SHORT WAVE NEWS

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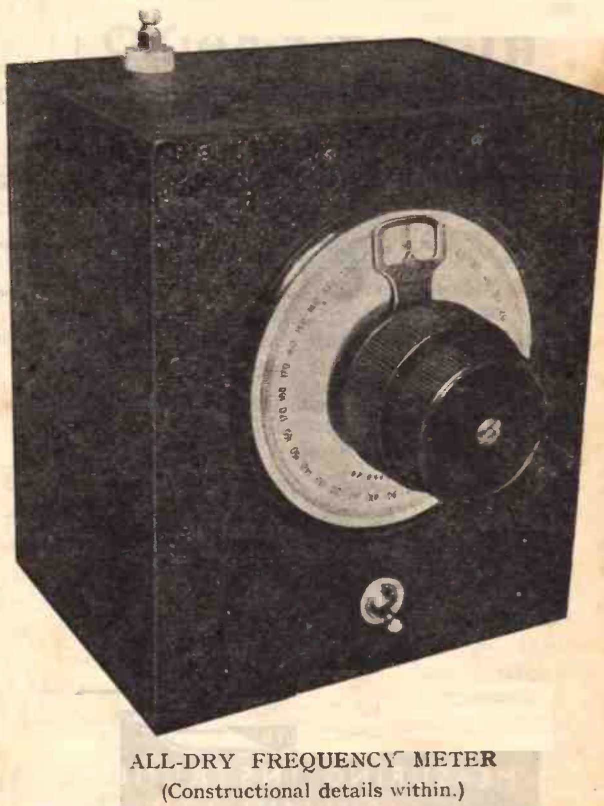
In this Issue :



ALL-DRY FREQUENCY METER
(Constructional details within.)

A SHORT WAVE PRESS PUBLICATION.

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SHORT WAVE NEWS

Vol. I. No. 2. **Annual Subscription, 16/-.** **February, 1946**

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First Impressions and Future Plans. EDITORIAL

This editorial is being written just after reading the first batch of letters from readers of our number one issue. It is very apparent that we have managed to fill a gap, in the literature available for the short-wave enthusiast, which has remained vacant for far too long. We wish to thank all those who have written wishing us success. It should be pointed out though, that whilst we realise that we have made a creditable beginning considering the difficulties of starting a new periodical in these trying days, the magazine in its present form is far from the type of publication we hope eventually to produce. Our main difficulty at present is the very meagre allocation of paper granted to new periodicals, and we owe a debt to our printers for doing so well with what we get. As the paper situation eases, so will the magazine increase in size. Already, we learn of the possibility of a little larger paper quota in the very near future which should enable us to add another four pages to each number, and to increase our circulation somewhat. We are now, too, receiving material for articles which we feel sure will make the Short Wave News really good value for money. In this connection, we hope our readers will write to us and let us have their views. Readers' correspondence is the only really reliable guide an Editor has to the views and requirements of those readers, so please do not hesitate to write us.

THE NEW TRANSMITTING REGULATIONS. The most interesting feature about the new licensing regulations is that the "experimental station" designation has been dropped, and in its place there has been substituted "amateur radio station." As we pointed out in our first editorial, this step has been long overdue and it is good to find the authorities taking the opportunity of a new "beginning" to initiate this alteration in status. The frequency allocation to begin with will be 28,000 kcs.—29,000 kcs. and 58,500 kcs.—60,000 kcs. Those who held a pre-war radiating licence will be permitted to use up to 100 watts on the first of these bands and 25 watts on the second, phone or C.W. Those with an A.A. licence will be limited to 25 watts on both bands, C.W. only at first. Operation on the other internationally allocated amateur bands will be allowed when such bands can be released by the military authorities. The issue of licences to new applicants is still under review at the time of writing these notes. Such applicants will be required to satisfy the Postmaster-General as to their technical qualifications and morse proficiency, either by passing the City and Guilds of London Institute "Radio Amateurs" examination or by reason of exempting technical qualifications—a list of which will shortly be published. We hope to give details of the "Radio Amateurs" examination in the very near future. A.C.G.

My Favourite Short Wave Receiver.

(BSWL 579)

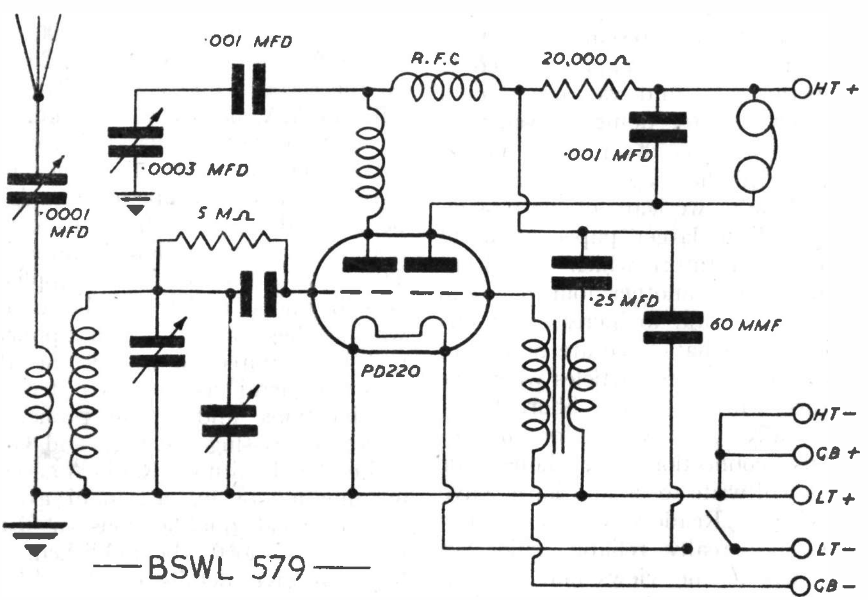
This is the second of the series of articles describing favourite receivers used by our readers, to whom the block of the theoretical circuit is presented. Contributions are invited on this subject, consisting of some 500 words and circuit drawing.

This month we present the Duo-One owned and constructed by Harold Lister of Pocklington, York. As he says, there is really nothing remarkable about this set from the technical point of view, but there is the satisfaction of getting something for nothing, in the sense that this single-valve receiver does give two-valve performance.

The receiver was built from surplus components, on a chassis measuring 8 inches by 7 inches, with 2½ inches under the chassis. These dimensions are ample, and allow for future alterations and/or additions. The values shown for the various components do not seem to be very critical. Reaction is quite smooth. In the writer's case, it was found necessary to use an additional series capacitor—a piece of flex twisted round the lead-in—when connected to an 85 feet inverted L aerial, in order to remove one or two "dead" spots. This would not be needed with the average aerial. It was also found that best results were obtained when LT+ was taken to earth, instead of LT— as is more usual. Some little time was spent experimenting with different combinations for the grid leak and capacitor, in order to get as smooth reaction as possible..

The RF choke was wound on an ebonite former ¾ inch diameter, with 150 turns of 36 swg. DSC wire, these being pile wound in five sections. All components with the exception of the tuning capacitors, coil, and valve were mounted underneath the chassis. A 120 volt H.T. battery is used, it being found that reaction is difficult to obtain with less than 100 volts; 1½ volts grid bias is applied to the audio section.

The receiver has given a very good account of itself, and many DX signals from all parts of the world have been logged. H. Lister ends by suggesting that this circuit would form a good foundation for a more selective receiver having a tuned RF stage, and also has possibilities as a portable for Field Day use.



On the Ham Bands.

Conducted by "CQ"

As this article is being penned, good news is filtering through from all quarters concerning the restoring of amateur transmitting facilities. The latest information to hand is as follows:—

Eire: The order prohibiting transmission has been revoked and Eire's 53 pre-war amateurs are now permitted to operate.

Switzerland: Amateur transmitting equipment has been returned and ham activities were resumed on September 30th.

Colombian Republic: Governmental decree authorised amateur operation, subject to pre-war regulations, from October 9th.

U.S.S.R.: Activity on all amateur bands was authorised on October 12th and contacts were not restricted to domestic limits.

Australia: Equipment has been returned by the authorities and amateurs have been released from their wartime silence.

Trinidad: VP4's may operate on any pre-war band (including 7 Mcs. phone) according to a report from VP4TI (via W2NYC).

Brazil: Amateur operation has now been re-established.

U.S.A. and Canada: Authorisation of amateur activity on 28 Mcs. and higher frequencies. A letter from Ed. Fraser, W1KQY, states that W's expect the return of all bands early in the year.

And that is most of the information to hand at present, but next month, and in subsequent issues, we hope to be able to give more news as it is released from authoritative sources.

● **28 Mcs.:** Although we are now passing through the "dead" period of reception for this band, patient listening will bring forth quite good results and some surprising DX catches. After November 15th, the official day for the resumption of W and VE activity, and up to early December, all districts of the U.S.A., except the 7th were heard. All Canadian districts, except the 3rd and 4th were also logged. It was quite common to log as many as four dozen W's and a few VE's between 1300 and 1700, particularly on Sundays when the band teemed with signals. The most sought-after DX of the band, as far as the W's were concerned, appeared to be EA1D (ex-W9JGQ in Madrid). During the later part of December the band has been very disappointing, often completely dead, with only a few weak carriers struggling through. It would seem that we must wait until late Spring before the interesting DX possibilities of this band can be probed again.

● **14 Mcs.:** This band has proved most enlightening and the least said about some of the calls heard the better! Those with more likely sounding calls have been PY7AD, 6AW, 7UD; HK1AB; U3AT; LU8EE; numerous HB9's, etc. U3CY was also heard, very clipped in his QSO's and giving his QRA as "near Moscow" only. VK9XE was logged one day, but we do not feel very happy about his authenticity! Amongst the "probably genuine" calls, the following prefixes have been entered in the log book: LA, F, OK, PA, I, LX, LZ, ON OZ, SM, OH and XU.

Doubtful stations have been TA1XA (shades of pre-war TA1AA!—Ed.), OY3C, ZC4NX, VQ4ZL, VQ4MIL, etc.

● **Portable:** And with an accent on the P! In other words, have you heard W9VND flitting around the Mediterranean? Here is a resumé of his activities on 14 Mcs. as recorded here: He was first heard operating under the call of AR7VN, when he was located at Latika, Syria. After being QRT for a few days, he re-appeared using the call W9VND located at Haifa, Palestine. This was an Anglo-American station operated by W9VND himself (Oscar Jaeger) and G6ZY. After a few days the station, operating on phone/CW, was run entirely by G6ZY. Later on, Oscar himself again appeared on the scene—this time using the call ZC4VN. The latest mention in the log book is when he appeared off Malta using the call ZB1VN! What's the betting that he is now in Timbuctoo with the latest in callsigns! Incidentally, from the very first QSO, 9VND has asked that all QSL's be sent to his Call Book address, all of which will be answered when he reaches home.

● **7 Mcs.:** Well, to put it mildly, this band is most certainly in need of a good clean-up! We have broadcast stations, service stations and lastly, the most wonderful collection of pirates imaginable! Taking the prize for "spitch" are certain French "experimental stations," as they term themselves, modulating well over 100 per cent. with fatal results! Europeans, some may be genuine, may be heard by the dozen and OZ, ON, LA, SM, EI, HB9, etc., have all been heard. Some of the queer calls have been GD4AA, GC1AA and G9YL.

Have you heard YM7N calling CQ 40 metre phone? If not, then you have missed the opportunity of nostalgic memories of the North country, for 7N's fascinating Danzig-cum-Yorkshire accent is a treat not to be missed!

● **3.5 Mcs.:** Not much activity has been noted on "80," although one or two stations have made themselves heard through the severe service QRM. PAOAF is about the best signal, and various I, HB, OZ, ON and SM calls have been logged.

● **This page:** The idea of this monthly feature is to present, in as interesting a form as possible, a cross-section of the month's listening on the ham bands. Like my colleague "Monitor," I must rely, to a certain extent, upon logs and comments contributed by readers of the magazine. We need details of conditions, DX heard, tips on rare stations, notes on the QSL position, and so forth. It should be noted that readers should send their logs on a separate sheet of paper to any accompanying letter, with CW stations and phone stations listed separately and preferably in alphabetical order of callsign. May we add that lengthy logs are not in themselves so very essential unless they are accompanied by useful data. Incidentally, please record the times of reception for out-standing "catches," and, if a member of any listening organisation, quote your identification number. Logs for each ham band should also be listed separately.

Please address all communications to: "CQ," 10 Orchard Lane, Pilgrims Hatch, Brentwood, Essex.

That is all for this month, and so vy 73 and DX!

Physical Society's Exhibition.

The thirtieth Exhibition of Scientific Instruments and Apparatus held by the Physical Society at the Imperial College of Science and Technology, South Kensington, London, on January 1st-3rd, must have been one of the best attended of any of this Society's excellent exhibitions. This year's exhibition was simply packed with interesting equipment which was eagerly viewed by a great crowd of visitors. Radio naturally was well to the fore and some of the exhibits in this field were extremely interesting indeed. It would be quite impossible to do justice to this exhibition in the short space available here, so we will content ourselves with mentioning that to judge from enquiries made at some of the trade stalls, there would be no dearth of both transmitting and receiving valves suitable for amateur use on the higher frequencies. Of particular interest to the amateur were the range of quartz crystals for frequency control units hermetically sealed in glass containers mounted on B7G type miniature valve bases, to be seen on at least two trade stalls. These crystals are quite suitable for 14 Mcs. and one manufacturer's representative informed us that his firm were considering marketing a suitable crystal of this type for amateur use. A very nice aerial change-over relay suitable for the amateur station was also on show. We hope to describe these pieces of equipment in detail in the near future.

Solution to Crossword No. 1.

Across:

(1) Aerial. (4) Meters. (6) Anode. (7) Leaf. (9) Skip. (10) Electrons. (11) Yard. (13) Spar. (15) Storm. (16) Lamps. (18) Earth. (21) Beams. (23) Drill. (24 and 20) Apple-ton. (26) Tram. (28) Page. (30) Amplitude. (31) Mast. (32) Tube. (33) Rouse. (34 and 32) Single-tube. (35) Spirit.

Down:

(1) Alloy. (2) Layers. (3) Control. (4) Megohm. (5) Super. (9) SSS. (12 and 35 across) Amateur-spirit. (14) Antilog. (17) SOS. (18 and 8) End-fed. (22 with 26) Optimum-times. (24) Ampere. (25) Eludes. (26) Times. (27) Mat. (28) Pet. (29) Event.

Receiver Types and Properties.

Types

Receivers used for short-wave reception can be divided into three main groups, each of which can be interpreted in many forms. They are (1) the Straight receiver, (2) the Superheterodyne, and (3) the Super-Regenerative receiver. The actual circuit chosen will depend on the performance required, and this will vary according to the individual, but in general *performance* can be expressed as the efficiency of the receiver in regard to certain functions.

Sensitivity

This is the ability of the receiver to detect radio signals and to render them intelligible, and is thus an expression of the overall amplification. It is given as the strength of signal in microvolts which must be applied to the aerial and earth terminals of the receiver to produce a given audio output. The sensitivity will vary according to the frequency to which the set is tuned, and this frequency must therefore be specified if the figure is to have any value, as also must be stated the audio output figure. This latter is usually taken as 50 milliwatts where the output is fed into a loudspeaker, and a much lower value—of the order of six milliwatts—where headphones are employed. In the case of telephony, the input signal is assumed to be 30 per cent. modulated by a pure sine wave of 400 cs. In the case of telegraphy, an output level of one or two milliwatts is often chosen.

The modern "communications type" receiver often has a sensitivity of better than one microvolt, and is capable of receiving any signal greater than the inherent receiver noise. When measuring sensitivity, the receiver controls should be set for maximum response and the injected signal applied through a standard "dummy aerial." This consists of a non-inductive resistor of 400 ohms. for the short-wave bands, and for the medium and long waves an inductor of 20 microhenries, a capacitor of 200 micro-micro-farads, and a resistor of 25 ohms., all in series.

Selectivity

The greater the sensitivity, the greater the required selectivity—i.e., the ability of the receiver to reject unwanted signals. The greater the number of tuned circuits in a receiver, the greater the selectivity, assuming a given selectivity for each tuned circuit.

Selectivity is measured by injecting signals of various frequencies on either side of the frequency to which the receiver is tuned, and measuring the voltage of the signal required to give a constant output in each case. In other words, the sensitivity is measured at various frequencies off resonance, and a curve is plotted from the figures so obtained. Fig. 1A shows a typical response curve taken from a superheterodyne receiver with sharply peaked I.F. circuits, and Fig. 1B shows a curve from a similar type of receiver in which the I.F. circuits are "staggered," i.e., they have bandpass characteristics. It will be observed that curve A, while possessing much better selective qualities than curve B, and from the point of view of reception of CW on a crowded amateur band is thus the better, will be at a disadvantage if the incoming signal is suffering from frequency drift, and will also be at a disadvantage in the matter of fidelity.

Fidelity

This refers to the relative ability of the receiver to reproduce accurately the range of audio frequencies modulating the carrier being received. It can be indicated by a curve, drawn on a logarithmic scale, and showing the decibel variation in output with a constant R.F. input modulated by various audio frequencies, the depth of modulation being reasonably constant. It should be noted that the speaker used, or headphones, can have a profound effect on the results. Such a curve is shown at Fig. 3.

Stability

The stability of a receiver is most important, being, in effect, the ability to remain tuned to resonance to any given signal of constant frequency. Apart from bad circuit design, bad stability can be caused by both electrical and mechanical faults. Stability will be adversely affected by bad voltage regulation, "dry" joints, the wiring in R.F. circuits not being rigid enough, and so causing variations in circuit capacitances, by the use of components having high temperature co-efficients, by temperature variations, and inefficient screening among other factors.

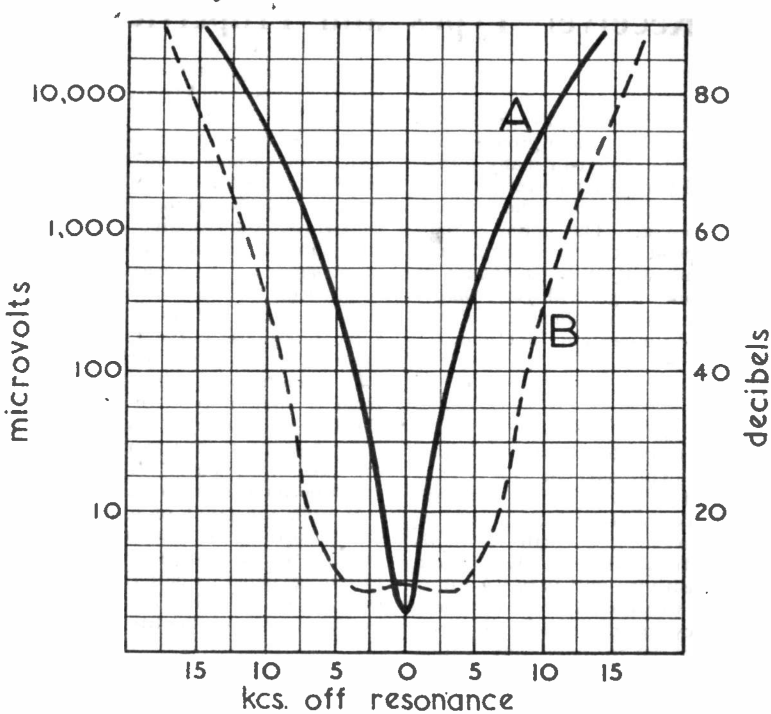

10,000
1,000
100
10
microvolts
80
60
40
20
decibels
A
B
15 10 5 0 5 10 15
kcs. off resonance

FIG. 1.

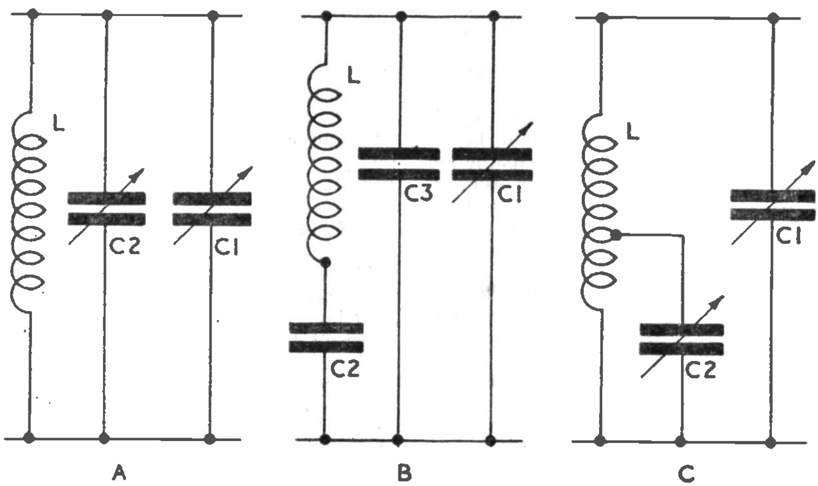

L
C2
C1
A
L
C3
C1
C2
B
L
C1
C2
C

FIG. 2.

Signal/Noise Ratio

Apart from external noise picked up by the receiver, every set generates a certain amount which gives rise to a constant background "hiss." However sensitive the receiver, a signal is useless unless it can be read above the noise background, so that the signal to noise ratio, as it is termed, is an important factor, and especially so on the amateur bands where low power transmission is general. Man-made static, such as car ignition interference, which consists of high amplitude peaks of very short duration, can be greatly alleviated by the use of noise limiter and suppressor circuits. Atmospherics can be eased by the use of aerials having marked directional properties, as, for example, the Bruce Inverted "V." Both forms of static cover a very wide frequency range, appearing in practice to be untunable, so it is obvious that if the selectivity of the receiver can be made such that the bandwidth is sufficient only to pass the range of frequencies necessary for intelligible reception, then the static received will be minimised accordingly, and the ratio improved. The noise generated in the set itself can be divided into two groups, the first including such items as mains hum, crackling, microphonic howling, excessive hiss from the beat frequency oscillator and/or mixer stage, etc. These faults can be traced to either bad design or faulty components. The second group consists of two items, the first being the noise due to thermal agitation—that is, the movement of electrons in the various circuits causing minute voltages to be set up—resulting in a constant background hiss. The second item arises in the valves and is known as "shot effect." This is due to the electron flow in the valve being irregular, and can be dealt with only by improvements in the design of valves. It is useful to remember, though, that valves with a high mutual conductance are usually best from the noise point of view. Dealing with receiver noise, that generated in the input stage is the most important, as here the signal/noise ratio is at its worst. Summing up, the best signal/noise ratio will be achieved by the use of as efficient an aerial/earth system as possible, coupled with the use of high quality components and valves having low noise characteristics in the input circuits of the receiver.

Tuning Range

It is not possible to cover the whole frequency range required with a single L/C combination, as the variation in capacitance would have to be excessive, and the tuning correspondingly sharp. The problem is overcome by having several ranges, with the same tuning capacitor, or set of capacitors, being used on all ranges, and the coil or coils varied according to the range in use. Commercially, the most favoured system is that employing a switch, which inserts the appropriate inductors in circuit, often short-circuiting the remainder to prevent absorption losses. In the cheaper receivers, the switch is used to vary the inductance of tapped coils. The majority of amateurs favour the use of plug-in coils, which—though more unwieldy from the handling aspect—has an advantage in that the circuit wiring can be cut to a minimum, resulting in lower losses and an extension of the high frequency range covered with any given inductor.

Tuning

Even with the smaller tuning capacitors used in short-wave receivers, the frequency range covered by any one L/C combination is much greater than the whole of the medium waves, and tuning therefore is correspondingly more sharp. For ease of tuning, a slow-motion drive is essential, preferably one of the dual-ratio type, or having a flywheel incorporated so that if necessary the receiver can be quickly switched over from one end of a band to the other. It is important that the drive used should not suffer from "backlash," that is, slip in the motion causing the logging point to vary according to the direction of rotation of the tuning knob.

Bandspread

Usually, the short-wave listener is interested mainly in certain bands, either the broadcasting bands or those allocated to the amateur. More rarely, he is interested in both, but in any case it is obviously convenient, and results in easier tuning and logging, if it can be so arranged that the band in use at any one time is spread over as much as possible of the tuning dial. Fig. 2 shows three methods of bandspreading, as it is called.

Fig. 2A illustrates the system most commonly employed. The circuit consists of the inductor L tuned by C1 and C2 in parallel, C1 being the bandset capacitor of, normally, around 150 uuF and C2, the bandspread capacitor of some 15 to 25 uuF. The setting of C1, plus the minimum capacitance of C2 and the circuit capacitance, will determine the maximum frequency to which the circuit will tune. Similarly, the minimum frequency will be decided by the additional capacitance which can be added to the circuit by setting C2 at maximum capacitance. Unless special inductors are used for each band, it will be found in practice that the lower

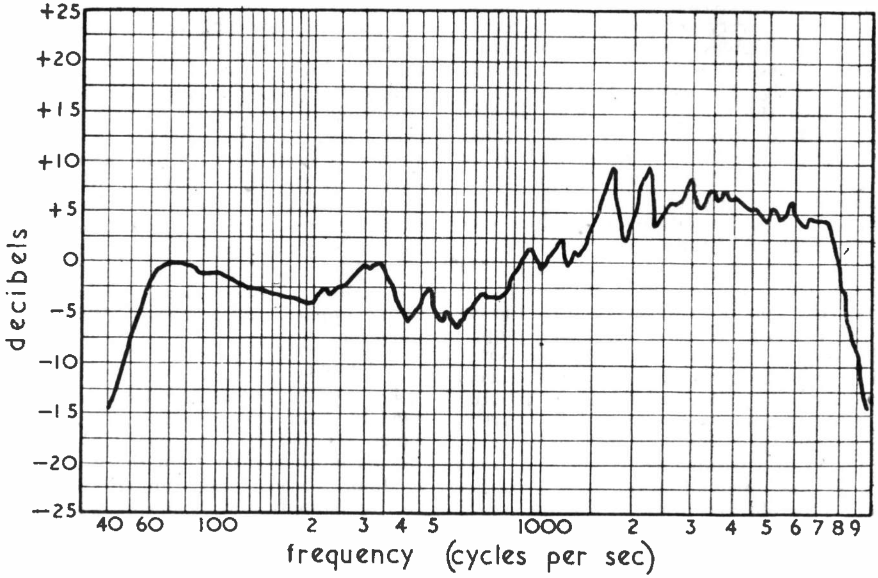


FIG. 3.

frequency bands will occupy much more space on the dial than the higher bands.

Fig. 2B shows an arrangement that is useful when it is desired to get full spread on the dial of, say, the amateur bands. One variable capacitor only is employed for each tuned circuit, which disposes of the problem of setting a bandset capacitor accurately every time the band is changed. The inductor L and the padder C2, which should preferably be of the air dielectric type, are built in one complete unit, with C3 added in the case of the lower frequency bands. The purpose of C3 is to obtain an LC ratio of such a value that these bands will be confined to the dial coverage. C1 is the tuning capacitor of some 100 to 150 uuF.

Let us assume C1 to be 100 uuF maximum and 10 uuF minimum, with a circuit capacitance of, say, 30 uuF. These two are in parallel, giving us 130 uuF maximum and 40 uuF minimum, which, in series with C2, will tune the inductor L. Suppose we require to spread the 7 Mcs. amateur band. If C2 is made 12 uuF, this will give us an effective maximum capacitance of a trifle under 11 uuF, and an effective minimum of 9.2 uuF. Using a 50 uH inductor, this will give an approximate coverage of 6.8 to 7.4 Mcs., that is, the band will occupy roughly half the dial space. If C2 is made 10 uuF., the maximum and minimum capacitances will be 9.3 and 8 uuF, respectively, and the coverage with a 55 uH inductor will be roughly 7 to 7.5 Mcs., in other words, some three-fifths of the dial will be occupied by the band. With a little experimenting, it is possible to obtain almost full spread in this manner.

The circuit shown at Fig. C2 will also give complete spread, but has a disadvantage, from the practical point of view, in that the tapping point on the coil will have to be determined by experiment. C1 is the bandset capacitor, and, here again, if certain bands only are contemplated, C1 can be mounted with the inductor to form a complete unit, and can best be of the air dielectric type as used in high frequency I.F. transformers. C2, the bandspread capacitor, is not critical regarding value, a suitable figure being around 50 to 100 uuF. The actual amount of spread is determined by the position of the tap; the nearer it is to the bottom of the winding, the greater will be the spread.

Operating Efficiency

A point not brought up as often as it might be is that any receiver, to give of its best, must be efficiently handled, and the controls, and their position, can do much to help or hinder this. The majority

(Cont. on page 44)

The Short Wave News All-dry Frequency Meter.

No listening station, or amateur transmitting station, is or can be efficiently operated unless it be equipped with an accurate method of frequency checking. Indeed, the G.P.O. insists, and rightly, that some form of frequency measurement is included in the apparatus employed in every licensed station. From the transmitter's own point of view, it is important that he be able to determine the exact limits of the frequency bands allotted for his use, whether his station is operating within those limits, (especially when frequency doubling) the frequency of any parasitic oscillations, and such matters.

The listener, too, cannot operate satisfactorily without some means of checking the coverage of his receiver. When reporting, it is seldom that the type of tuning scale or dial fitted to most sets will allow of an accurate frequency report being made, a most useful item of data to the transmitter operator should his signals be drifting, or outside the band. It is also helpful if he can be informed of the frequency of any station causing interference with his transmission. Again, the receiver calibration may be subject to alteration over a period through differences occurring in the tuned circuit constants, and the error though apparent, may not be readily measured unless a frequency meter is available.

There are several types of frequency meter, ranging from the simple job of indifferent accuracy to the elaborate crystal controlled and stabilised frequency substandard of extreme accuracy. The cost of construction varies accordingly.

The most simple form is the absorption wavemeter, which consists of a tuned circuit loosely coupled to an indicating device. In its most simple form the latter can be a lamp connected across a small winding inductively coupled to the tuned circuit. When the latter is tuned to resonance with a source of RF, such as a reacting detector or oscillator, the power absorbed causes the lamp to light. The wavemeter can be

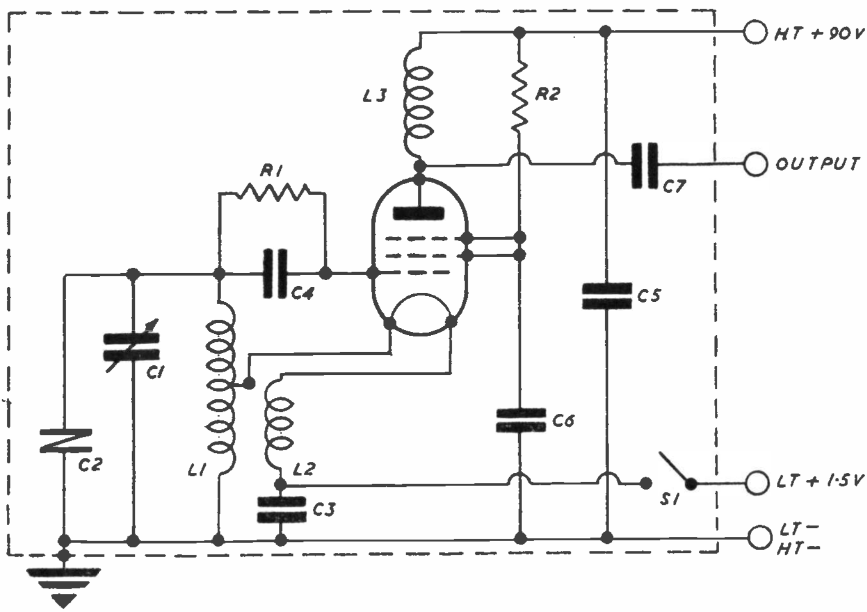


Fig. 1. Theoretical circuit.

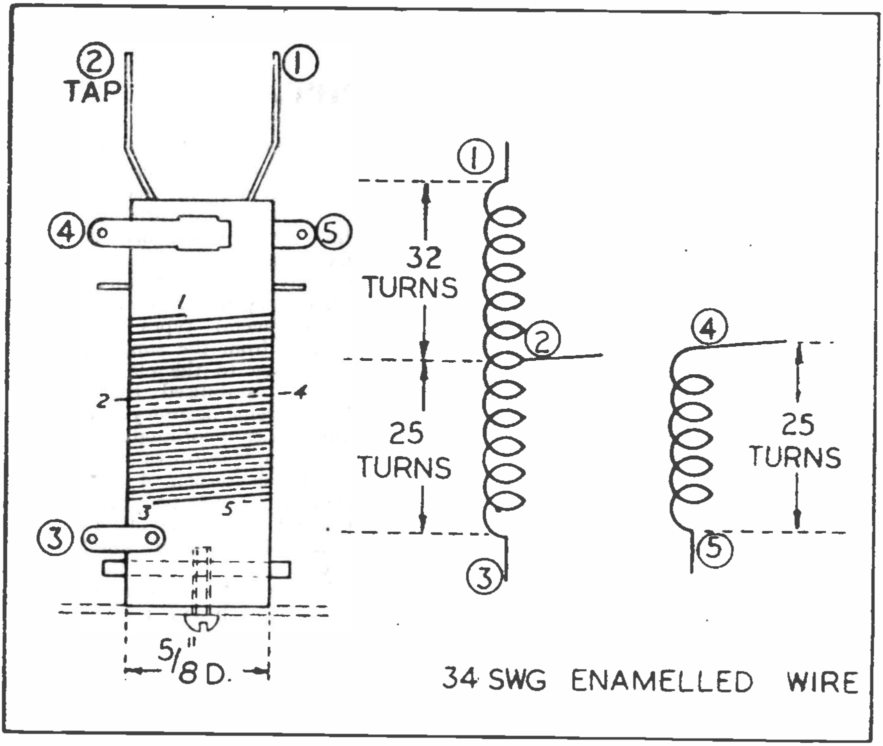


Fig. 2. Coil details.

made more sensitive by employing a valve-voltmeter, or microammeter plus diode or crystal rectifier as an indicator. The greatest advantage of this form of frequency meter is that it gives indication of fundamental frequencies only, so that the problem of confusion over harmonics does not arise. The accuracy, however, from a calibrating point of view is poor, and therefore it is not recommended for frequency measurement except for the purpose of identifying any particular band of frequencies.

The crystal controlled sub-standard, as has been stated, can be made exceptionally stable and capable of enabling frequency measurements to be made with an extreme degree of accuracy. Such an instrument, however, requires very careful construction and handling, especially if a multi-vibrator is incorporated for frequency division, and is also expensive.

The S.W.N. frequency meter is of the electron coupled type, and the theoretical circuit is shown at Fig. 1. Given the use of good quality components, careful construction and occasional checking against known frequencies, which can be certain transmitting stations where a standard is not available, the heterodyne wavemeter is capable of an accuracy of the order of 0.05 to 0.1 per cent. It is in effect a small transmitter, working on a relatively low frequency, from which signals, either fundamental or harmonics, are fed into a receiver. Any incoming signal of unknown frequency will beat with the signal from the meter, producing an audio frequency signal in the receiver output. When the wavemeter is tuned correctly to resonance with the unknown signal, the receiver should indicate zero beat, that is, the silent point in the centre of the two "side bands."

In order to obtain the greatest possible accuracy, there are certain points which must be borne in mind. The complete wavemeter must be fitted in a screening case, to avoid stray coupling. Construction must be rigid and mechanically and electrically sound, in order that the calibration remain constant over long periods. The wavemeter should be free from frequency drift after the initial warming-up period, which means careful design. The tuning dial must be free from backlash, and capable of being read to fine limits. High grade insulating materials only are permissible, and plug-in type coils are definitely not recommended.

Construction. The screening case and chassis employed in the frequency meter are built up from aluminium sheet, of 18 swg material, and in order to avoid any difficulty that may arise in bending up from one strip, individual sides are cut out and fastened together by brass angle strips bolted inside. A ready-made cabinet and chassis will probably be available by the time this article appears in print. The case measures 8 inches high by 6½ inches wide by 4½ inches deep, and the chassis 6 inches by 3 inches by 1⅜ inches. These sizes should be taken as minimum figures, and can be enlarged where it is not essential that the meter occupy the smallest possible space. The chassis is fastened to the panel by four 4BA screws, and the unit built completely on this with the exception of the output terminal, which is mounted on the top of the case. The back of the latter should therefore be removable at will, in order that the output lead, which is of stiff 16 swg. tinned copper wire, can be connected to the terminal.

The position of the various components is shown in Figs. 3 and 4. The layout is not critical, but it is essential that heavy gauge wire be used for the tuned circuit in order to avoid any possible movement and consequent change in calibration. It must be remembered, in this respect, that the leads from the coil to the filament sockets on the valveholder form part of the tuned circuit. Care must be exercised when tightening the ceramic feed-through bushes, or they may crack.

Floating components, such as tubular capacitors, resistors, and the R.F. choke, must be wired in as firmly as possible, and the length of the connecting wires kept to a minimum. A rubber grommet protects the flexible battery leads against chafing, where they pass through both the back of the chassis and the back of the cabinet.

The same considerations, as regards short but rigid wiring, apply above chassis. It will be noticed that a small trimmer is connected across part of the coil, the purpose of this being to provide a means of periodically checking and adjusting the calibration of the meter against a station of known frequency. An opening must therefore be made in the case opposite this trimmer, through which can be passed the end of an insulated trimming tool.

Coil. The coil used in the frequency meter is not a standard product, so will have to be wound, but this is not a difficult procedure. Full details are shown in Fig. 2. It is not necessary that the tags on the former be arranged exactly as drawn,

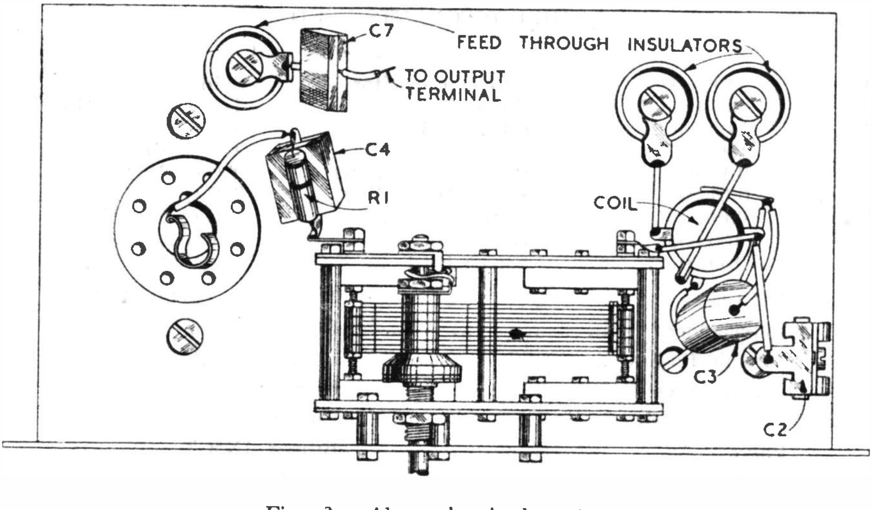


Fig. 3. Above-chassis layout.

this arrangement (Wearite "P" type) happening to be the original and to show clearly the connections. The gauge of wire and diameter of former should, however, be adhered to as closely as possible, any deviation resulting in a change in the frequency range covered. It is best to start winding by putting on section 1-2, this part being close-wound, i.e., adjacent turns separated only by the enamel covering of the wire. Sections 2-3 and 4-5 are then put on together, or interwound, that is, each turn of section 2-3 comes next to one of Section 4-5. Any movement of the coil would affect the stray capacitance and hence the calibration, and the coil former must therefore be rigidly fastened to the chassis. This can be done by means of two small brackets, or by a cross-bar with a tapped hole and screw as shown in Fig.

Calibration. Before any attempt is made at calibrating the instrument, it should be switched on and left for a period in order that it may reach the maximum operating temperature. This also applies whenever the frequency meter is used for accurate frequency measurement purposes, as during the initial warming-up period there is bound to be a certain amount of frequency drift. In the absence of a signal source of real accuracy, calibration can be done by checking against radio stations, and for this purpose a list is appended of selected stations of known accuracy and frequency. A foot or two of wire connected to the output terminal is placed near to the receiver aerial, and a station tuned in to resonance on the receiver. The drive of the frequency meter is then rotated until a beat note is heard, i.e., the receiver sounds as if it is oscillating. It may be found that this effect can be obtained at more than one setting of the meter dial, in which case the setting should be chosen which gives the loudest beat. As the frequency meter is tuned through the station, the beat note will start at a high pitch, gradually becoming lower until a minimum—usually a silent point—is reached, and then rising in pitch again. The zero point occurs when the frequency meter is set to the exact frequency of the station being received, and a note should be made of the meter dial setting at this point. As many of these reference points should be obtained as possible, in order to cancel out any inaccuracies that may arise. A calibration chart can now be drawn up plotting the dial readings against frequencies.

The fundamental range using a coil exactly as described is from approximately 1.6 to 5.6 Mcs., and harmonics allow the whole frequency range from 1.6 to 30 Mcs. to be covered. It should be remembered, when calibrating, that the stations given in the accompanying list will be operating on frequencies that are in harmonic relation to the frequency to which the meter is set when the beat note is obtained. In some cases two, or more, settings of the dial will produce a beat, but, knowing the fundamental range, these settings can be easily separated into second, third and fourth harmonics.

THE COMPONENTS USED

C1	250 uuF	Tuning Capacitor	Cyldon S.L.F.
C2	4—30 uuF	Trimmer	Tele-Radio (1943) Ltd.
C3	0.05 uF	Filament Bypass	T.C.C. 345.
C4	100 uuF	Grid Capacitor	T.C.C. Man.K.
C5	0.1 uF	Battery Decoupling	T.C.C. 345.
C6	0.01 uF	Screen Decoupling	T.C.C. 345.
C7	0.001 uF	Output	T.C.C. Man.K.
R1	100.000 Ω	Grid Leak	Dubilier.
R2	10.000 Ω	Screen Feed	Dubilier.

RF Choke	Tele-Radio (1943) Ltd.
Valveholder	Raymart VA8.
Ceramic Bushes	Raymart.
Utility Drive	Raymart.
On-Off Switch	Bulgin.
Valve	Brimar 1N5GT.
Grommets	Tele-Radio (1943) Ltd.
Battery	Ever Ready. All-Dry No. 3 or B.103.

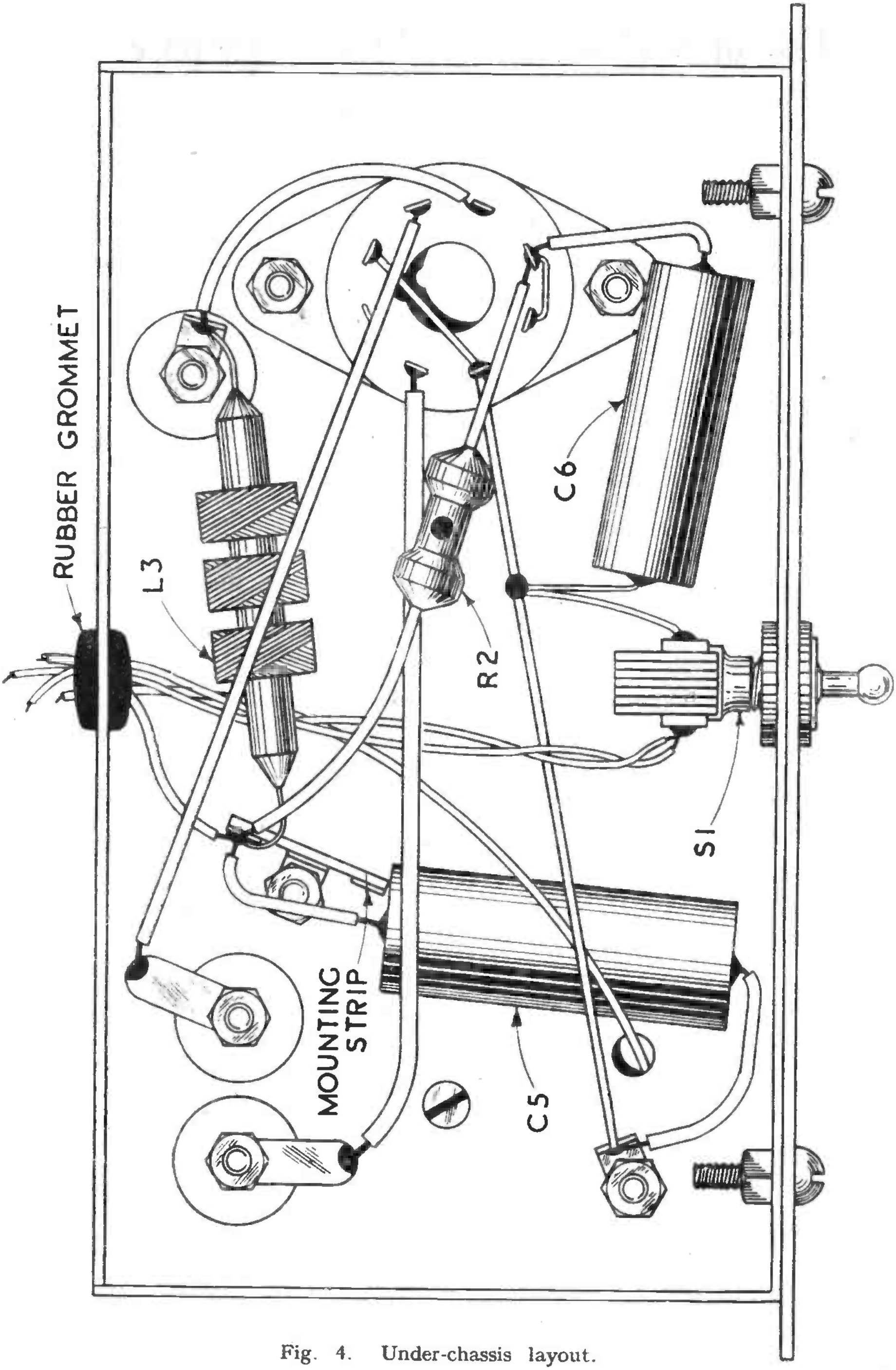


Fig. 4. Under-chassis layout.

List of Stations for Calibration purposes.

Frequency (Kcs)	W/L (Metres)	Dial Readings	Call Sign	Location
22520	13.32		LSD4	Monte Grande
21270	14.10		CEH3B	Santiago
21110	14.21		LSO8	Olivos
20980	14.30		WMY	Brentwood
20720	14.48		PPX	Sepetiba
20485	14.64		LQB6	Monte Grande
20040	14.97		QTP	Leopoldville
19960	15.03		LCK	Jeloy
19850	15.11		ZBI9	Ascension Isle
19660	15.26		SUS	Abu Zabal
19470	15.41		WDH	Hicksville
19260	15.58		PPU	Sepetiba
19180	15.64		CUS	Lisbon
19060	15.74		GLWG	Dorchester
18920	15.86		WQE	Rocky Point
18780	15.97		WMD	Brentwood
18690	16.05		ZEH	Salisbury
18480	16.23		HBH	Geneva
18298	16.40		YVR	Maracay
18150	16.53		HJO3	Bogota
18000	16.67		WEQ	Brentwood
17860	16.80		WQC	Rocky Point
17685	16.96		GYJ6	Portsmouth
17580	17.06		GYK23	Simonstown
17480	17.16		OCQ2	Lima
17320	17.32		VWF173/ VWF8	Bombay
17190	17.45		OXV	Skamlebeak
16940	17.71		NBA	Panama Summit
16740	17.92		SUX2	Abu Zabal
16390	18.30		XGN	Chungking
16285	18.42		WKS	Brentwood
16130	18.60		FYX	Lyons
16000	18.75		WKQ	Rocky Point
15850	18.93		WCW	Hicksville
15760	19.04		WPE2	Rocky Point
15675	19.14		WAE	Brentwood
15515	19.34		HDR	Quito
15455	19.41		FYJ	Lyons
15370	19.52		TIV	Cartago
15100	19.87		EPB	Teheran
15020	19.97		GMX	Dorchester
14800	20.27		WQV	Montevideo
14915	20.11		CVO	Rocky Point
14695	20.41		WDU	Brentwood
14538	20.64		HBZ2	Geneva
14415	20.81		GMR	Ongar
13980	21.46		LCO	Jeloy
13870	21.62		WIY	New Brunswick
13630	22.01		GIT	Oxford
13480	22.26		WAJ	Rocky Point
13255	22.63		OLI	Prague
13090	22.92		TAG	Ankara
12910	23.24		OXR	Skamalebeak
12820	23.40		RBP	Moscow
12695	23.63		SAG	Goteborg
12537	23.93		CUL	Lisbon

12235	24.52	TFJ	Reykjavik
12028	24.94	SDM6	Karlsborg
11975	25.05	XOF	Chungking
11910	25.19	SUW	Abu Zabal
11692	25.66	PJS	Curacao
11625	25.81	ODE	Beirut
11480	26.13	PUO	Marapicu
11420	26.27	GLY	Dorchester
11200	26.79	HBU3	Berne
11000	27.27	CUK3	Lisbon
10930	27.45	GLQ	Ongar
10820	27.73	WIX	Brentwood
10640	27.20	OZT	Skamlebeak
10480	28.63	WDY	Brentwood
10380	28.90	WCG	Rocky Point
10330	29.04	PSP	Sepetiba
10180	29.47	WJD	Brentwood
10090	29.73	WDK	Rocky Point
10048.5	29.86	ZFB	Bermuda
10000	30.00	WWV	Washington
9965	30.11	FTL	St. Assise
9840	30.49	FYC2	Paris
9800	30.61	LSD7	Monte Grande
9742.5	30.79	LSA5	Monte Grande
9450	31.75	WES	Rocky Point
9390	31.95	WCL	Hicksville
9213	32.56	GIV	Oxford
9060	33.11	GYJ	Portsmouth
8870	33.82	VWF3	Bombay
8705	34.46	ZPZ	Asuncion
8665	34.62	HBM	Berne
8595	34.90	OXU	Skamlebeak
8455	35.48	CWF	Cerrito
8380	35.80	CUL	Lisbon
8310	36.10	RBO	Moscow
8185	36.65	PSK	Marapicu
8110	36.99	EPF	Teheran
8075	37.15	TYB2	Paris
8005	37.48	GLK	Dorchester
7900	37.97	HBR	Berne
7875	38.10	GNX	Dorchester
7797	38.48	HPB	Geneva
7625	39.34	WDQ	Hicksville
7415	40.46	WEG	Rocky Point
7365	40.73	GOW	Dorchester
6950	43.17	WKP	Rocky Point
6895	43.51	EDT	S. Lorenzo
6800	44.12	FYM2	Croix d'Hins
6725	44.61	WQO	Rocky Point
6680	44.91	SUZ2	Abu Zabal
6400	46.88	YIE	Baghdad
6276	47.80	SUP2	Abu Zabal
5968	50.27	HVJ	Vatican City
5960	50.34	LCI	Jeloy
5905	50.80	WSY	New York
5835	51.41	LZD	Sofia
5732.5	52.33	SDB	Motala
5645	53.14	OXZ2	Lyngby
5595	53.62	SAG	Goteborg
5410	55.45	ODP	Beirut
5355	56.02	WCF	Hicksville
5285	56.76	HBD	Berne
5250	57.14	WKT6	Brentwood

Around the Broadcast Bands.

Monthly survey by " Monitor "

All times are given in G.M.T.

Information please! Your scribe will be very grateful for any notes and logs from readers. Please address all letters to:—" South View," Upper Drive, Angmering-on-Sea, Sussex. Remember, readers, this section is for your benefit and only by a combined effort can we make it a comprehensive review of the latest DX signals heard. And now to my survey of the month on the broadcast bands:—

Australasia

The Aussies continue to provide steady DX signals in their broadcasts to Britain. The 0755-0825 session is heard over VLG3, Melbourne (11710 kcs.), VLA6, Shepparton (15200 kcs.) and VLC2, Shepparton (9680 kcs.). The 1515-1545 programmes to Great Britain remain as reported in last month's survey.

Those of you who have never heard Australia's famous Kookabura bird should tune in to VLA (7280 kcs.), VLC6 (9615 kcs.) or VLG (9580 kcs.), from 1435-1445 when the news to the Australian Forces overseas is opened by the song of this bird. This is really something worth hearing. If you like something a little different, and more difficult, have a try for the North American service over VLR3 (11880 kcs.) at 0520 when they sign on with " Waltzing Matilda " followed by news in English.

News reaches me from diverse sources that New Zealand may soon blossom forth with a 10 kW transmitter on the 6, 9, 11 and 15 Mcs. bands. However, at present the only station on the air is ZLT7, Wellington, on 6715 kcs. with a power of 5 kW. Has anyone heard it yet? The present position regarding the " Free Indonesian Radio Station " on 18140 kcs. (heard around 1300) is not clear, and any information that readers can furnish will be much appreciated.

Asia

No further development has been noted from " Headquarters Radio SEAC," signals have still only been heard on 11845 kcs. India, through the vast array of AIR channels, is still being heard well, one transmission regularly logged is the Burma beam from Delhi on 7300 kcs. at 1400-1500.

North America

Reception of the U.S.A. West Coast stations has not been as good during the past few weeks as during the summer months. However, a correspondent of mine heard KWIX, San Francisco, closing at 1500 on 9570 kcs.—a good catch at that time of the day.

The most reliable signal from Cuba, remains COCX, " Emisora El Pueblo " on 9295 kcs. (The station is officially listed as on 9273 kcs., although it would appear to be nearer 9295 kcs.—Ed.). Others that have been particularly noted, during the past few weeks, are COKG, Santiago, 8955 kcs., and COCQ, 8825 kcs., announcing as " CMQ Red Nacional " at 0400.

Across to the Dominican Republic and we find HI1R, San Cristobal, pounding in nightly on 6420 kcs. Is easily identified by call: " Broadcasting Nacional HI1R La Voz de Santacion," and is at excellent strength from 2300 onwards. Also heard about the same time are HI9B, Santiago, " Broadcasting Hotel Mercedes " on 6393 kcs. and HI1N, Trujillo, on 6243 kcs.

Apart from TGWA, Guatemala is to the fore this month by the appearance of a new station on about 7170 kcs. heard on numerous occasions around 0330 giving the call of " La Voz de la Libertad." Signs off at 0415. (This is TGNA, Guatemala City —Ed.).

If you haven't heard the difficult country of Mexico, note that XEWW on 9500 kcs. is still putting out consistently strong signals as mentioned in the January issue. XEFT, too, is still being received here. It is a 250 watt short-wave outlet of XETF " La Voz de Vera Cruz," and can be heard from about 0400 onwards—if you are lucky! The station verifies with a card giving the QRA as Indepencia No. 74, Vera Cruz.

Nicaragua is a country well heard, although it involves rather late hours! YNWW, " Radio Sport " on 7020 kcs., YNBH, " Radio Panamerica " on 7010 kcs. and YNQ, " La Voz de la Victoria " on 6915 kcs. have all been heard between the hours of 0000-0300. Roger Legge of Washington, D.C., reports hearing a YNXW

"Radio America" on 7070 kcs. It may be as well to note that YNQ has until recently been announcing as YNQW.

For consistent reception from Panama all honours go to HP5K on 6005 kcs. An interesting programme is at 0315 in English. Uses the slogan of "La Voz de la Victor" and belongs to the Cadena Panamerica de Radiodifusion (network) and the QRA is "Apartado 33, Colon, Panama."

South America

Brazilian stations appear to be finding much favour in the 4 Mcs. band (60 metres) as recent listening on that band has revealed the following stations:—PRJ4, "Radio Educadora do Parnaiba," Parnaiba. 4825 kcs.; PRC5, "Radio Clube do Para," Belem, 4865 kcs.; PRF6, "Radio Bare," Manaos, 4895 kcs. (Official slogan of PRF6 is "Governo Del Estado do Amazones" but it appears that the shorter one is generally used—Ed.). Other recently identified Brazilians heard have been PRI3. "Radio Inconfidencia," Belo Horizonte. 6000 kcs. and PY2, Maceio Alagoas, 9310 kcs. The latter station is an experimental one and is on the air from 2300-0000, "transmitting for the State of Alagoas and all Brazil."

Excellent signals are received from the Colombian Republic, especially from HJDE. "La Voz de Antioquia," Medellin on 6145 kcs. It is best heard between 2300-0330, when it closes in English. Relays HJDK and belongs to the N.B.C. Pan American network. Bogota is well heard through HJCD, 6160 kcs., and HJCT, 6200 kcs.

Dutch Guiana's PZX located at Paramaribo has been heard on occasions around 0030-0130 with dance-music sessions on records, mainly of U.S. origin. Signal strength is fair but a slight heterodyne is sometimes noticed. Gives call on the hour, very indistinctly, but as Dutch is used there should be no trouble in identification. Signs off, with Dutch anthem, at 0135.

Chile breaks into print this month by the re-appearance of CE1174, "Emisora Nuevo Mundo," Santiago, 11740 kcs., inactive for some time, but heard recently at 0220 with news in Spanish. The well-known CE1180 "Radio Sociedad Nacional," located at Santiago is still heard consistently although signal strength has sadly diminished. Even weaker, and more difficult to log, is "Radio El Mercurio," CE1185, Santiago, 11850 kcs.. which has been heard occasionally. "La Voz de Chile," CE970, at Valparaiso was logged recently on 9728 kcs.—it has a marked carrier hum and suffers QRM from the powerful "Radio Nacional," PRL7, which is only some 10 kcs. lower.

Peru is not too easy to hear at present, the famous OAX4Z has not appeared in my log for some weeks now. A listen on 6010 kcs. may reveal OAX4Q, "Radio Victoria," at Lima. It announces as OAX4X-OAX4Q and is audible from 0330. Usually QSA3 R6. Other Peruvians heard at odd times are OAX6E, Arequipa, "Radio Continental" and an OAX4-(?) at Lima on about 6420 kcs. (This is OAX4G, "Radio Lima," on 6410 kcs.—Ed.). Most Peruvians are, unfortunately(!) at their best between 0300 and 0500.

Salvador is definitely a rare country! If you have the opportunity of listening around 0315-0445, however, you may be fairly certain of hearing this country on 6150 kcs. Call is given every 30 minutes, but exact letters are not yet known. (May be YSPB, "La Voz de Cuscatlin"—Ed.).

CXA19, Montevideo, is now operating on 11835 kcs., and is probably one of the loudest regular Latin Americans. Identification is easy as the call is frequently given as "Difusora El Espectador de Montevideo," CX19 y CXA19." Heard between 2200-0300. CXA10, Montevideo on 11900 kcs. is not quite so good, but may be quite a useful signal under favourable conditions. This one relays CX6 "Servicio Official de Difusion Radio Electrica." Readers may also look out for "Radio Nacional de Montevideo," which is the slogan of CXA30 operating on 6035 kcs. The call is given every 15 minutes and is preceded by a single gong stroke.

Don't be misled if you hear the call "Radio Caracas" around 6200 kcs.—this is really YV6RD, Cuidad Bolivar, which has a habit of relaying YV5RN.

Europe

There is not much new to hand this month from this sector of the globe. Ponte Delgada and PCJ appear to be still well heard by most listeners. AFN London is a colossal signal on 8565 kcs. during the afternoon, but then it should be—the power is 100 kW! AFN Paris on 6080 kcs. is also putting out R9 signals from its 100 kW transmitter.

The medium-wave "Emetteur National Sottens" is now relayed on the short waves (6345 kcs.); The "Programme Nacionale" of the Radiodiffusion Francais, is broadcast on short-waves (11885 and 9560 kcs. from 1130-1300; 11885 and 9620 kcs. from 1830-2100).

BAND REVIEW.

It is intended to "review" a particular frequency range each month, listing only stations heard, in the hope that it may help you to identify and search for new signals. This month we review the "60 metre band," i.e., 4,000 kcs.—5,000 kcs. The following stations have been recently logged by your scribe:—

Frequency	Call Sign	Location	Slogan
4040	ERA	Ponta Delgada	Emissora Regional Azores.
4750	YV1RV	Maracaibo	Ecos del Zulia.
4770	YV1RY	Coro	Radio Coro.
4775	HJGB	Bucaramanga	Radio Santander.
4780	YV4RO	Valencia	La Voz de Carabobo.
4785	HJAB	Barranquilla	La Voz de Barranquilla y La Voz de Victor.
4790	YV6RU	Cuidad Bolivar	Ecos del Orinoco.
4795	HJDX	Medellin	Ecos de la Montana.
4800	YV1RX	Maracaibo	Ondas del Lago.
4805	HJDU	Medellin	———
4810	——	Saigon	Radio Saigon.
4810	YV1RL	Maracaibo	Radio Populares.
4825	PRJ4.	Parnaiba	Radio Educadora do Parnaibo.
4840	YV1RZ	San Cristobal	La Voz de Tachira.
4830	YV2RN	Valera	Radio Valera.
4845	HJGF	Bucaramanga	Radio Bucaramanga.
4855	HJCA	Bogota	———
4860	YV5RU	Caracas	Ondas Populares.
4865	PRC5	Belem	Radio Clube do Para.
4865	HJEX	Cali	Radio Cali.
4885	HJDP	Medellin	Emisora Claridad.
4890	YV5RM	Caracas	Radiodifusora Venezuela.
4895	PRF6	Manoas	Radio Bare.
4915	ZOY	Accra	———
4920	YV5RN	Caracas	Radio Caracas.
4930	HJAP	Cartagena	Radio Colonial.
4945	HJCW	Bogota	Radio Compania de Bogota.
4950	VQ7LO	Nairobi	———
4955	HJCQ	Bogota	Radiodifusora Nacional de Colombia.
4965	HJAE	Cartagena	La Voz de los Labortorias de Colombia.
4975	HJAG	Barranquilla	Emisora Atlantico.
4990	YV3RN	Barquisimeto	Radio Barquisimeto.
5000	WWV	Belmont	USA Frequency Standard.

(RECEIVER TYPES.—Cont. from page 34)
of operators are right-handed, and use the right hand for writing, logging and keying, with the left hand doing most of the tuning operations. Thus, the best position for the receiver is on the left-hand side of the listener, with the main controls, such as tuning, audio gain, reaction, etc., nearest his left hand. The more rarely used controls, such as tone, selectivity, band-switch, etc., could then be fitted to the other side of the panel, subject, of course, to layout considerations.

Examples of other small items that help are the provision of extra headphone jacks for visitors, a spare pencil ready sharpened, the keeping of proper log-sheets or book, and a station list amended as alterations arise. A little thought will suggest other points of a like nature.

Corrigendum—

DENCO PRODUCTS. On page 21 of the January issue of this magazine, there appeared the following: "We are informed that Denco products will be exclusively distributed by Messrs. Tele-Radio (1943) Ltd. of 177 Edgware Road, London, W.2." This statement is entirely incorrect, and should have read "We are informed that *these* Denco products, etc.", referring of course to the Maxi-Q coils which were being reviewed.

Denco products in general are being handled by a number of firms, including Messrs. Berry's (Short Wave) Ltd. of 25 High Holborn, London, W.C.1, to whom we are indebted for pointing out this slip.

We apologise to Denco agents for any inconvenience they may have been caused.

The B.S.W.L. Multi-Range Meter.

Of all measuring instruments, the multi-range test meter is deservedly the most popular. The one described here will enable the majority of circuit faults to be traced, and the cost of construction is not high. In order to get accurate readings when used as a voltmeter it is necessary that the meter draws the minimum current, and the movement should therefore have a full scale deflection of 1 mA or better. However, for most purposes a high degree of accuracy is not required, so that the use of a movement with a deflection of 2 mA or even 5 mA is permissible. With these, if an accurate reading is wanted, it can be obtained by measuring the total resistance in circuit, then the current flowing, and working out the voltage by applying Ohms Law. The accuracy as an ammeter or as an ohm-meter is determined solely by the quality of the workmanship.

The circuit is quite straightforward. As an ammeter, various shunts are connected across the meter on all ranges but one, the value of the shunt being such that on any one range, the meter passes at maximum its rated value, and the surplus current is by-passed by the shunt. The formula for calculating the required value of the shunt is

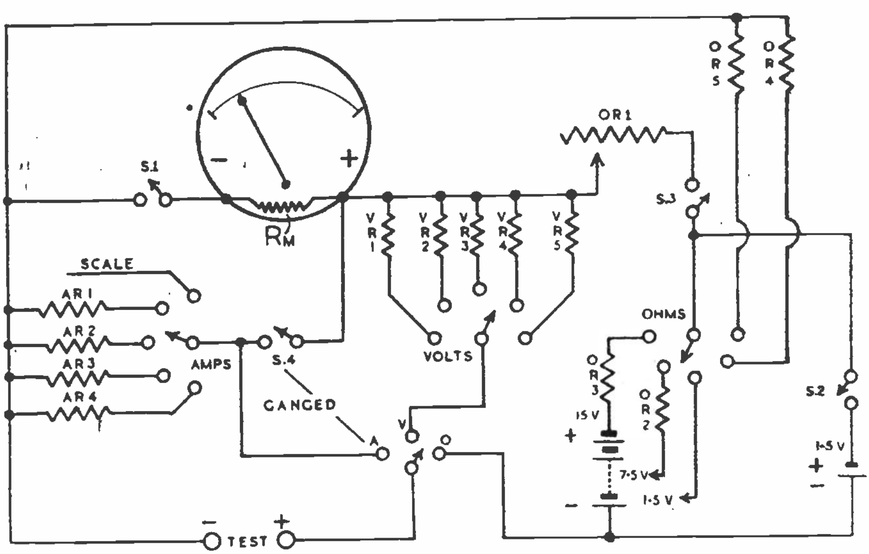
$$R = \frac{Rm}{n - 1}$$

where R is the required resistance, Rm is the resistance of the meter and n is the number of times the scale is to be extended.

As a voltmeter, on all ranges a resistor is placed in series with the meter across the load to be measured, the value of the series resistor being such that when on any one range the maximum voltage for that range is applied, the resistor limits the current flowing to a value equal to the full scale deflection of the meter. Using the same notations as before, the required value of the series resistor is given by $R = Rm\ (n-1)$ in the case of an existing voltmeter, and by

$$R + Rm = \frac{E \times 1000}{I}$$

where E is the required full scale voltage, and I is the full scale deflection of the meter in mA, in the case of a milliammeter.



THE B.S.W.L. MULTI-RANGE D.C. METER.

As an ohm-meter, the meter is again employed as a current reading instrument. The meter is inserted in series with a battery and a variable resistance, the latter being adjusted so that the meter reads full-scale when the test prods, also in series, are shorted. When the prods are placed across the resistance to be measured, the meter gives a lower reading due to the current being limited by the extra resistance in circuit. For convenience, the scale is marked at points corresponding to the mA readings that would be given by cardinal values of resistance placed across the prods. Thus with a 5mA meter, and 1.5 volts applied, the necessary resistance in circuit to give a full scale reading is 300 ohms. If the resistance to be measured has a value of 200 ohms, then the total resistance in circuit becomes 500 ohms, and the current flowing will be limited to 3mA. Thus 3mA on the scale becomes synonymous with 200 ohms. On very low values of resistance, the arrangement so far described is not practicable, as the change in current flowing is too small to be easily discernable. The current change can be made greater by making the initial resistance in circuit more comparable with the resistance to be measured, and this can be achieved by placing a shunt in parallel with the meter and variable resistor, the two latter being still in series. Thus, taking the example already given, to obtain a ÷ 10 range, the initial resistance has to be reduced from 300 to 30 ohms, i.e., the shunt will require to have a value of 33.3 ohms. For a ÷ 100 range, the initial resistance becomes 3 ohms. and the shunt value 3.33 ohms.

The above dissertation is given in the belief that the maximum benefit can be obtained from any instrument only when the method of operation, and not just the application, is understood.

CONSTRUCTION. No attempt is made to lay down any hard and fast arrangements for layout, size and type of cabinet, or even what parts should be used, as these matters are capable of a wide variety of interpretation and so are best left to the constructor concerned. The model shown in the photograph was built in the largest half of a suitcase portable rx cabinet, and the meter used was a six inch movement, with a full scale deflection of 5mA, simply because these happened to be on hand. The panel is of plywood, but could equally well be of metal, paxolin, or ebonite.

There is a wide variety of methods of dealing with the selector dials. The one in the photo is of aluminium sheet, the lining being cut with a scriber. The lettering is done by letter and number dies, and the panel then rubbed over with emery paper to remove sharp edges. Frosting is accomplished by immersing the plate in a strong solution of soda, kept just on boiling point, for a few minutes. The blacking-in is then done by warming the panel, and rubbing in cobblers' heel-ball, or similar hard wax, the surplus being carefully removed with a piece of rag.

Ebonite and paxolin can also be stamped with these dies, but are more tricky in that the amount of pressure used is much more critical if a good appearance is to be achieved. Filling in is best done with these materials by means of white paint, preferably paint which has gone almost hard.

Yet another method, and one capable of giving a near commercial finish, is to draw the lining and lettering on tracing paper, using Indian ink. This is treated as a negative, and a photographic print made on a bromide paper such as Kodak Snow White Royal, the result being similar to the commercial engraved celluloid panels. After being glued to the sub-panel a coat of clear varnish is given to protect the surface from dampness, scratches, etc.

This does not exhaust the list by any means. Other methods, such as the use of white ivorine marked with Indian ink, and protected by a thin sheet of celluloid or perspex, will suggest themselves to the reader.

Coming now to the actual "works," the following notes are given in the hope that they may prove useful to the non-technical reader.

VOLTAGE RANGES. The best resistors to use as multipliers are precision wire-wound types such as those made by Bulgin and guaranteed to an accuracy of ± .5 per cent. In the absence of these, the ordinary standard carbon resistors can be utilised. As normally sold, these have a tolerance of from five per cent. to 20 per cent. plus or minus the nominal value. It is advised that the shopkeeper be asked to supply resistors below the required value, they can then be adjusted by filing carefully, until the meter reads correctly when connected across a known voltage. After filing, the resistors should be painted over to exclude dampness. When resistors can be obtained to a definite value, but the meter resistance is unknown, this factor can be ignored without unduly affecting the accuracy, on all ranges but the lowest, on which the required value will have to be found by trial. On the higher ranges, it is recommended that two or three resistors be used in series,

THE ORIGINAL MODEL

d any chance of high voltage g over " and damaging the move-

AMP RANGES. It is unlikely that its for these ranges can be pur- ound to the correct value, but they ly be constructed by the reader. t wire to use from the stability view is Eureka. In order to avoid ue to the shunts heating up and value, the gauge of wire used be ample to carry the necessary It is suggested that 36 swg. wire for shunts up to 50 mA, 32 swg. |00 mA range, and 30 swg for the 250 mA range. The wire should be wound on paxolin strip formers, and the exact value arrived at by running solder along the wire. In the absence of Eureka, ordinary enamelled or silk covered copper wire can be used, but great accuracy cannot then be expected, as copper wire has an appreciable temperature co-efficient, and a change of temperature of five degrees Fahrenheit, apart from any heating due to the current being passed, will affect the accuracy by as much as one per cent. If copper wire is used, the length needed will be much greater than in the case of Eureka, so to avoid the possibilty of errors due to a magnetic field being created, and affecting the movement, the wire should be astatically wound on a bobbin. To do this, the necessary amount of wire is wound on starting from the centre point, winding both halves together, so that both ends come on the outside of the coil. Whichever method is used, the shunts should be adjusted to the exact value by comparison with a meter of known accuracy, if possible. Failing this, the meter should be connected in series with a battery and variable resistor, the latter being adjusted so that the meter reads full scale. The shunt is then connected and adjusted until this reading occupies the correct place for the next range. Range two is then used to obtain range three, and so on.

OHMS RANGES. The variable resistor OR1 will be of low value, so the best type to use is a wire-wound one with on-off switch S3 combined. Switches S1 and S2 should preferably be made for the job, such as those marketed by Ferranti, Ltd., as any resistance in the contacts will affect accuracy, but as a substitute a good self-cleaning switch, such as the Yaxley pattern, can be used. Toggle switches, like those in the photo, are a bad third, and should be replaced at the first sign of erratic behaviour. S2 is the X/÷ switch, and should be open when in the X position. The 1.5 volt battery it controls must be capable of passing a heavy current, a matter of half an ampere in the case of a 5mA movement and the Ever-Ready U14, as used in gaslighters, is suggested. OR4 and OR5 must also be able to carry a heavy current without any appreciable heating, a suitable size being 34 swg. for OR4 and 32 swg. for OR5. They should be wound on thin sheet paxolin formers, and be finally adjusted as follows. A known resistor of a value that will give a mid-scale reading on the ÷ 10 range is used for checking. Again using the 5mA meter for an example, this will be 30 ohms. The meter is then switched to the ÷ 10 range, the shunt applied, and the zero set OR1 adjusted. OR4 is then altered, each time re-setting OR1, until the pointer indicates 300 ohms on the dial. Finally OR5 is similarly adjusted until a three ohm resistor also gives a pointer indication of 300 ohms on the dial, with the meter set to the ÷ 100 range. The 30 ohm and three ohm resistors can be lengths of Eureka measured on the X1 and ÷ 10 ranges respectively.

GENERAL. Range selection can be done by either switches or plugs and sockets. Both methods are used commercially, and while the latter is perhaps not so convenient in use it does cause one to take more care that the instrument is set to the correct range. If switches are used, they should be of a type having a very low contact resistance, especially in the case of the Milliamps switch. Failing the types made specially for this purpose, the Yaxley pattern is recommended. Note that S4 is ganged to the Amps/Volts/Ohms selector, and should be closed when the latter is in the Amps position, being open in the other two positions.

Unless one is used to it, it is not advisable to try to mark a resistance scale on the actual meter dial. Instead, it is suggested that a chart be drawn out, and mounted on the panel or else stored inside the battery compartment, where it will not get mislaid.

On the X ranges, the 15 volts necessary is obtained from two Grid Bias batteries connected in series, and care should be taken that the polarity is correct.

Clues across: (1) Recast-anagram. (6) Pretty low ones, in the case of most G's. (9) Springs sometimes relieve it. (10) This power is pretty low. (11) It's on the record. (12) His Christian name was Samuel. (15) Ham these are held in peace-time. (17) The owners of ZRH/ZRK etc.—abbrev. (20) Brand of resistor. (21) What the Ham does. (22) A signal generator would help to—this—your set. (23) What the "earth" should have. (24) These aerials are to be preferred. (25) The electron is an essential part of it. (27) The L.S. might incorporate one. (30) The paper for the workshop. (32) The end of the treasurer. (33) Many commercial stations send it. (35) With 29 down—In the past, not always the best "supply house"—two words. (36) YL's., XYL's., OM's., OB's., etc. (37) May be necessitated by QRM. (38) You must know this for your licence.

Clues down: (2) Signal/noise? (3) Not necessarily an inferior valve. (4) Your call must be—with each QSO. (5) This in the wiring may mean no "sigs." (6) A power one is useful. (7) This plug seems at a loose end? (8) What readers do in the "Around the Shacks" feature. (13) The B.F.O. should not do this. (14) Using spare components might not be—. (15) Part of the "Spout." (16) The beginner should start on these circuits. (18) Tries out. (19) This eye is a tuning aid. (25) Current unit. (26) Old Rx cabinets were often—. (28) Not Dx on most bands. (29) See 35 across. (31) Unit of power-level. (33) What you do on a graph. (34) On the sun? [Correct Solution next month.

HAM QUIZ.

This month's quiz is of an historical nature and should, if our guess is correct, prove fairly difficult. This quiz section is somewhat of an experiment and we would appreciate letters from readers giving their reactions and suggestions for improvements. Please mark your correspondence "Ham Quiz" c/o Short Wave News. In the meantime, let us delve into the mists of antiquity!

(1) Who was the first man to telegraph without wires connecting the transmitter and receiver, and in what year?

(2) When did Marconi first bridge the Atlantic?

(3) When was telephony first received from an aeroplane?

(4) When was the first cathode-ray tube manufactured?

(5) What amateur station carried the BBC Overseas Service on the short waves before the Daventry station was available?

(6) Who was the first man to "telephone" with the aid of Hertzian waves, how far did he send, and in what year?

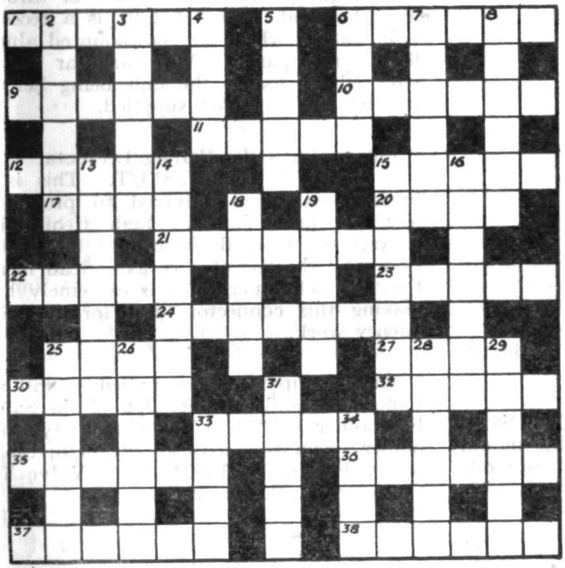
(7) Was the "bright emitter" introduced before the dull emitter?

(8) When and where was the last International Amateur Convention held?

(9) In Humming's first "carbon" microphone, what did he use in place of the carbon granules used today?

(10) Who was the first British ham to bridge the Atlantic on 5 metres?

RADIO CROSSWORD No. 2



Answers to Quiz

(1) Morse, by induction, in 1842.

(2) 1901.

(3) 1915.

(4) Commercially they were first available in 1900 (marketed by Messrs. Cossors). Early mentions go as far back as 1879 when Crookes was experimenting with them.

(5) G5SW at Chelmsford, Essex.

(6) Dolbear, in 1886. Distance was 13 miles.

(7) No.

(8) Cairo, 1938.

(9) Granules of finely ground coke.

(10) G5BY, Croydon.

THE S.W.N. 0-v-1 RECEIVER.

We must apologise for an error that crept in to the article describing this receiver in our last issue. In the theoretical circuit —Fig. 1—the LT-lead should be shown connected to that side of the switch S1, which is joined to R6 and C9. The correct connections are shown in Fig. 3. It seems that our Artist does not believe in LT switches—he prefers to have the valves always warmed up ready for instant action!

Component Review.

Belling & Lee, Ltd. It is surprising how many commercial receivers, excepting the AC/DC types, are not fitted with any form of protection in the shape of a fuse. We are afraid this is also too often true in the case of home-built apparatus, though we are at a loss to give any reasonable explanation. Certainly, it can have nothing to do with the cost.

We illustrate this month samples from the range of Belling Lee fuseholders. Fig. 1 shows the type L.356 panel mounting holder, a very neat fitting which takes up little panel space, and has the advantage of instant accessibility. The contacts are completely insulated from the panel, and when the cap is removed—a coin slot is provided for unscrewing—the fuse is ejected by means of a spring. Connections are made to soldering tags, and for fixing a ⅝ inch diameter hole is needed.

Fig. 1.

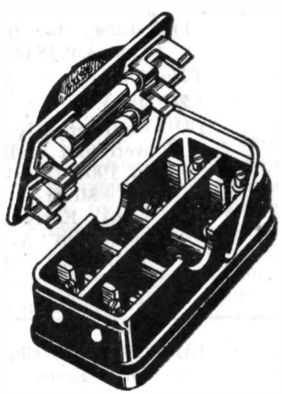


Fig. 2.

Fig. 2 illustrates the L.1033 Twin Safety Fuseholder. This is also a bakelite moulding, and is available as a single fuse model with the catalogue number L.1045. The fuses are withdrawn with the cover, rendering the apparatus dead and enabling safe replacement. Construction is the same as pre-war, except for the addition of a spring clip to lock the cover in place. The unit takes 1¼ inch cartridge fuses. Connections are to screw sockets, and can be brought in through the base or through at either end. Type L.1291 is a recessed twin model, which can be mounted almost flush on a panel. A rectangular hole is required for fixing, the unit being held in position by a bracket supplied.

Fig. 3 shows the Belling Lee octal valve top connector, type L.313/T. This is of brass construction, silvered to provide a low resistance path at high frequencies. Polystyrene is used throughout for insulation, and the use of a co-axial lead means that the self-capacitance is extremely low, making this connector ideal for high frequency work.

These components are priced as follows: Panel Fuseholder L.356, 2/6; Twin Safety Fuseholder L.1033, 4/-; Twin Safety Fuseholder (semi recessed) L.1291, 4/6; Single Safety Fuseholder L.1045, 2/9; Valve Top Connector L.313/T., 3[illegible]

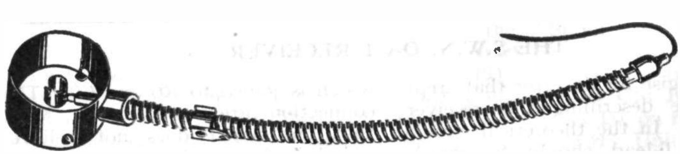


Fig. 3.

DENCO COIL DATA.

Through the use of polystyrene formers, iron dust cores, and Litz windings on the lower frequency ranges, the DENCO range of Maxi-Q coils has the following features:—

High Q, with miniature size.

Plug-in types fitting standard octal holders, or Chassis mounting types with single O-BA fixing.

Adjustable cores simplifying receiver alignment.

A complete range covering 150 kcs. to 130 Mcs., for straight or superhet receivers.

Less cores, the small size and short leads obtainable make the formers very suitable for VHF work.

Range	Nominal Inductance Main Winding (core at Maximum)	Frequency Coverage Tuned by 300 uuF (Circuit cap. 25 uuF)		Frequency Coverage Tuned by 100 uuF (Circuit cap. 15 uuF)	
	uH	Mcs.	Mcs.	Mcs.	Mcs.
1	2800	.175	.6	—	—
2	285	.55	1.8	.85	2.6
3	32	1.6	5.7	2.5	7.3
4	4.4	4.4	15.0	7.0	20.0
5	1.0	9.7	32.0	15.0	40.0
				Tuned by 50 uuF.	
6	0.5	—	—	30.0	60.0
7	0.2	—	—	50.0	90.0
8	0.1	—	—	72.0	130.0

As will be seen from the above chart, complete coverage of the long, medium and normal short wave bands (10-1800 metres or 32-0.17 Mcs.) can be obtained with a 300 uuF tuning capacitor. For best S.W results it is recommended that the total tuning capacitance, including bandspread and circuit capacitance, should not exceed 110 uuF. Above 30 Mcs., this capacitance should not be more than 50 uuF, preferably less.

The following colour code is used to identify the coils:—

BLUE: RF stage coils with aerial coupling.

YELLOW: Detector or Mixer coils, with coupling winding which may be used for reaction, coupling RF stage or aerial.

GREEN: Detector coils with reaction and primary windings for aperiodic aerial or RF stage coupling (6 pin).

RED: Superhet oscillator coils. I.F to be stated (465 kcs. and 1.6 Mcs. available).

Plug-in coils are suffixed "P" and chassis mounting types "C." Thus a coil would be described as, for example, BLUE 4 C, meaning a chassis mounting type RF stage coil for range 4.

For a superhet receiver using these coils, a triode hexode of the 6K8 class should be used, in a conventional circuit (up to 30 Mcs.).

CONNECTIONS: Pins three and six, main winding; one and eight, Coupling or reaction (except some oscillator coils. See below); four and five, Primary on 6-pin coils.

Range 1. Oscillator coils. Padder to pin 4, value 250 uuF.

Range 2. Oscillator coils. Padder to pin 5, value 300 uuF.

Range 3. Oscillator coils. Padder to pin 7, value 1800 uuF.

DIMENSIONS: Former diameter ½″ Overall height (less pins) 1⅜″. Base diameter, plug-in types 1″.

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