently in sets of the midget type, is due to one of two things. Most receivers nowadays employ resistance-capacitance coupling between the detector (or first audio stage) and the output valves. The first thing to suspect is a gradual breakdown under load of the coupling capacitor, resulting in the application of an increasing positive voltage to the output valve grid. Connecting a sensitive voltmeter from grid to the negative line (usually chassis) will generally give an indication of such a voltage.

Unsoldering the capacitor from the grid and connecting the voltmeter from the free

end to the negative line will soon prove if this component is at fault. If it is not, then the positive voltage reading will still be obtained across the grid leak, indicating that there is excessive secondary emission in the valve, i.e., the vacuum is not complete, and electrons collected on the control grid are causing a voltage to be developed across the grid leak, this voltage being in opposition to, and partially or wholly nullifying, the applied grid bias voltage. Secondary emission is aggravated by unduly high temperature working conditions, hence its prevalence in midget receivers, or by excessive anode and/or screen voltages. As the emission rises, due to the increase in positive bias, so does the temperature of the valve, so that the effect is cumulative.

The presence of such secondary emission, if another valve is not available for a substitution test, can be readily checked by inserting a meter to read the anode current, and then watching for change of reading as the grid leak is shorted out. With a valve in good condition there will be no change. Incidentally, why is it that so few valve testers do not enable this particular fault to be investigated, when all that is necessary, in most cases, is the addition of a toggle switch, grid leak and a few wires?

HAM QUIZ.

This section, we hope, will be presented as a regular feature of the magazine, and will be devoted to puzzles, brain-teasers and other devices designed to stir up the "grey matter." Although we have a general plan of action, we would greatly appreciate ideas and suggestions from our readers as to the type of puzzles they would like to see in these pages. Our idea is to cater for all tastes and topics, to present something for everyone.

This month we are including a Radio Crossword Puzzle and a General Knowledge Quiz, both of which should provide some entertainment to all classes of radio fans.

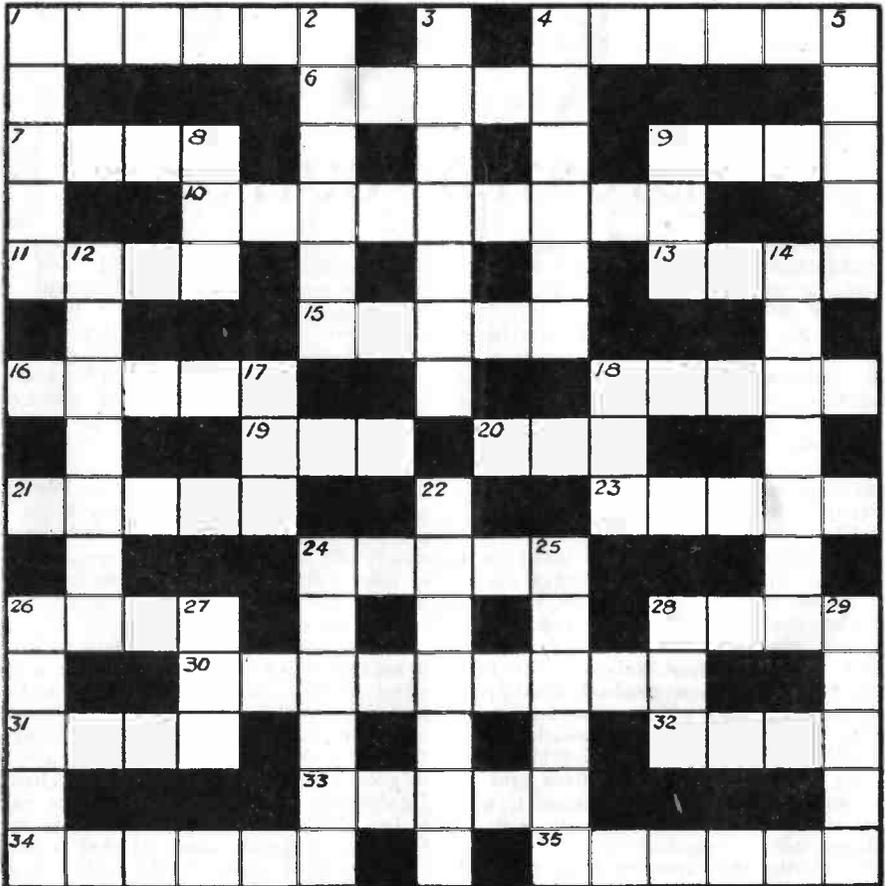
Do you know your microphone?

1. What type of work is the ribbon

microphone adaptable to?

2. A sound cell is used in some microphones. What type?
3. What are the advantages and disadvantages of a condenser microphone?
4. What advantages has the Transverse Current carbon microphone over the button type?
5. Approximately how thick is the ribbon in a ribbon microphone, and of what is it constructed?
6. What is a Cardioid microphone?
7. Does the crystal microphone give a low or high output, and is a diaphragm employed?

(Answers on page 25).



OUR RADIO CROSSWORD No. 1

by H. Lister, BSWL 579.

Clues across

1. It brings 'em in—or should!
4. Useful instruments.
6. An electrode.
7. Perhaps from the logbook.
9. A short one brings in the "locals."
10. They make it all possible.
11. A metre, roughly.
13. Iceland this was used in early television.
15. An electrical one might cause a fade out.
16. Useful illuminators.
18. Diagrammatically triangular in shape.
19. The simplest short waver.
20. See 24 across.
21. These are highly directional.
23. Useful tool.
- 24 and 20. Well known radio pioneer.
26. Might cause QRM to the city dweller.
28. Alternative to 7 across.
30. Modulation method.
31. Might support 1 across.
32. The American valve.
33. R9 plus on speaker might do this to the house.

HAND CAPACITANCE EFFECTS

By "Constructor"

It is possible that hand capacitance—more correctly *body* capacitance effects have been the cause of more headaches and more harsh words than any other problem which confronts the constructor of short wave receivers. Many accept these effects as part and parcel of the short wave builder's heritage, but this view is entirely incorrect. With a correctly constructed receiver, hand capacitance effects can in most cases be completely eliminated.

It is not possible to state that attention to any one point will affect a cure in any given case. When designing a new receiver, thought should be given to the effects that may arise, and due precautions taken. For those already in possession of a receiver prone to such troubles, the following notes may be of assistance.

Now, the greatest trouble is primarily due to the presence of RF currents in the audio side of the set, so that the audio stages form part of the oscillatory circuits. The operator is at earth potential, from the receiver point of view, so that as his body varies its position in relation to the receiver, the effective tuned circuit capacitances alter accordingly, with the result that stations cannot be pinned down to any definite tuning point.

34. With 32, describes 19 across.
35. See 12 down.

Clues down.

1. Chassis might be made of one.
2. Without these, DX would be lost in space.
3. With knobs on?
4. Pretty high resistance.
5. Describes a "hot" RX.
8. See 18 down.
9. Possibly a 5 down, abbreviated.
- 12 with 35 across. Should be prominent at club meetings (but not on the table!).
14. Sounds like the *nom-de-plume* of one opposed to DX'ing, but it is just like a mathematical term.
17. A call we do not wish to hear.
- 18 and 8. Type of 1 across.
- 22 and 26 down. A knowledge of them is useful when dx'ing.
24. Another pioneer.
25. A poor site might explain why DX this some fans.
27. On the shack floor?
28. Most fans make one of some circuit.
29. A field-day is one.

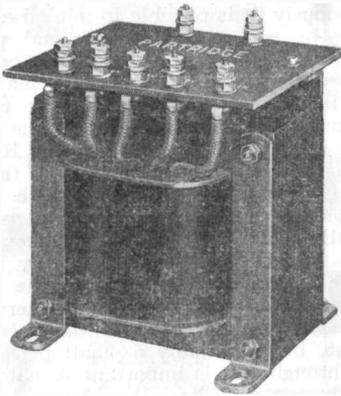
This puzzle is for amusement only.
Correct solution will be given next month.

Obviously, it is possible to minimise these effects by using an earthed metal panel, and a metal cabinet, but this is just begging the question, and in any case may not provide a total cure. It is best to try preventing the entry of RF into the audio stages at the detector, by inserting RF bypass capacitors, from either side of the RF choke in the anode circuit to earth. The best values can only be arrived at experimentally, but will be in the neighbourhood of 50 to 250 μF generally. Any single type filter can be compared to the shunt in a current meter; it provides an alternative path and by-passes most of the unwanted current, but invariably a small percentage gets through. It is important to note that these bypass capacitors should be returned, not to any old "earth" point, but to the negative side of the filament, or the cathode, of the appropriate valve.

Grid stoppers, that is to say resistors inserted in series between the control grids of the audio valves and their respective input circuits, often prove beneficial. Suitable values again seem to depend on the actual receiver, and usually range from 10 000 to 100 000 ohms. Any remaining instability can in most cases be taken care of by fitting an RF choke in series with the output anode and the headphones or speaker, with a bypass capacitor of around 300 μF between anode and earth, or by using parallel feed (choke output) to the phones.

COMPONENT REVIEW.

Partridge Transformers Ltd. We have received samples of their intervalve and output transformers, and smoothing chokes, from this well-known firm. Take any book of amplifier circuits, and the intervalve transformers shown will appear to be the same, apart from the number of tapping points, whether the amplifier is single-ended, class A, B, or A-B. In practice, the design of the actual component used makes all the difference between success and failure. As an example, many think that a transformer can be judged by the overall response curve; yet the leakage inductance and self capacitance may be different for each half of the secondary, resulting in the higher frequencies being unbalanced, while the overall curve indicates the transformer to be an efficient job. The Partridge intervalve transformer is specially wound with heavy gauge wire fully paper interleaved, and in consequence will stand a swing of 500 volts R.M.S. The response curve is practically linear between 30 and 15,000 cycles per second.



A Partridge product.

Speaker transformers are obtainable in all shapes and sizes. The formula for determining the correct turns ratio is well-known, and the correct ratio is really necessary if the optimum output is to be obtained. There are many other points to be considered, however, if high fidelity reproduction is desired. For instance, tapping points are undesirable especially when an appreciable part of a winding then becomes unused. The peak flux density, hysteresis and eddy losses, primary/secondary ratio of copper weight, etc., these are among the

points which have to be studied if a successful transformer is to be evolved. Anyone looking for a cheap transformer from Partridge Ltd. will be disappointed, but those wishing to acquire a quality product will be more than satisfied.

The theoretical symbol shows a smoothing choke to be just an iron-cored inductor. But there is really a little more in it when it comes to practical considerations. The passage through the choke of DC current lowers the effective permeability of the core, and the inductance too becomes less. The nominal or no-current inductance can be restored either by increasing the core section, not often very practical from the cost or physical size points of view, or by introducing a gapped core. The latter is not just a question of inserting any old gap, but involves quite a lot of calculation. Again, when used in a choke input circuit, there is a large AC voltage across the winding, and in consequence the choke must be soundly constructed and liberally paper interleaved. All such factors have been taken into account in the Partridge choke, but the price remains very moderate.

Two useful publications, the P.A. Manual at 2/6 nett, and the Amplifier Circuits at 2s. nett, can be obtained from Partridge Transformers Ltd., 76/78 Petty France, London, S.W.1.

Raymart. The SMU Utility Micro Drive marketed by Messrs. Radiomart of 44 Holloway Head, Birmingham 1, is not a war-time inspiration as the name would seem to suggest, but a component which was deservedly popular in the good old days. The construction appears to be exactly the same as then, with the sole exception of the dial, which now has, in our opinion, a somewhat inferior finish doubtless due to present conditions. The drive is of all brass construction, and gives two ratios, advertised as direct and 100.1. We were unable to obtain this latter figure with the samples in our possession, including a pre-war model, our best effort being 70.1, but the reduction is still ample for most purposes, and certainly for receivers. The reduction gear is of the epicyclic type employing three brass wheels, and there is an adjustable friction device enabling the tension to be suited to the stiffness of the driven component. Access to this involves no dismantling, just a matter of unscrewing the front knob. The dial is divided into two halves, each of 180 degrees, and can be mounted so that the

reading increases either with frequency or with wavelength. The cost of the unit, 8/9, is not high for a drive which can really be relied on.

We understand that certain price increases have recently come into effect, and readers contemplating purchases from Messrs Raymarts are therefore advised to apply for their latest price lists.

Denco. The cover illustration shows the new RF inductors now in production by Messrs. Denco, of Clacton-on-Sea, well known for their pre-war high-grade low-loss components for the amateur. We have received advance information and samples of these coils, and can assure the constructor that one firm, at least, is going to put out some really good gear. The Maxi-Q coils, as they are known, are wound on polystyrene formers, and can be supplied in two types, for single hole chassis fixing or fitted with pins to plug into the standard international socket. These formers will also

be available in both types, plain or threaded, for the constructor who prefers to do his own winding. The high performance which is obtainable with these coils is due, apart from the low-loss former, to the use of high-permeability dust cores, which are adjustable for matching purposes. The range now in production is designed for use in superheterodyne receivers, but further ranges will be available for T.R.F. receivers using a 100 uuF max. tuning capacitor, and a range without dust cores for use on frequencies between 25 and 200 Mcs. tuned by a 25 uuF max. capacitor. Limited space prevents us giving further details now, but in view of the possibilities envisaged by these coils we propose to devote a page in our next issue to a complete description. We are informed that Denco products will be exclusively distributed by Messrs. Tele-Radio (1943) Ltd. of 177 Edgware Road, London, W.2.

Soldering For the Beginner.

By 2FWB & 2ATV

Shall I solder it, or clamp the wire under the terminal? The novice is always coming up against this question, and too often, alas, the result is a bad joint. Terminal connections have the bad disadvantage that the area or wire in contact is extremely small, and eventually the wire becomes tarnished, resulting in a high resistance joint. On the other hand, when the beginner makes an attempt at soldering too often the result is disappointing. Actually, soldering is quite simple, providing that the principles are thoroughly understood; here lies the reason for most failures.

First, let us consider briefly the necessary tools. Where the supply allows, an electric soldering iron is undoubtedly the best type to use, as it does not tend to overheat, and is moreover far cleaner. Fig. 1 shows a well known make, the SOLON industrial type with pencil "bit," and a consumption of only 65 watts. The pencil bit is particularly useful in confined spaces and for instrument work, but this iron is also

obtainable with the standard bit where this is preferred for general use.

If conditions allow only the use of an ordinary iron, then it is best heated by gas. A coal fire is to be avoided if at all possible, as it will almost certainly cause the iron to become dirty, and make frequent re-tinning of the bit essential. In this respect, a good idea is to put an old cocoa tin, or piece of scrap tube, in the fire, and to insert the iron into this. The bit is at the correct temperature for soldering when the heating flame becomes tinged with green.

The purpose of the iron is to convey heat to the required point, for the work to be joined has to be at the same temperature as the molten solder. Many beginners do not realise this; they think that the iron is used just to melt the solder, and as a result remove the iron too quickly, thus causing a "dry" joint to be formed. Too much heat, on the other hand, will "burn" the solder and also result in a bad joint.



Fig. 1

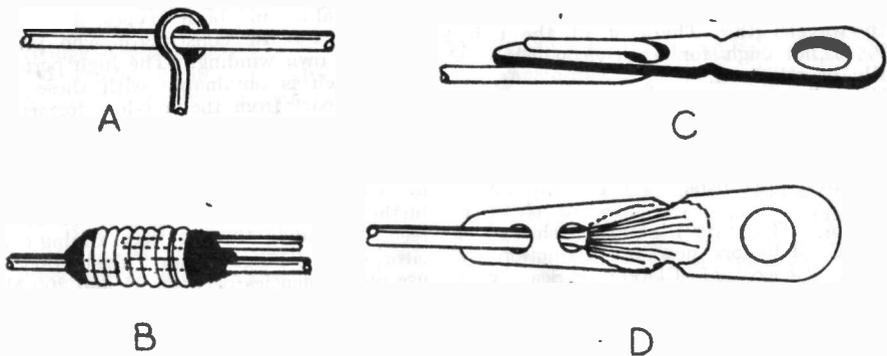


Fig. 2.

The correct procedure is to thoroughly clean the metal concerned—for dirt is fatal—apply a coating of flux, of which more later, then bring the “bit” into contact with the metal at the desired point. Next the solder is applied, and the iron left in contact until the solder flows freely. The joint is left to cool naturally, after which any surplus flux is removed with a rag.

Now let us consider the flux mentioned earlier. When metal is heated, a coating of oxide is formed on the surface, and the presence of this would prevent the solder and metal amalgamating. The source of the oxygen is the atmosphere, and the remedy is to exclude all air from the joint, which is done by coating it with flux. For radio purposes it is essential that the flux used should be non-corrosive, hence fluxes like “killed spirits” are barred. Recommended are Fluxite and Coraline Paste, while for fine wires—such as those used on coils—resin only should be applied. Resin cored solders, of which B.I., Solon, and Ersin “Multicore” are examples, are probably the most convenient form of solder to use, but it should be realised that the metals to be joined must be really clean, and also that on no account should the solder be carried to the required position on the iron itself. This will succeed only in burning up the resin before it has accomplished the purpose for which it is intended. The iron should be applied simultaneously to the solder and to the joint, so that the resin flows over the joint before the latter has a chance to become oxidised.

Now for a word or two about “tinning” the iron. In order to pass on heat to the joint efficiently, it is necessary that the iron itself should not become oxidised, and this is achieved by giving it a coating of solder. The iron is heated until it will just melt

the solder, and is then cleaned with an old file or by rubbing on a piece of emery paper, after which it is fluxed and the solder allowed to flow over the “bit.” This coating will last until it is either overheated or becomes spoilt with burnt resin, and to prolong the time it is a good plan to wipe the “bit” after making each joint, with an old piece of rag.

So far we have been considering the process, but it is equally important that the function of soldering should be understood. Primarily, the aim is to achieve electrical continuity in the wiring concerned, the jointing effect of the solder being incidental in the sense that for the actual strength of the joint we rely mainly on it being a sound joint mechanically. For example, when making a butt joint, the correct procedure is to make a loop in the end of one piece of wire, then close it over the other wire with pair of pliers, and finally solder, as in Fig. 2A. A very sound method of joining two or more wires, which is used commercially, is illustrated in Fig. 2B. Here a length of fine wire, around 22-26 SWG, is wound around a wire or rod of convenient size to form a sort of tube, and cut into small lengths. The ends of the wires are then inserted and the whole soldered together. When connecting to a soldering tag, the wire should be inserted in the hole provided, and bent over and closed to form a tight joint, then soldered, as in Fig. 2C. When soldering stranded wire to a tag, it should be inserted through the hole, and each strand laid flat, as in Fig. 2D, to obviate the possibility of one or more strands being soldered unsatisfactorily. This is especially important in the case of a coil wound with Litz wire, and any other wiring at R.F. potential.

Club News of the Month.

BRITISH SHORT-WAVE LEAGUE Bath Chapter (Bath Radio Club)

A new series of meetings is scheduled to commence early in the New Year, being held as previously at the School of Economic Science, 4 Wood Street, Milsom Street, Bath. Meetings will embrace discussions, demonstrations, comparison of logs and plans are under way for the construction of a club transmitter. Regarding the latter, this will form the chief part of the immediate future activities, and the club will offer co-operation to any hams requiring tests of a general or special nature. Although many of the members are now in the Services, it is felt that the club has a promising future, and local readers are invited to write to the Secretary for fuller details of future programmes.

Secretary: W Welsman, BSWL 951, 40 Newbridge Hill, Bath.

Birmingham Chapter

Newly formed, the Birmingham Chapter is progressing in a very satisfactory manner and will be holding the First Annual General Meeting on Monday, January 7th at the "Hope and Anchor Hotel," Edmund Street, Birmingham. The meeting will commence at 7.45 p.m. and a steward will be in attendance at the door to direct members and visitors to the appropriate rooms. Normal meetings have been held at the President's QRA and will no doubt continue to be until such times as a permanent HQ can be obtained.

Secretary: G. Hodgkiss, BSWL 1938, 30 Towyn Road, Moseley, Birmingham, 13.
Liverpool Chapter (Liverpool Short Wave Club)

The Liverpool Short Wave Club ceased all activity in October 1939, but now that conditions are becoming more favourable it is proposed to reorganise at the earliest opportunity. The nucleus of the new club has been formed and it consists of about a dozen supporters, three of them licensed hams. As soon as club rooms become available it will be a case of "full steam ahead."

Secretary: B. G. Meadon, BSWL 1473, 10 Alfriston Road, West Derby, Liverpool, 12.

London Chapter

Regular weekly meetings are now being held at Senior Street School, Paddington, W.9, from 7.30—9.30 p.m. every Monday. Recent highlights have been a Query Bee (November 12th), won by R. Rous with G. Grounsell being a close second; a Pictorial Quiz on November 26th, in which T Vallard excelled himself; and a demonstration on "Oscilloscopes" by A. H. Burkill on December 3rd.

It is hoped to supplement these London meetings by the formation of a local chapter for South London members, details of which will appear in due course.

Secretary: N. Stevens, BSWL 1039, 53 Madeley Road, Ealing, W 5.
Teeside Chapter (Teesside Radio Society)

Although formed during the war, this Chapter has quite a strong following and is holding meetings at Central Garage, Billingham-on-Tees, although the secretary is keeping an eye open for more suitable headquarters. A club library has been formed and activities include lectures, discussions, Query Bees, morse instruction and so forth.

Secretary: H. Sambrook, BSWL 1676, 38 Westland Avenue, Norton-on-Tees.

EDGWARE SHORT WAVE SOCIETY

Throughout the war nearly all the old members have kept in touch with each other by means of the Letter Budget, which is passed on with an entry in the form of either a letter or photographs. The scheme was suggested and managed by G2QY, who has been presented with the club's "Enthusiasts" cup. All the letters are to be preserved, to form a record of the club's war effort. Since meetings started again last August, the membership has reached a total of 53, plus a considerable number still in the forces. Meetings are now held on the first and third Wednesday of each month, at the Constitutional Club opposite the Ritz Cinema, Edgware, where prospective members will be welcomed. Recent activities include a film show on "Radar," lectures and demonstrations of the "Panoramic" and communications receivers, and an unusual junk sale. Future meetings will take the form of a Discussion Night, an All-comers Quiz Night, and a T.C.C. lecture. A first-class technical library has been formed, with a nucleus of 20 good books, miscellaneous data sheets, and copies of QST and the Bulletin. The Society has its own magazine, and later on hopes to equip a workshop and HQ station.

Chairman: P. A. Thorogood, G4KD, 35 Gibbs Green, Edgware.

ROMFORD & DISTRICT AMATEUR RADIO SOCIETY

Formerly known as the Chadwell Heath Amateur Radio Society, this society was formed in 1936, changing its title to the present one in 1938. After several years of difficulties, the society gradually gathered strength and by 1939 had a membership

of some 35, including 15 A.A.'s and 10 full calls. Pre-war activity centred largely round field-days and the society achieved signal success in this direction. During the war years the efforts of a few members has kept things going, although it has been no easy task. Now that members are returning from the services, and amateur radio generally is showing signs of returning to normal, a determined effort is to be made to build the society up to its pre-war strength. Already over 20 members are giving their support and it is hoped that many more will follow suit.

Meetings are now being held every week at 8.30 p.m. at the Y.M.C.A., Red Triangle Club, North Street, Romford. It is hoped to move into new quarters in the near future, when it is proposed that a workshop be fitted up and the clubs transmitter (G4KFP) rebuilt in preparation for offensive operations in the National Field Day! Lectures will be arranged as soon as practical, and morse instruction is now under way for members wishing to apply for their tickets. The secretary points out that guidance and co-operation will always be extended to the lesser-experienced and the society welcomes the opportunity to lend a helping hand.

Secretary: R. C. Beardow, G3FT, 3 Geneva Gardens, Whalebone Lane North, Chadwell Heath, Essex.

SOUTHEND & DISTRICT RADIO & SCIENTIFIC SOCIETY

This society intends to resume activities as soon as possible and will devote its in-

terests to radio and allied scientific subjects. This was announced on Monday, November 19th, by the President, Mr. H. H. Burrows, J.P., at a special meeting of the members.

Secretary: J. M. S. Watson, G6CT, 23 Eastwood Boulevard, Westcliffe-on-Sea, Essex.

THE WORLD FRIENDSHIP SOCIETY OF RADIO AMATEURS (U.S.A.) (BRITISH SECTION)

This society, whose motto is "Look Upward and Forward," was founded in 1935 by three radio amateurs, and since then has, through the joint efforts of its representatives and members, achieved considerable success. It is now looking forward with confidence to a new era of prosperity.

The objects of the society are: (1) To promote and foster the "Ham" spirit of friendship by radio, personal contact, and correspondence. (2) To enrol in this work Amateur Radio enthusiasts of whatever nationality, creed, or colour. (3) To write letters of good cheer to brother Hams and others who are crippled or invalids. (4) Ultimately to extend the good work of this society to all parts of the world.

The Honorary Secretary is pleased to report that the membership includes enthusiasts from most of the well-known radio societies, and he extends a welcome to any reader who may happen to be in his neighbourhood. An appointment is advisable. Full particulars of membership, which is granted free in the case of blind, crippled or invalid applicants, is obtainable from the Hon. Sec., G6AQ, 35 Bellwood Road, Waverley Park, Nunhead, London, S.E.15.

A BED-TIME STORY.

"By Veteran."

Once upon a time, so they say, there lived an eccentric Old Man who spent most of his existence in a shack. From this abode emanated the most weird and awe-inspiring noises, resulting in a general exodus from the neighbourhood. For months and months no one had ventured near this place, until one fine day the postman was called upon to deliver a letter, or to be more correct a postcard, on which was inscribed what appeared to be hieroglyphics of, apparently, Chinese origin. Having very gently eased the card through the letter-box, with exceptional care so that it should not become creased or otherwise damaged, as required by the regulations, the postman beat a hasty retreat to the gate. There he was halted by the sounds of intense activity coming from the shack.

Looking nervously around, our friend was greeted by the sight of the Old Man, postcard in hand, tearing down the garden path in a state of furious excitement. Before the postman could reach the gate and safety, the Old Man descended upon him, waving his arms and visibly foaming at the mouth. "It's a QSL," blubbered the Old Man with uncontrollable emotion, "the first one for two years." Observing a blank and rather pitiful expression on the postman's face, he explained, "You see, OM, this is vy fb. I'm a Ham!"

Our mailman, obviously deciding to be tactful and to humour this strange individual, replied with much cordiality "Congratulations! I am a Poached Egg!". As can be imagined, a rather embarrassing silence prevailed for some minutes, but the

postman was now becoming engrossed in his new acquaintance, and he therefore engaged him in a long conversation, from which were gleaned the following facts.

Apparently, the Old Man sported various names, such as Old Boy, Old Timer—though he could not have been more than 20—DX Hound, SWL and so forth. But whatever you chose to call him, he was emphatic about being an "Incurable Ham." His audience murmured something about how sad it was for one so young, but that in time things might improve a little. This Being-a-Ham business appeared to be very complex, and evidently one of the main qualifications was patience, with benevolence a close second. One of the well established customs, he found, was to compile a list of addresses of fellow Hams (or SWL's—he would never decide which!), and to send each one of them a postcard. To obtain the greatest effect, these cards should be inscribed with as many queer letters, figures, dots and dashes as can reasonably be printed on the space available. It is not necessary to be able to understand what these mystic signs indicate, as long as they look impressive to the Layman. Something about "Experimental Station" or "Monitoring Post" should be displayed in a prominent place. The idea, seemingly, is for the recipient to return the compliment, but using his own ideas as to best rendering mysterious such cards. However, this rarely happens and is where the Patience part comes in. When it does come off, there is much rejoicing at the appropriate shack, followed by the sending out of another batch of cards. Hence the Benevolence previously referred to

The Old Man explained further that "in the game we call them QSL's," and that the main advantage is that no end of money could be saved, as these cards made exceedingly pretty wallpaper. And then, of course, they entitled one to be called a Ham. Asked by the postman if there was any specific reason for the mass-mailing, the reply was that, as far as the Old Man knew, there was no actual reason. He had never really thought a lot about it, but it was most probably a tradition handed down from the Pioneers. The question "Hasn't it something to do with radio?" stumped the Old Man, but after deep consideration he remarked that he had an idea that it was connected in some vague way, and that he would look it up. After studying the card in his hand for some minutes, he exclaimed "I believe you are right! It most distinctly says 'To radio SWL' at the top. But then that doesn't mean a lot, for they all say that—it's part of the custom."

Suddenly the Old Man raised his eyebrows, and, effervescing with excitement, pointed out that the inscriptions on the card bore a remarkable resemblance to a radio report. He said that he was certain of this as, years ago, he had himself been interested in radio and had sent out similar reports, though he had never known that cards could be used for this purpose. He did admit, now, that at a pinch they could be so used, but explained that in any case he gave up sending out reports as he never received any replies. "I always gave the station R9 plus to be on the safe side," he moaned, "and what's more I gave full details of my receiver, and how many countries I had heard. I used a 9 valve superhet but invariably quoted an O-v-O, and once or twice I even mentioned that the weather was poor. Even then there were no replies, so I gave it up."

Thus was heard the story of injustices to a radio fan, who had, despite opposition, risen from SWL to Ham, and who kindly explained that his motto was "Perseverance is the key to success." It suddenly occurred to the Old Man that, though he had been talking for hours and opening his heart, he yet knew nothing about his newfound friend. The reply received on asking if the postman had a hobby is reproduced here word for word, and should go down to posterity; at least, the Old Man is never likely to forget it!

"Oh, yes! I have a great hobby too! I AM A RADIO HAM, used to work QRP on 40. My call is G9XX, and I used to receive QSL cards, too. Have a look at that one in your hand, it's one of mine and I sent it you in the hope of meeting you and learning something more about Hams. I have! Good evening, Old Timer, pleasant swapping!"

The moral of this bedtime story? "Call a Spade a Spade—and not a Rake!" Good-night, Children!

Answers to microphone Quiz.

(1) Studio work. (2) Crystal microphone. (3) Assets: Frequency response is good and has low noise level. Disadvantages. Expensive, has low output, a high impedance, is bulky, a polarised potential is necessary and the small clearance between plates makes maintenance difficult. (4) The Transverse Current type has a higher impedance and a lower output, but the frequency response is much improved over the button type. (5) About 1/10,000" thick. Usually of aluminium foil. (6) A combination microphone consisting of two or more basic types. (7) Low output. There are two types of crystal microphones, the Diaphragm type and the Sound Cell type.

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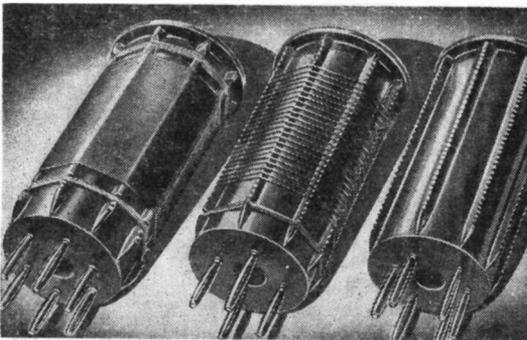
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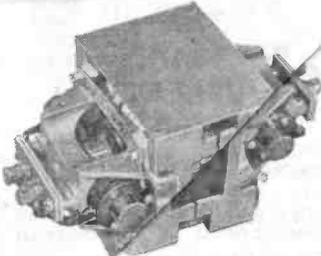
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