A NEW EXPANSION CIRCUIT — See page 519.

A NEWNES PUBLICATION

Edited by F. J. CAMM

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Practical Wireless and PRACTICAL TELEVISION

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EVERY WEDNESDAY

Mar. 9th, 1940.

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★ PRACTICAL TELEVISION ★
EVERY WEDNESDAY
Vol. XV No. 390. Mar. 9th, 1940.
EDITED BY F. J. CAMM
Staff: W. J. DELANEY, FRANK PRESTON, H. J. BARTON CHAPPLE, B.Sc.

ROUND THE WORLD OF WIRELESS

Amplifier Design

AN amplifier has a much wider range of circuits than a standard broadcast receiver, although there are many types of receiver. These may be divided roughly into straight or superhet circuits, and beyond this there is very little with which to experiment. On the other hand, an amplifier must be designed first to give a certain output—according to the uses to which it is to be put—and, secondly, to incorporate a certain type of circuit. This may incorporate push-pull, transformer coupling, resistance-capacity coupling, or even mixtures of these. Thus, when an amplifier is designed, it will probably only meet the requirements of a few listeners, and so we receive many requests for amplifier designs for special purposes. We have, of course, described dozens of alternative designs, all embodying various features, and in this issue we give yet another, built from spare parts, and employing a push-pull output stage. This is regarded by most listeners as the best type of output, being simple to wire and construct and giving the best quality for a medium H.T. supply. It is reasonably free from trouble, and due to the special working of the push-pull valves hum and distortion troubles are reduced to a minimum. We shall, however, continue to describe various types of amplifier, and in a forthcoming issue shall give details of a new high-quality unit incorporating the direct-coupled principle.

Austria

MORAY McLAREN is preparing for March 12th a programme which is of topical interest. This is the anniversary of the day on which Hitler's troops marched into Vienna. McLaren, who knows Austria intimately, will show in this programme how much of the real spirit of the country has been destroyed since it was incorporated in Hitler's Reich. The feature will include tributes to Austria by English people who knew it in its happier days, and the music and the poetry of life in Austria of those days will be strongly featured.

Goebbels Exposed

THE fourth talk in "The Voice of the Nazi" series, in which W. A. Sinclair, of Edinburgh University, is giving such a telling exposure of Nazi propaganda methods, will be repeated on March 7th, following its first appearance in programmes on February 20th. It is entitled "Some Tricks of the Trade."

"Convoy"

ONE of Britain's greatest war efforts since the commencement of hostilities has been the successful convoying of many thousands of tons of shipping to and from the ports of this country. This service, carried out by the Royal Navy in conjunction with the Merchant Navy, is to be made the theme of a special programme which has been written by Captain Taprell Dorling, R.N., who is perhaps better known as "Taffrail."

This will be heard in the Home Service programme on March 15th. It is a survey which searches back through Britain's maritime history. Naturally, it draws upon the experiences of the Great War, and it is documentary in so far as it quotes the official naval history of the Great War, words by the late Lord Jellicoe and the Rt. Hon. Winston Churchill when he was First Lord of the Admiralty in the last war, and, more recently, quotations from speeches made during the present war by H.M. the King, Mr. Chamberlain, and Mr. Churchill.

With a risk, in an air raid, of failure of the electricity supply, battery portables have distinct advantages for A.R.P. work. This portable, working 10ft. below ground level in the Ekco radio shelter at Southend-on-Sea, gave results identical with those obtained in normal conditions on the surface.

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The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL WIRELESS. *Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor,* PRACTICAL WIRELESS, *George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.*

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

Composer Cavalcade

RAY NOBLE will be the subject of the next "Composer Cavalcade," to be broadcast on March 7th. It is probably not generally realised that Noble is an Englishman. He has lived for many years in the United States, and for a long time his band has been associated with the famous Rainbow Room in New York.

He won a competition for orchestration in 1927, and in 1928 he started composing, almost at once joining the front rank of song writers. He has been responsible for the scores of several famous stage successes and film musicals, including "The Little Damozel" and "Brewster's Millions." Probably his most famous number is "Love is the Sweetest Thing." Many listeners will also remember "Good-night, Sweetheart," "The Touch of Your Lips," "What More Can I Ask?" and a score of others.

Rawicz and Landauer

RAWICZ and Landauer, whose performances in "Saturday at 9.30" have been a highlight in that series, are to give a lighter programme with the B.B.C. Theatre Orchestra, conducted by Stanford Robinson on March 7th. This should be of special appeal to younger listeners, though it is expected that it will be appreciated by listeners generally.

The programme will include such pieces as Debussy's "The Golliwogs' Cakewalk," "The Teddy Bears' Picnic," by Bratton, "The Parade of the Tin Soldiers," by Jessel, and a selection from "Snow White and the Seven Dwarfs," by Churchill. The broadcast will be taken by the Home Service and For the Forces programmes.

A UNIVERSAL VALVE-TESTER—3.

(*Continued from previous page.*)

and the supply can also be used as a substitute for a set's filament winding of the mains transformer (where this is suspected to be faulty). Other uses will, no doubt, occur to the constructor.

The filament transformer is quite separate from the H.T. one, and this obviates interaction faults between the two, and makes for safety in use.

The H.T. section supplies three rectified and smoothed outputs for operating the anodes, screens, and extra screen or oscillator anode of the valve panel electrodes. This supply can also be used for other purposes as the outputs are variable and very well smoothed. A large range of output voltages is possible with thé aid of the series of resistances and volume control resistances. Pos. 1 is the large current output for the plates of valves or other purposes where a large current may be drawn. Pos. 2 is for screens, and Pos. 3 similar, and these can only supply small currents; it is dangerous to try and take a large current and damage may result.

This supply can also be used for substituting the H.T. supply of a set where this is suspected, and for applying a large voltage to test condensers.

Components and Parts

The filament transformer is specially wound, and any good transformer winder can make it easily. The maximum current drawn is 2 amp. in the secondary, and the output voltages are obtained by tapping the winding for 2, 4, 5, 6, 6.3, 7.5, 13, 14, 20, 24, 25, 26, 30, 35 and 40 volts.

One end of the transformer is connected directly to a socket, and the other taps go to a multiple-contact rotary switch with 15 contacts. In the writer's model this was one of the old rotary arms making contacts with studs, each separated enough to prevent the switch arm from being on two studs at a time (and shorting the particular section there). The centre arm is connected to the other socket.

The H.T. transformer is wound to take a Mullard DW4 rectifier valve, i.e, filament winding for 4 volts, 2 amp., and H.T. winding to deliver 400-0-400 volts, and giving 400 volts D.C. at approx. 120 mA.

The smoothing choke is a Bulgin L.F. 21, or any other reliable component having 15 hys. at 100 mA will suffice.

C1 and C2 are each 8 mfd. electrolytic type, C3 and C4 are 2 mfd. each, electrolytic, and C5 is 4 mfd. electrolytic.

V3 is a 300,000 ohm 3 watt variable resistance, V2 a 25,000 ohms 5 watt variable resistance, and V1 a 10,000 ohm resistance; a Bulgin MV14 is recommended. This last is a power resistance, and if it is of the sliding top bar type, then it will not be mounted on the panel, as shown at V3, but can be placed elsewhere or on top of the cabinet.

V4 and V5 are each 5,000 ohms, and Bulgin PR9 were used.

R1 and R2 are each 100,000 ohms variable.

Construction

From the foregoing remarks a good idea of the circuit will have been obtained. The panel layout is depicted in Fig. 6, and the panel itself can be of any convenient size, about 9in. square is suggested, but the constructor can suit his own requirements.

The D.C. H.T. sockets are placed on the left for easy connection to the valve panel, and the A.C. is on the right-hand side. The top two sockets give the output from the secondary of the H.T. transformer (useful for a number of tests), and the centre two are for the input from the mains, or these can be dispensed with, and the mains cord led in directly at the back of the unit.

The bottom two sockets are from the filament transformer, and their output is controlled by the filament selector-switch S4 (Fig. 7.)

S1 and S2 are shorting switches for cutting out the voltage dropping resistances V4 and V5. S3 is the mains on-off switch.

A baseboard is cut to hold the two transformers behind the panel, and also the rectifier valve and large filter condensers. There are no difficulties in the assembly, and the usual precautions are necessary to space the transformers well, and also away from the choke which is screened and can be earthed.

Operation with Tester

When using with the valve tester (or otherwise) always use V1 before V2 and V3 when adjusting the voltage of the Pos. 1 output. This is to avoid overloading the smaller wattage resistances on a heavy drain of current. It will be found that these resistances give all the control required over the Pos. 1 output, but if extra control is needed then the other two resistances, V4 and V5, can be brought into circuit. The resistances are operated in the order: V1, V2, V3, V4 and V5. This is important, as they are then placed into circuit according to their power-handling capabilities.

The connections to the valve tester are self-explanatory, and need little adding to; the filament supply to fils. on tester, negative to negative, and the same with the other outputs. The valve being tested is not inserted in its holder until the applied voltages have been roughly adjusted, and then when it is in place the voltages are accurately made.

The H.T. outputs are from practically zero up to 400 volts at 60-80 milliamps for power valves, etc., and smaller currents for the screens. The output voltages and currents will be found to satisfy the requirements of all modern valves. The H.T. outputs can be removed from the valve tester, and with the aid of a neon lamp in series with one of the leads we can test for short-circuits between the various electrodes (the filament transformer meanwhile heating the valves).

This finishes the complete outfit, and it can now be seen that the three units, although primarily made to work together for the testing of all valves, can also be very useful for other purposes. The cost of the whole is not heavy, and if made in stages will be easier, and yet will not prevent the carrying out of very useful work with the apparatus already assembled.

Impressions on the Wax

A Review of the Latest Gramophone Records

Vocal Variety

HEADING a quite remarkable array of light vocal talent, there is a new record by none other than Sophie Tucker this month. The coupling is a wise one—a new tune, "The Lady is a Tramp," has been paired with an old Tucker favourite—"Some of These Days"—*Brunswick O* 2893. Jack Doyle and Movita, who recently made a successful broadcast, have recorded "Speak to me of Love" and "Romance in Rio," which comes from Movita's film, on *Decca F* 7351.

Also in the Decca list there are new records by Vera Lynn singing "I Shall be Waiting" and "I'll Pray for you"—*Decca F* 7330; Adelaide Hall singing "The Lady is a Tramp" and "Where or When," both from the film, "Babes in Arms"—*Decca F* 7345; Al and Bob Harvey with their version of "Sing Hullabaloo Belay" and "You Never Miss the Old Faces"—*Decca F* 7353, and Ben Lyon and Bebe Daniels—*Decca F* 7349-50.

Sidney Burchall—he was the first to record "There'll Always be an England"—has now recorded a ballad hit of to-morrow in the form of "Absent Friends" on *Decca F* 7354. He has coupled it with "The Old Lady of Armentières."

Elsie and Doris Waters bring typical Gert and Daisy touches to "Please Leave my Butter Alone" and "Knees Up, Mother Brown" on *Decca F* 7309.

Connie Boswell fans will be glad to hear that this famous American singer, who has been crippled since birth, is now able to walk again. Connie has recorded a song called "Stra-va-na-da," coupled with "At Least You Could say 'Hello,'" on *Brunswick O* 2891, and has also made a duet record with Bing Crosby of "Start the Day Right" on *Brunswick O* 2890.

For Dancers

AMBROSE and His Orchestra have made some attractive records this month, one of which introduces that popular hit tune of the moment, "Scatter-brain." It is coupled with "Over the Rainbow" on *Decca F* 7348. His other records are "Give me my Ranch" and "Bella Bambina"—*Decca F* 7347, and "Where or When" coupled with "Are You Havin' any Fun?"—*Decca F* 7346. Jimmy Dorsey and His Orchestra have a really grand tune in "Let's Make Memories To-night" on *Brunswick O* 2895, whilst Guy Lombardo leads his Royal Canadians through a typical version of "Faithful Forever" on *Brunswick O* 2897. Count Basie and His Orchestra play "Jive at Five" and "Evil Blues" on *Brunswick O* 2894. Billy Kyle's solo piano record of "Between Sets" probably has nothing to do with tennis, but makes delightful listening. On the other side is an opus called "Finishin' up a Date"—*Brunswick O* 2898.

Brian Lawrence and His Lansdowne Orchestra appear in the Rex list with two new records. They are "Where or When" and "Good-morning," both from the film "Babes in Arms" on *Rex* 9711, and "Are You Havin' any Fun?" from George Black's show shop, "The Little Dog Laughed" and "You Never Miss the Old Faces" on *Rex* 9712. Horace Finch at the Empress Ballroom plays a number of popular tunes on the organ in "Finch Favourites, No. 5"—*Rex* 9709, whilst Billy Cotton and His Band play "Red, White and Blue" and "Massed Bands of the Guards" on *Rex* 9699.

ON YOUR WAVELENGTH

By Thermion

The Television Black-out

THERE is not, as was hoped, any possibility at present of a resumption of the television service in any shape or form. I quoted the question which Sir Reginald Curry asked in the House of Commons on January 1st, when he asked: "What is the present situation with regard to television broadcasting in this and other countries; whether the Postmaster-General will consider an early resumption of television broadcasting as an encouragement both to research work and to manufacturers of television sets enabling them to establish a British product in world markets." Major Tryon replied that he could hold out no hope of its early resumption, and although he agreed that television services were in operation in other countries he did not believe that they had passed the experimental stage. Another speaker pursued the question some days later, and received the reply that the P.M.G. could see little prospect of the provision of a television service during the war. The Television Advisory Committee is, however, to meet representatives of the manufacturers to probe the question of the development of television "in the more distant future."

Nomenclature for Metallised Valves

THE importance of distinguishing between a valve with a clear bulb and one with a metallised bulb is becoming increasingly appreciated. The General Electric Company has, therefore, decided that in certain existing, and in all new types of Osram valves of the metallised type, the suffix M shall be included in the coding.

It is felt that this step will do much to obviate many of the difficulties encountered by traders in making out their orders for each type of valve.

It is not intended that this distinctive nomenclature shall apply to older type valves. It will, however, provide a safeguard in ensuring delivery of the correct finish of valves in the case of new receivers, where the new reference number indicating plain or metallised type will be specified in the manufacturers' instruction booklets.

The types involved in this change are DH63, KTW61 and X63 with plain bulbs, which will be specified as DH63M, KTW61M, and X63M when required with metallised bulbs. Types Osram X73M, KTW73M, KTZ73M and DH73M are available only with metallised bulbs.

Most traders will appreciate that there is no difference in the list price between plain and metallised valves.

"Newnes Short-wave Manual"

THERE has just been published from the offices of this journal "Newnes Short-wave Manual"—a complete treatise on the design, construction, operation, and adjustment of short- and ultra-short-wave receivers, aerials and equipment with designs for eight short-wave receivers. The chapters include: An Introduction to the Short Waves; Operating Your First Short-waver; Band Spread Tuning; Hand-capacity Effects; Short and Ultra-short Wavelengths; H.F. Amplification; Tuned H.F. versus the Superhet; Metres, Kilocycles and Megacycles; Mastering the Morse Code; Minimising Interference; Tuning Short-wave Aerials; Making a Screened Aerial-coupler; Couplings for Aerials; More Aerial Couplings; Reflector Aerials; Coil Design; Measuring Wavelengths or Frequencies; Ultra-short-wave Converters and Adapters; Finding and Measuring Wavelengths of Five Metres and Below; Two Simple One-valvers; Two Simple Two-valvers; An A.C. Two-valver; A Standard Three-valver; An A.C. Four-valver; A Nine-valve Communications Superhet. The book contains valuable tables, a list of world short-wave stations, and is fully illustrated. It costs 5s or 5s. 6d. by post from The Publisher, George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

It is attractively bound.

By the way, those of my readers engaged in the engineering trades may also be interested in our new volume "Dictionary of Metals and Their Alloys," which is also published at 5s. or 5s. 6d. by post.

What is a Crooner?

MOST of my readers know my attitude to crooners, and the following is an interesting discourse on the subject which I came across in the *Voice*. I give it for your attention.

"Let's have a few facts about crooning. Even if you're not very interested in the subject, a lot of people are—violently for or equally violently against. Yet I'll guarantee not one in a thousand of them could give you a definition of it.

"If one were to believe the stories in the papers, crooning can be regarded as a substitute for ipecacuanha, for, on being asked his opinion, the Average Reader (we are told) invariably replies: 'It makes me sick.'

"And such is the power of suggestion by newspapers, music-hall comedians, weekly 'funny' papers and others whose self-appointed task it is to raise a smile, that sure enough the average record buyer—*if asked his opinion of crooning*—will automatically reply: 'It makes me sick.'

"If, however, the dangerous word is not mentioned, the selfsame average customer will listen to and enjoy many samples of the art. It is the word itself which conjures up the dislike complexes, not the actual crooning.

"Of course, there is crooning and crooning. Some of it is so bad that even the strongest stomach will turn at it.

"But let us get quite clear in our minds about exactly what *is* crooning. The dictionary will tell you that it is 'to sing softly, as a mother to her child' and is unconsciously near the modern definition, which is 'to sing softly for microphone purposes.'

"Before microphones were in everyday use, a singer *had* to develop lung power or be lost at the back of the hall. Who has not seen a fifth-rate tenor going black in the face and with bulging veins reaching for his top notes? Was it pretty to see? Or enjoyable to hear?

"It is not fair to take the *best* of 'legitimate' singers and compare them with the worst of 'crooners.' You might just as well base your opinion of Wagner on a pub-door cornet player's rendering of 'O Star of Eve.'

"Crooning, as I have said, came into existence with the microphone—which is, literally, the 'magnifier of sound.' It was found that a lot of people had a talent for singing these popular ballads of the day in ways which were amusing, entertaining, unique or just appropriate—but whose voices were not strong enough for the public platform. Who has not had a talented friend who can entertain the drawing-room circle for hours singing at the piano or with a ukulele to accompany himself? Why waste such talent? Before the advent of the microphone such people had to be wasted by reason of sheer lack of carrying power.

"Following these 'natural' but untrained artists came those who grew up with the microphone, who were born into the microphone age. Singers and artists who spent their periods of study not in learning how to reach the back of the hall, but in learning how to master the microphone. For, make no mistake, the 'mike' is a merciless critic and will magnify the slightest weakness.

"It is not the crooner's fault if the songs he or she is paid to sing are banal and trivial. But it *is* his fault if his diction is bad, his intonation faulty or his treatment inappropriate. These are the points on which you should judge a crooner—not the sentimental words he sings. And within these limits he meets the 'legitimate' singer on equal grounds, and often beats him. The only points in which he can't compete are volume (which doesn't matter for microphone singing), tone (which is usually a natural asset with the crooner, otherwise he seldom gets as far as making a record) and technique in vocal tricks (which are not required for the singing of 'pop' ballads)."

Designing Mains Transformers—2

The Question of Determining Suitable Wire Gauges, the Winding Space Required, and Voltage Regulation are Discussed in this Article

By L. O. SPARKS

THE next consideration is what gauge of wire can be used for the various windings, bearing in mind such factors as winding space available, current flowing and the number of turns required. The selection of the most suitable gauge for any given section of the transformer often causes some little worry to the constructor, as the items mentioned above involve a certain amount of calculation which, if not accurate, will upset the whole of the constructional work and/or results obtained.

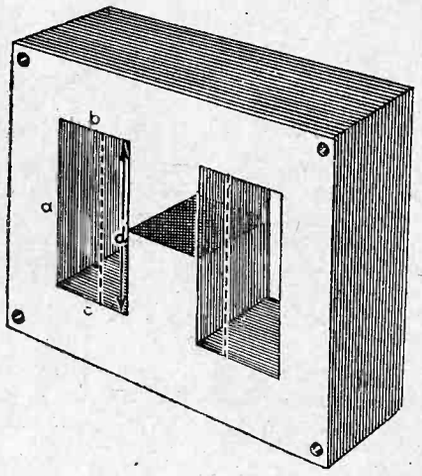
As the current flowing is of prime importance, it is first necessary to consider the value for each winding. These are usually pre-determined by the output requirements, but in the case of the primary winding this has to be determined, and this can readily be done by the following method. We have already calculated the wattage of the input or, in other words, the primary, therefore, knowing this and that watts are expressed as current multiplied by voltage, we can apply a simple twist and express the current flowing as watts divided by voltage, which, in the example under consideration, becomes $\frac{42}{250}$ or .168 amps. The value for the voltage, will, of course, be governed by the voltage of the mains supply on which the transformer is to be used.

Once the current value has been determined, then reference can be made to a wire table to find out the most suitable gauge to use.

When examining a wire table, it will be found that one column deals with the safe maximum current value for any particular gauge of wire. The column is usually headed "Max. Current in Amps. at 1,000 A. per square inch," but in some tables, separate columns are provided for different ratings, i.e., 1,500 A., 2,000 amps, etc. Without discussing the actual meaning of this, it can be noted that for most amateur transformers, the maximum current value can be doubled with reasonable safety. For example, if one looks up the safe maximum current for, say, 22 s.w.g. wire, and finds that the value is 0.6158 amps. (at 1,000 amps. per square inch), then it would be permissible to use that gauge to carry 1.316 amperes. For normal transformer constructional work it is advisable to use the 1,000 amp. rating and apply the above method.

Once the required wire gauge has been determined, reference must be made to the column which gives the number of turns per inch for the wire selected, not forgetting to note the difference between the space required for D.S.C. (double silk covered), D.C.C. (double cotton covered) and enamelled. If any doubt exists as to which form of covering or insulation should be employed, it should be remembered that the D.S.C. is the finest, especially where very high voltages are concerned, although it is the most costly and, for that reason, the other types are more widely used, particularly the enamelled wire. The latter is quite satisfactory, providing it is of reliable make, that care is taken when handling it, and reasonable insulation is used between layers.

If Fig. 1 is now examined, the rectangle formed by a, b, c and d represents what is known as the window of the stampings, while the shaded portion is intended to indicate the cross-sectional area of the core. The length of the window space is that indicated by "d," but the *actual length* available for winding purposes will be "d" minus twice the thickness of the walls of the bobbin which is going to carry the windings. The safest way is to take the measurement between the insides of the walls of the bobbin, as this prevents the calculations being upset by any variation due to the making of the bobbin.



Knowing the number of turns required for the primary, it is not now a difficult matter to calculate the number of layers that will be necessary to complete the winding. If, however, the wire gauge selected is stated to allow 30 turns per inch, it is always advisable to allow a little latitude for imperfections in the winding. Once the number of layers is known, the thickness of the winding can be deduced, but when doing this, it must not be overlooked that insulation, in the form of Empire cloth or dry brown paper, between layers will increase the calculated thickness; therefore, it becomes necessary to add, say, 50 per cent. We will assume that the winding under consideration will occupy the space shown by the dotted lines in Fig. 1.

For a satisfactory product, one or two more calculations become essential. It is advisable to determine the resistance of the wire used for the primary and the secondary (H.T.) windings, as these have a direct bearing on the accuracy of the output voltages when the pre-determined loads are applied.

Knowing the thickness of the primary winding, one can calculate or measure the average length of one turn. This is shown, in a simple plan view of the winding, in Fig. 2, the turn concerned being the heavy black dotted line.

If the length of the turn is multiplied by the number of turns in the winding, the total length of the wire used will be obtained and, by further reference to the wire table, its resistance determined. This resistance will produce a certain voltage drop in the effective primary voltage, depending, of course, on the current flowing and, as it is necessary to know how much is dropped, the following formula is applied. Vd = resistance of winding multiplied by current flowing in primary (in amps.). It is usual to express Vd. as a fraction of the primary voltage. Supposing Vd came to 20 volts and the applied mains voltage to the primary was 200, then the fraction would become 20/200 or, simplified, 1/10th.

The object of going to this trouble is to correct errors which will be present, due to losses, if the secondaries are wound according to the rule of so many turns-per-volt. The output voltages are likely to fall below the calculated values when loads are applied, if some allowance is not made for iron and copper losses, especially in the case of the low-voltage/high-current windings. With the latter, owing to the heavy gauge wire usually employed, the actual resistance of the winding will be of a very low order.

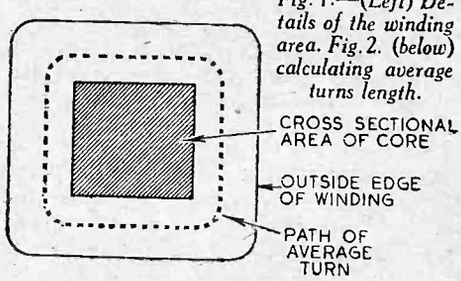


Fig. 1.—(Left) Details of the winding area. Fig. 2. (below) calculating average turns length.

Assuming that we have a figure of 1/10 for Vd., it would mean that the number of turns for the L.T. windings would be *increased* by 1/10th of the number arrived at by the turns-per-volt calculation. When considering the H.T. secondaries, it is not so essential to make this correction, owing to the difference in characteristics between this and the L.T. winding, but if one is prepared to go to the slight extra trouble and correct for losses, the output will be in keeping with the calculated value. In this instance, the actual resistance of the secondary winding must be calculated to determine its own voltage drop.

Voltage Regulation

This is another item which causes amateurs a little uncertainty. As mentioned above, if the design is not good, the voltage output of a secondary winding will vary according to the load applied or, in other words, the current flowing. It is possible to state the variation in output voltages secured under the two conditions as a percentage of the calculated value, and it is this figure which indicates the efficiency of the transformer as regards voltage regulation.

A New Expansion Circuit

The Pros and Cons of Contrast Expansion, and Details of a New Type of Circuit. By W. J. DELANEY

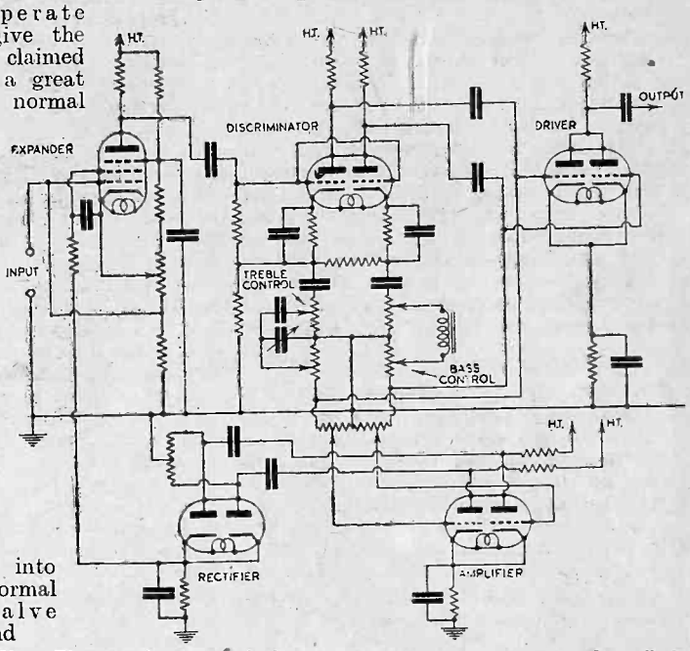
OWING to the restriction of broadcasting there is an increasing interest in gramophone record reproduction, and the great interest which has been shown by readers in the "Ideal" Radiogram circuit which was recently published shows that the contrast expansion circuit has a wide appeal. Many queries have been asked concerning the arrangement, and certain doubts have been expressed in some quarters concerning the advisability of using it. For the benefit of those who are not familiar with the arrangement it may be stated that it consists of a special amplifier so designed that loud passages, or increases in volume on a record, are given additional amplification, whilst the amplification is cut down when a quiet passage is reproduced. In this way the balance of the volume on a record is expanded and a more realistic effect is obtained. The reasons for the use of such a circuit are that the recording engineer has to reduce the contrast due to the deficiencies of the normal recording process and the limitations imposed by the record material. Now the purist or musical critic argues that the arrangement is worthless for several reasons. One claim which is put forward is that there is a form of frequency distortion which unbalances reproduction and which cannot be tolerated in spite of the contrast improvement.

Tonal Balance

Another, and perhaps more important point, is that of tonal balance. Take, for example, a dance band which has been recorded. Suppose that the trumpet suddenly takes a solo at full volume. Owing to the increased input to the expander amplifier the gain will be increased and the trumpet will sound appreciably louder. But, at the same time, all other instruments in the band will also be increased, as the overall gain has been so modified. Therefore, says the critic, the expander amplifier is spoiling the balance of the band, as all other instruments should remain at the same level. Against this, however, one may argue that the balance between the solo instrumentalist and other parts of the band will not be modified, and thus, although the whole record is increased in volume, one still retains the perspective of the record and does not notice the increased output of the rest of the band —the soloist standing out. A great deal thus depends upon personal taste, and some listeners will prefer to hear the record with expansion, despite this wrong balance due to unequal amplification. However, this point seems to have created considerable interest in America and a new circuit was recently introduced in an endeavour to overcome the "defect," and in view of the wide interest in this type of circuit we give on this page a theoretical diagram of the expansion arrangement which has been developed by the Radio News of America. The theory underlying the scheme is that a special discriminator circuit is provided in the expansion chain and this "sorts out" the high and low frequencies, and each may be boosted or attenuated as desired. In this way it is possible to pass on certain frequencies for normal expansion, whilst others may be stepped up to receive additional amplification, or cut down so that they are not expanded. Obviously, such a scheme necessitates that the operator knows the musical score of the record being played and must operate the controls to give the desired effects. It is claimed that the result is a great improvement on the normal expansion circuit, but it is obvious that the results are in the hands of the operator and thus personal preferences will enter into the reproduction. Many will prefer the automatic reproduction of the disc. However, the arrangement utilises five valves, and we have not yet had an opportunity of trying out the scheme in full.

The Circuit

The signal is fed into the grid of the normal expander type of valve in the usual way, and the output of this valve is regulated by signals coming from the amplifier and rectifier of the expander circuit in the normal manner. The fifth valve of the circuit is the input to the final amplifier or output stage. The output from the expander valve is taken to the two grids of a double-triode, and in the cathode circuits of this double valve the special discriminator or tone-selector circuits are arranged. Adjustments of the ganged potentiometers in these two cathode circuits attenuate or boost bass or treble according to their settings, and the output from each of these circuits is split and taken to the grids of the output or driver valve and also to the grids of the expander amplifier. This is also a double-triode valve, and the grids are fed in push-pull, the output from the two anodes also being taken in push-pull to the anodes of a double-diode rectifier. The output from this stage is taken from the two cathodes (linked) round to the expander or input valve. The output from the two anodes of the discriminator valve are also taken to the driver or output valve and thus there is a double mixing in this stage. It will be seen from the explanation and the diagram that the idea is to select any desired balance of high and low frequencies in the detector stage for subsequent rectification and this is fed back as control voltage on the expander.



Theoretical circuit of the new expansion arrangement. It will be seen that the signal passes from the expander stage and thence to the discriminator stage. From here it is taken both to the driver or output valve and to the expander amplifier. The A.F. currents are stepped up here, passed to the rectifier and the resultant rectified D.C. is applied to the expander as control bias. At the same time the signal is taken from the cathode circuits of the discriminator stage and through tone-control arrangements is also fed to the amplifier and driver.

Modifications

The idea is very fascinating and to my mind represents one of the most interesting fields for experiment in modern radio. Too little attention has been paid to the reproduction of records and there have been very little changes compared with the vast developments in the radio side of receivers. The L.F. amplifier has remained unchanged since the earliest days, and with the improvements in records due to electrical recording it is desirable to take steps to improve the amplifier as the pick-up is beyond the hands of the ordinary listener from a development point of view. The ideal arrangement would, of course, be an automatic discriminator which would not operate beyond certain levels so that in a case such as that mentioned earlier, where a soloist takes a lead at increased volume, that instrument would receive additional boost, but all others which were below a given level would remain unchanged. But whatever form of circuit is adopted one of the most difficult things to eliminate is frequency distortion or effects due to the time lag of various condensers and similar components connected in the circuit.

EXPERIMENTAL 6-

Constructional Details of a Unit for Microphone

ALTHOUGH we have published several constructional designs in the past for various types of amplifier they are, like all published designs, incapable of satisfying every particular reader, and so we give in this issue a further type of amplifier which covers some of the points which have previously not been incorporated in a single design. Economy has been one of the main keynotes in view of the present general conditions, and at the same time a reasonably high output has been aimed at. The amplifier was, in fact, designed primarily for home-recording purposes, and many existing components were incorporated. The amplifier is not critical in its design, and any suitable parts which you have on hand may be substituted for those which we used, provided the main essentials are borne in mind. The circuit which was adopted included a single input stage feeding two high-power triodes in push-pull in the output stage, and a valve rectifier was incorporated on the mains side. The input is, as already mentioned, designed for a microphone or similar input for recording purposes, but there is no reason why this should not be modified for normal microphone and pick-up work, or for connection to a radio unit for normal broadcast reception. One of the main difficulties of using only two stages is that of lack of amplification, so that the output stage is not fully loaded, and in this design we have endeavoured to overcome this drawback by using a high step-up transformer—actually a Q.P.P. component.

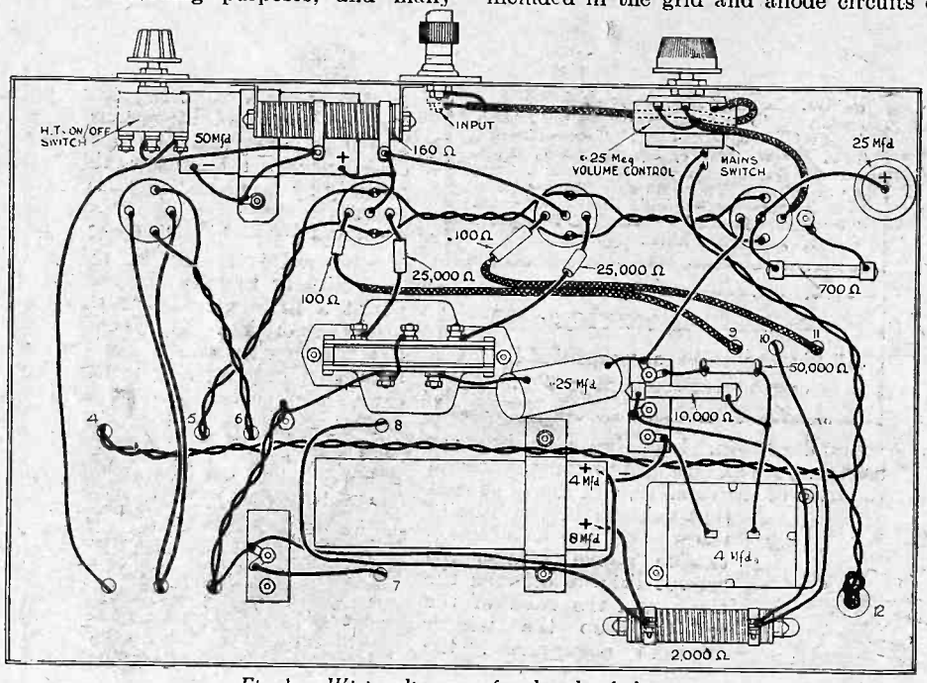


Fig. 1.—Wiring diagram of underside of chassis.

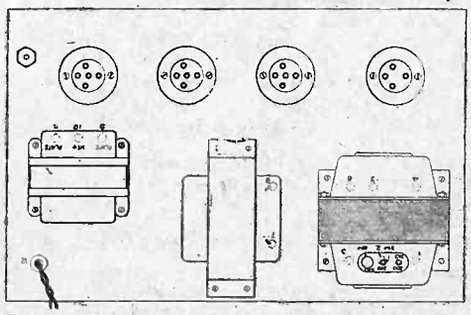


Fig. 2.—Top of chassis showing position of main components and holes.

General Features

This transformer is parallel-fed, and to avoid all forms of instability in the output stage, which in the original model would have rendered it useless for recording purposes, oscillation stoppers have been included in the grid and anode circuits of the two push-pull valves. The first stage is adequately decoupled—the parallel-fed transformer also assisting in this direction. The valves in the amplifier are of the indirectly-heated type, but the rectifier which was on hand was of the directly-heated type, and, therefore, it was necessary to take steps to avoid damage to condensers and other components due to voltage surge when the amplifier is switched on. For this purpose an on/off switch has been included in the H.T. negative lead, and this is not operated until the valves have been switched on for some minutes. If, however, an indirectly-heated rectifier is available this switch could be eliminated, and the H.T. negative line joined direct to the chassis. The latter is of the all-metal type and carries on the front runner the H.T. switch just mentioned, the input terminals and the input volume control. The output leads are taken direct from the output transformer. On the mains input side the transformer which was used had plug-in sockets and the mains lead was fitted with suitable plugs and mains switching was effected by the combined volume-control switch.

Constructional Details

The chassis must first be drilled in accordance with the detailed drawing, Fig. 5, and although standard dimensions are given for the valveholders, the remaining holes may be modified according to the components which are employed. The choke should, however, be of the type specified, and the output transformer should also be identical. The front runner strip should next be drilled to accommodate the three items which are mounted on it. There are only the three components on the upper surface, and thus to simplify assembly and wiring it is desirable to leave these three items until last, when the chassis may be placed upon the bench in an inverted position and all parts mounted and wiring carried out so that the unit is practically completed before the main three items are mounted. Note that a small clip will have to be made to hold the electrolytics in position, and also that certain of the wires are screened. It is also very important to note that the metal case of the volume control must also be earthed, as it was found that hum was experienced until this had been carried out. The resistors, with the exception of the large wire-wound resistors, are suspended in the wiring, and an insulated anchoring point is provided for the H.T. positive connection. This could be dispensed with but there is always a risk that a short-circuit might develop due to the metal chassis being "live" and accordingly the insulated anchoring point is a worth-while refinement. Although an earth

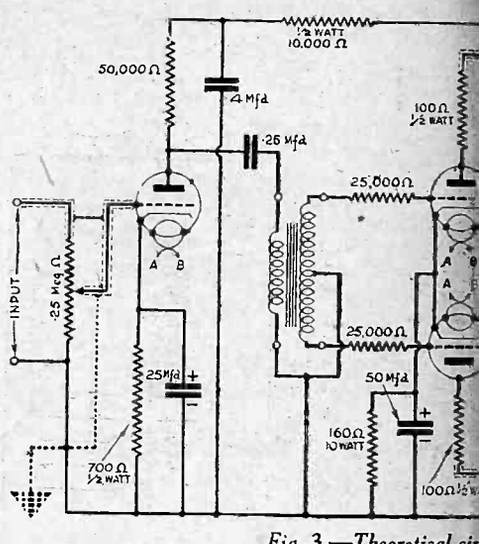


Fig. 3.—Theoretical cir

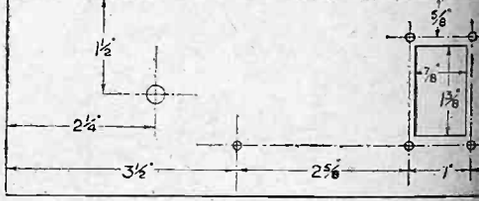


Fig. 4.—Drilling details of

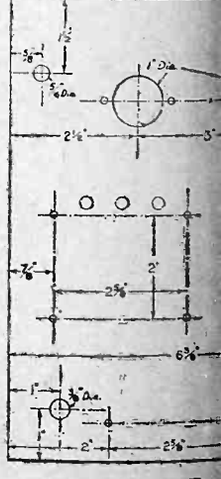


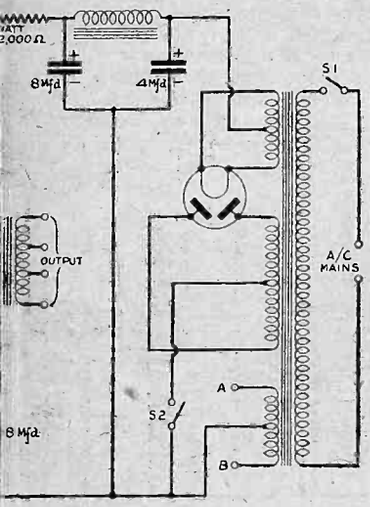
Fig.

WATT AMPLIFIER

f-contained A.C. Mains r Pick-up Work

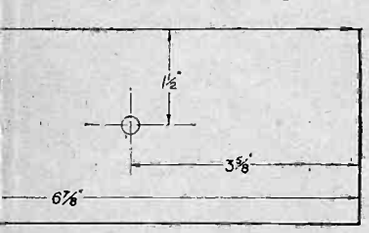
onnection has not been shown on the hassis, it is usually necessary to provide n earth to the metal work to obtain the ost efficient screening and to reduce back-round noises.

The input terminals on the original odel were mounted on a small strip of sulating material, which was finally olted to the chassis, after the rectangular

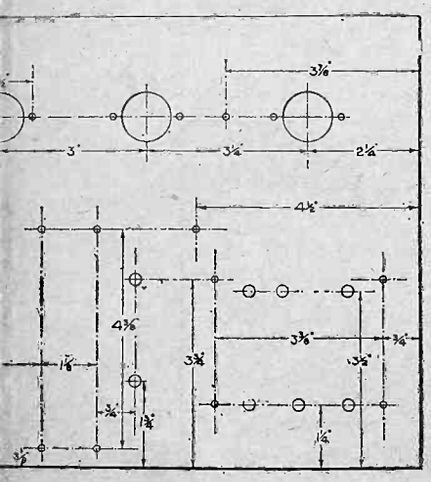


he amplifier.

ening shown in the drawings had been ade. Insulating bushes can, of course, used in place of the strip. A further



t chassis runner.



rilling details for the chassis.

point concerns the 4 mfd. fixed condenser which, in the original model, was one of the paper type which was available. These are rather expensive and if condensers are being purchased for the amplifier it would be preferable to obtain a multi-block electrolytic condenser in which this also

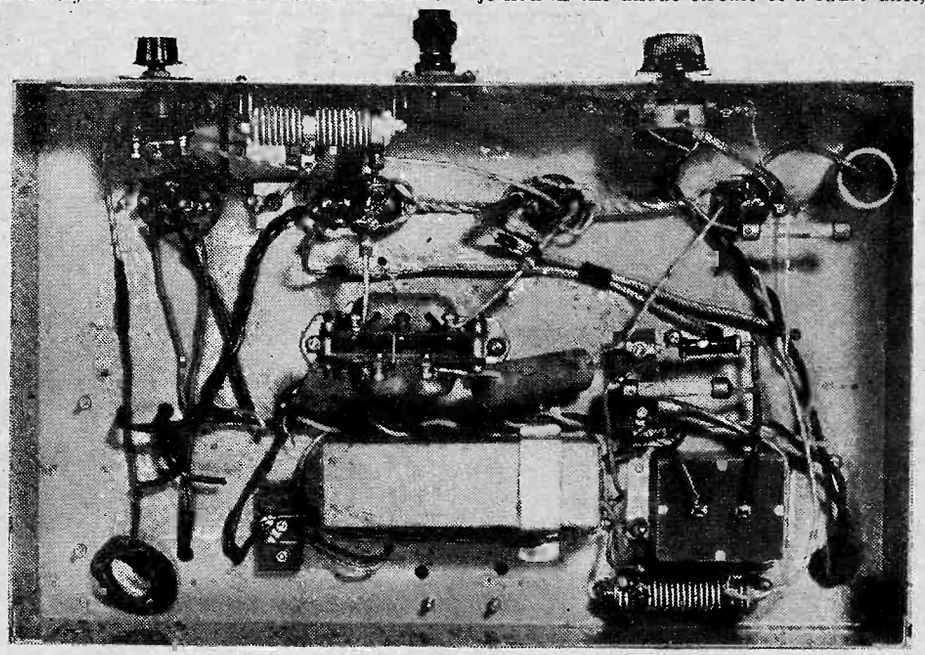


Fig. 6.—Compare this illustration with the diagram in Fig. 1.

was included. Thus, instead of obtaining the type 0288 condenser, consisting of two 8 mfd. and one 4 mfd. you should obtain the type 317 which contains two 4 mfd. units in addition to the two 8 mfd. sections.

The output transformer should be selected according to the type of speaker which is going to be used, and this will govern the question of the ratio of the transformer. It is possible to obtain them with a high ratio or low.

Input Arrangements

A particularly important point to be noted in connection with an amplifier of this type, or any equipment used for microphone work, is that voltage fed to the output stage is dependent upon the type of microphone which is employed. As already mentioned, the gain from the single valve through the high step-up transformer is sufficient under *normal* conditions to load the output stage, and for this purpose we assume an efficient microphone of the transverse-current type matched to the input circuit by means of a suitable microphone transformer. If other types of microphone are employed it will be necessary to add a further stage of amplification, and this may be built as a separate self-contained unit or included on the same chassis. Many operators of amplifying equipment prefer a separate amplifier built into the base of the microphone and the necessary mixing or volume controls are mounted on this. By doing this it is possible to have ready at hand means of controlling the output of the amplifier, which may then be placed in a suitable out-of-the-way position in the hall or other place, and the user of the microphone may actually operate the amplifier at the same time.

If the amplifier is to be used in conjunction with a radio receiver, then no additional amplification should be necessary and the input circuit may be taken direct from a detector stage where resistance-capacity amplification may be included, or, if a unit is being specially built, it would be possible to use a choke-capacity filter. If headphones or speaker are at present joined in the anode circuit of a radio unit, and this is to be used with the amplifier, the two phone terminals should be bridged by a good L.F. choke, and a 2 or 4 mfd. fixed condenser joined to the anode terminal and this may then be joined to the grid end of the input volume control.

LIST OF COMPONENTS

- One mains transformer—350-0-350 at 120 mA; 4 volts at 3 amps; 4 volts at 2 amps.
- One smoothing choke (Partridge).
- One push-pull output transformer (see text) (Ferranti).
- Three 5-pin valveholders, chassis type (Clix).
- One 4-pin ditto (Clix).
- One .25 megohm volume control with switch (Dubilier).
- One Rotary on/off switch, type S.91 (Bulgin).
- Two large insulated terminals.
- One 2,000-ohm, 20-watt resistance, type PR.7 (Bulgin).
- One 200-ohm ditto, type PR.24 (Bulgin).
- One Q.P.P. input transformer (any make).
- Seven fixed resistors:
  - Two 100 ohm.
  - Two 25,000 ohm.
  - One 50,000 ohm.
  - One 700 ohm.

  } Half watt type (Dubilier)
  - One 10,000 ohm, one watt type.
- One .25 mfd. fixed condenser type 4608/S (Dubilier).
- One 50 mfd. electrolytic condenser, type 3,004 (Dubilier).
- One 25 mfd. electrolytic, type 401 (Dubilier).
- One block electrolytic, 8-8-4 mfd., type 0288 (Dubilier).
- One 4 mfd. fixed condenser (see text) (Dubilier).
- One 442 BU. valve
- One 41 MH. valve
- Two 41.MXP valve

} (Cossor).

PRACTICAL TELEVISION

March 9th, 1940. Vol. 4. No. 193.

Renewed Activity

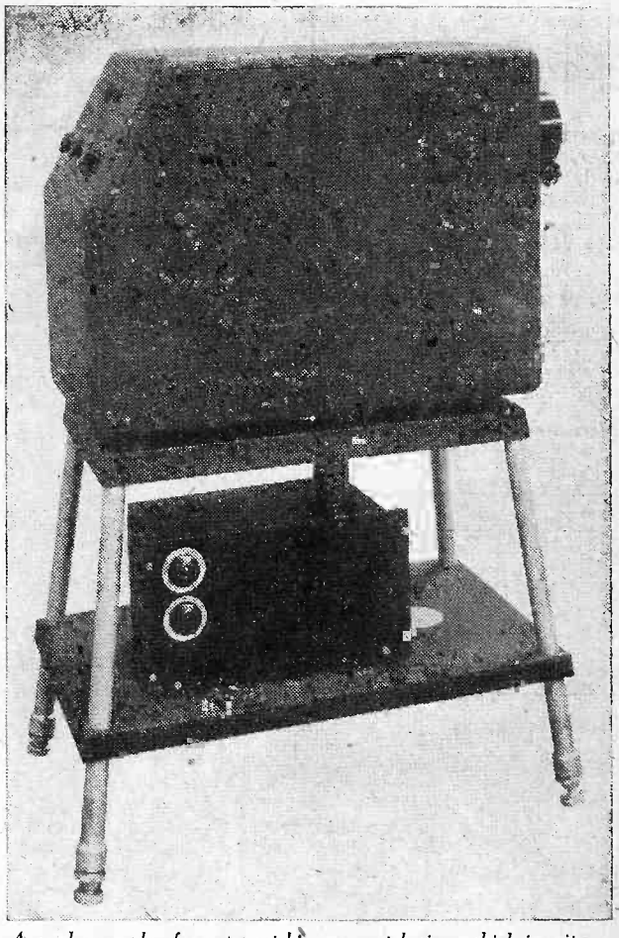
THERE is every sign of renewed activity in the television front line, in spite of the Postmaster-General's recent statement in Parliament that he could hold out no hope of an early resumption of the television service. Although nothing is heard of their activities or deliberations in committee meetings, there is still in existence the Television Advisory Committee, and it is known that a meeting was held by them a few days ago. Following past practice, however, there is little hope of any statement being issued by them, but many conjectures are being made as to the possible renewal of some form of television service, in spite of war's activities. Even if it is accepted that the radiation of signals into the ether is impossible for a variety of reasons, the fact that vision and sound can be sent over cable keeps cropping up as an alternative. It cannot be dismissed solely on the score of expense, for there are many far-seeing people associated with the television industry, in one form or another, who have pinned their faith in a rediffusion of television signals through the medium of a wire connection. Originally, it was proposed to have a series of main receiving centres from which the radio signals would be redistributed by means of cable links to houses willing to pay rental fees, the idea being an elaboration of present-day sound rediffusion practice which is so popular in many districts. Since these centres cannot now obtain their signal as an incoming radio link, the suggestion has been put forward that these centres could be connected to the main television station by coaxial cable, and then rediffused by means of less expensive cable over relatively small areas.

Big-screen Possibilities

IT is known that television signals, with their very high frequency characteristic, have been relayed jointly by the Post Office and the B.B.C. over normal telephone cable circuits, and the hope has been expressed that carefully directed research would enable this scheme to be developed for home consumption. No question of providing an ideal direction finding station for enemy aircraft would then arise, and the rebirth of a badly hit industry would be ensured. Quite apart from the home entertainment angle, however, there is always that important question of big-screen working which must not be forgotten. Certain of the large London cinemas were installed with up-to-date big-screen receivers before the outbreak of war, and first-class variety programmes could be rediffused to these and other entertainment centres from a central studio, and thus add materially to box office receipts which have been so seriously affected since hostilities started. By accommodating the artists in one spot, and allowing their acts to be seen in a number of theatres and cinemas, the costs involved would be shared on an equitable basis. Not only the large halls and theatres need be involved, but the smaller ones as well, for compact intermediate-sized television receivers could be developed for this purpose. As an example of what could be expected in the way of equipment capable of giving a good television picture up to, say, 8 or 10ft., reference can be made to the accompanying illustration. It shows one of the earlier model receivers employing a projection type cathode-ray tube. The fluorescent screen can be of the direct type, in which the built-up picture is projected right through the screen on to a remote screen, or use could be made of the later types, in which the picture was projected directly from the front face of the fluorescent screen set at an angle to the scanning beam of electrons. Suitable for front theatre projection with the receiving set, time-base generator, scanning equipment, cathode-ray tube and lens complete, the unit can be built up in a compact form and provide a satisfactory service for relatively small halls unable to meet the expense incurred by the larger screen prototypes. In any case, it will be interesting to watch the developments of the present-day television agitation and to hope that a satisfactory solution will be found that in no way interferes with vital defence services which are essential at this stage of the war.

A Progress Review

IN a recently published review of progress by the Institution of Electrical Engineers, in so far as it applied to the trends associated with the use of electricity in ships, some very interesting comments were made in relation to the research problems which are now being investigated. It was pointed out that these were largely concerned with the minute investigations of innumerable problems, which although in themselves could not be classed as those of major order, were capable of ultimately producing a matter of first-class importance. As examples of this, mention was made of the question of stabilised frequency control for radio communication purposes so that the most minute and accurate adjustments could be made. This same problem has a high degree of importance in the radiation of television signals, for with the very high carrier frequency involved, deviations from the frequency of operation cannot be tolerated if a satisfactory service is to be provided, and that is why crystal controlled transmitters are employed having a performance factor better than 0.01 per cent. in carrier stability. Other problems alluded to in this same review made reference to the commercial application of scientific discoveries, and in the examples furnished they all had a direct bearing on television and its associated ramifications. They were visual direction finding, penetration of fog by the reflection of electric magnetic rays, remote frequency control, applications of television and variable frequency modulation. It was said that the field of research in this subject was wider to-day than ever before, not only because of the youth of the subject, but also because every day a new tool or instrument is being forged for commercial use. How invaluable it would have been to British ships working in fog, mist and darkness if apparatus had been developed to a commercial stage whereby the captain on his bridge would have been able to "see" his way by some form of noctovisor? There is no doubt at all that this is one of the most urgent needs of a maritime nation, such as Great Britain, and in many quarters the hope has been expressed that inventors will exercise their ingenuity in this direction, and so remove one of the terrors of those who go down to the sea in ships.



A good example of a compact big-screen televisor which is suitable for small halls for signal rediffusion.

NEW SERIES

RADIO ENGINEER'S POCKET-BOOK

No. 19

List of Prefixes

mega means a million times.
kilo means a thousand times.
hecto means a hundred times.
deca means ten times.
deci means a tenth part of.
centi means a hundredth part of.
milli means a thousandth part of.
micro means a millionth part of.

Square Measure

100 sq. metres	=1 are.
10,000 sq. metres	=1 hectare.

Weight

10 grammes	=1 decagramme.
10 decagrammes	=1 hectogramme.
10 hectogrammes	=1 kilogramme.
1,000 kilogrammes	=1 tonne.

Capacity

1 litre	=1 cubic decimetre.
10 litres	=1 decalitre.
10 decalitres	=1 hectolitre.
10 hectolitres	=1 kilolitre.

Length

10 millimetres	=1 centimetre.
10 centimetres	=1 decimetre.
10 decimetres	=1 metre.
10 metres	=1 decametre.
10 decametres	=1 hectometre.
10 hectometres	=1 kilometre.
10 kilometres	=1 myriametre.

No. 20

METRIC CONVERSION FACTORS

To convert—	
Millimetres to inches	× .03937 or ÷ 25.4
Centimetres to inches	× .3937 or ÷ 2.54
Metres to inches	× 39.37
Metres to feet	× 3.281
Metres to yards	× 1.094
Metres per second to feet per minute	× 197
Kilometres to miles	× .6214 or ÷ 1.6093
Kilometres to feet	× 3,280.8693
Square millimetres to square inches	× .00155 or ÷ 645.1
Square centimetres to square inches	× .155 or ÷ 6.451
Square metres to square feet	× 10.764
Square metres to square yards	× 1.2

Linear Measure Equivalents

1 inch	=2.54 centimetres, or 25.4 millimetres.
1 foot	=30.4799 centimetres, 304.799 millimetres, or .3047 metre.
1 yard	=.914399 metre.
1 mile	=1.6093 kilometres=5,280 feet.
1 millimetre	=.03937 inch.
1 centimetre	=.3937 inch.
1 decimetre	=3.937 inches.
1 metre	=39.370113 inches. 3.28084 feet. 1.093614 yards.
1 kilometre	=.62137 mile.
1 decametre (10 metres)	=10.936 yards.

No. 21

METRIC CONVERSION FACTORS

To convert—	
Square kilometres to acres	× 247.1
Hectares to acres	× 2.471
Cubic centimetres to cubic inches	× .06 or ÷ 16.383
Cubic metres to cubic feet	× 35.315
Cubic metres to cubic yards	× 1.308
Cubic metres to gallons (231 cubic inches)	× 264.2
Litres to cubic inches	× 61.022
Litres to gallons	× .2642 or ÷ 3.78
Litres to cubic feet	÷ 28.316
Hectolitres to cubic feet	× 3.531
Hectolitres to bushels (2,150.42 cubic inches)	× 2.84
Hectolitres to cubic yards	× .131
Hectolitres to gallons	÷ 26.42
Grammes to ounces (avoirdupois)	× .035 or ÷ 28.35
Grammes per cubic cm. to lb. per cubic inch	÷ 27.7
Joules to foot-lb.	× .7373
Kilogrammes to oz.	× 35.3
Kilogrammes to lb.	× 2.2046
Kilogrammes to tons	× .001
Kilogrammes per sq. cm. to lb. per sq. inch	× 14.223
Kilogramme - metres to foot-lb.	× 7.233
Kilogramme per metre to lb. per foot.	× .672
Kilogramme per cubic metre to lb. per cubic foot	× .062
Kilogramme per cheval-vapeur to lb. per h.p.	× 2.235
Kilowatts to h.p.	× 1.34
Watts to h.p.	÷ 746
Watts to foot-lb. per second	× .7373
Cheval-vapeur to h.p.	× .9863
Gallons of water to lb.	× 10
Atmospheres to lb. per sq. inch	× 14.7

No. 22

TRANSFORMER DATA

DETAILS OF STALLOY CORE STAMPINGS.

Size No.	Dimensions. A	B	C	Number of Stampings.	Approx. Watts.	Turns Volt (50 cycles).	Approx. Winding Area.
	in.	in.	in.	doz. prs.			sq. in.
4	15/16	25/16	7/8	6	50	8	1 1/16
5	5/8	1 1/2	3/4	6	30	12	1 1/4
28	1 1/4	3	1 1/4	6	250	6	3
29	2	4 1/2	1 3/4	6	300	4	5 1/4
30	15/16	1 7/8	7/8	6	45	8	2 3/16
31	1	3 1/2	1	6	100	8	2 3/4
32	1	2 1/4	1	6	75	8	1 3/4
33	1 1/4	2 3/4	1	6	125	6	2 1/4
35	1 1/2	3 1/4	1 5/8	6	200	5	5 1/4

This table covers most of the commoner sizes of stampings, but some makers give different numbers to stampings of similar size.

COPPER WIRE DATA

Standard Wire Gauge	Max. Working Current (amps.)	Enamelled: Winding Turns per sq. in.	Enamelled: Yards per lb.	Double Cotton-Covered: Winding Turns per sq. in.	Double Cotton-Covered: Yards per lb.
16	6.5	226	26.3	173	25.5
18	3.6	392	46.9	297	45.5
20	2.0	685	83.3	472	79.4
22	1.25	1,110	137	592	129
24	0.76	1,770	221	977	203
26	0.51	2,560	330	1,280	294
28	0.35	3,760	488	1,630	422
30	0.25	5,370	694	1,990	587
32	0.18	6,890	915	2,550	755
34	0.13	9,610	1,202	3,020	1,024
36	0.10	13,500	1,840	4,100	1,477
38	0.06	20,400	2,810	5,100	2,287

In the above table the "MAX. WORKING CURRENT" (in amperes) is based on a figure of 2,000 amperes per square inch.

LATEST PATENT NEWS

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, either sheet by sheet as issued on payment of a subscription of 5s. per Group Volume or in bound volumes price 2s. each.

Abstracts Published.

DIRECTIVE WIRELESS SIGNALLING.—Lorenz Akt.-Ges., C. No. 499708.

Relates to a radio-goniometer of the kind described in Specification 477963 in which an auxiliary coil 11 (Fig. 1) is mounted at right-angles to the search coil 6 and is substituted for it, in order to give the "sense" of the bearing. According to the invention, the switches 9 and 15 which control the setting of the "sense" coil and insert it, first in phase and then in phase-opposition, are mounted on the hand wheel of the direction-finder, and may take the form of a push-button or press-ring.

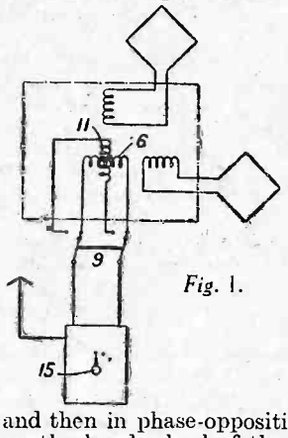


Fig. 1.

WIRELESS RECEIVING-APPARATUS.—Pye, Ltd., Butler, C. E. M., and Root, E. V. No. 500873.

The waverange switch of a wireless receiving-set is operated by rotating the tuning knob after the tuning condensers have been moved to a limit of movement. When the spindle 10 (Fig. 2) is rotated balls 14 rotate and transmit movement of the spindle to sleeve 20 to which the arm 26 controlling condenser shaft 27 is fixed. The movement of the shaft 27 is slow at first, but after rotation through a predetermined angle

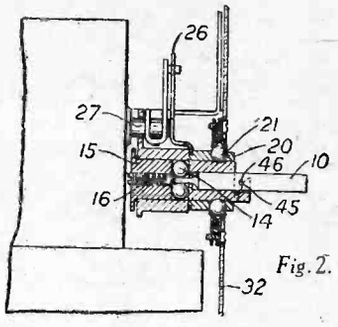


Fig. 2.

pin 46 on shaft 10 engages a cam surface 45 and the shaft moves axially against spring 16, to replace the drive through balls 14 by a direct drive through sleeve 15 so that the condenser shaft 27 can be rotated quickly. When the condenser reaches its limit of movement, rotation of sleeve 20 is prevented and further rotation of the spindle 10 is transmitted through sleeve 15 and balls 21 to disc 32. The disc carries the waverange scales and contacts such as 33 (Fig. 3) which co-operate with stationary contacts such as 34 and these may alter the waverange of the receiver, the disc being centred in the various positions by roller 37 on arm 38 which engages detents such as 41. An extension 42 of arm 38 may operate muting

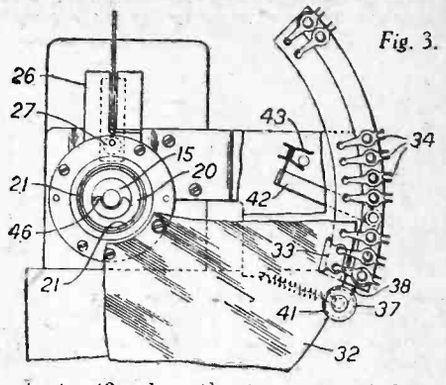


Fig. 3.

contacts 43 when the waverange is being altered. The device is said to be particularly suitable for mechanical remote control by means of a flexible shaft.

TELEVISION. — Radioakt.-Ges. D. S. Loewe. No. 501608.

The Specification as open to inspection under Sect. 91 comprises the following subject-matter. A scanning disc with spiral scanning holes and synchronising slots is lighted by a lamp to form a ray of less width than the slots. A photo-cell is coupled to an amplifier with oscillatory circuits tuned to the frame frequency and provided with screening grid tubes. The frequency reducer comprises a pentode to the outer grid of which the amplified filtered slot frequency is conducted. The anode circuit is adjusted to one quarter of the slot frequency. The impulses are led to a circuit tuned to the reduced frequency. This subject-matter does not appear in the Specification as accepted.

NEW PATENTS

These particulars of New Patents of interest to readers have been selected from the Official Journal of Patents and are published by permission of the Controller of H.M. Stationery Office. The Official Journal of Patents can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. weekly (annual subscription £2 10s.).

Latest Patent Applications.

2116.—British Artid Plastics, Ltd., and Bamberger, M. O.—Indicator dials. February 2nd.

2376.—Dalgleish, J. W., Durrant, H. C., and Pye, Ltd.—Device for attaching fabric screens, etc., to cases, etc. February 7th.

2359.—Symonds, F. C.—Timing apparatus for use on wireless receiving-sets. February 7th.

Specifications Published.

517514.—Baird Television, Ltd., and Chapter, C. F.—Electron-discharge devices.

517420.—Cooper, A. H.—Radio-receivers.

517427.—Baird Television, Ltd., Denisoff, A. K., and Spiers, J. M. S.—Luminescent screens in cathode-ray and like electron-discharge tubes.

517428.—Baird Television, Ltd., and Bentley, L. C.—Television or like receivers.

517482.—Baird Television, Ltd., and Jones, V. A.—Electron-discharge devices for television and like systems.

517483.—Baird Television, Ltd., and Jones, V. A.—Television and like receivers.

517578.—Marconi's Wireless Telegraph Co., Ltd., and Brett, G. F.—Thermionic valves.

517579.—Marconi's Wireless Telegraph Co., Ltd., Brett, G. F., Herriott, E. G., and Gratze, H. J. S.—Cathode-ray tubes.

517555.—Harman, W. E.—Electric sound-reproducing appliances for deaf-aid or for small portable wireless receiving-sets.

517627.—Standard Telephones and Cables, Ltd., and Newton, G.—Bearings, particularly for the tuning mechanism for radio-receivers or the like.

517636.—Marconi's Wireless Telegraph Co., Ltd. — Automatic tuning systems for radio-receivers.

517597.—Baird Television, Ltd., and Tingley, G. R.—Deflecting means for use with cathode-ray tubes. (Cognate Application, 27367/38.)

517602.—General Electric Co., Ltd., and Espley, D. C.—Nipkow discs for use in television.

517605.—General Electric Co., Ltd., Jesty, L. C., and Sharpe, J.—Screens of material adapted to be excited to luminescence by the incidence of charged particles.

517607.—Associated Press.—Scanning devices.

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at the uniform price of 1s. each.

ASTRONOMICAL TELEVISION

THE application of television to astronomical studies has been advanced as a serious possibility in many quarters, and varying degrees of success have attended the efforts of inventors who have built apparatus to assist in the study of the heavenly bodies. One of the biggest difficulties seems to be associated with the employment of the correct types of lens to allow the objects to be focused on to electron camera photo-electric surfaces for synthesising purposes. In spite of this, however, it was stated recently that in America television apparatus has been built for the specific purpose of providing aid to the study of the behaviour of the sun. Except on those rather rare occasions when a partial or complete eclipse is visible in some part of the earth, the brilliance of the sun's face prevents astronomers from making an exact study of the corona of flaming gas which surrounds the periphery. In this new television equipment, therefore, the sun's face complete with corona is projected on to scanning equipment of a mechanical type. The circular image corresponding to the sun's surface is then masked off, and the remaining flaming corona ring is scanned and reproduced as a television picture on the face of a cathode-ray tube receiver to which the transmitter is directly coupled. An uninterrupted study can then be undertaken, and the higher the degree of picture definition used for dissecting the picture the more accurate becomes the resultant picture. When such a course is found necessary it is possible to make a film of the television picture or alternatively static photographs

MAINTENANCE OF WIRELESS APPARATUS IN THE R.A.F.

ALTHOUGH communication in the R.A.F. is largely by landline and teleprinter, there is still much wireless signalling between ground and aircraft, as well as from aircraft to aircraft. The maintenance work is carried out by the wireless and electrical mechanic. The wireless operator uses the set, the wireless and electrical mechanic, commonly called the WEM, maintains it.

In a transmitting station we may find a number of transmitters working quietly by themselves without any apparent cause. The transmissions are made by a cable laid from a distant receiving station, this method being termed "remote control." These transmitters, being of low power, seldom require maintenance; but when they do, the replacing of a component is a fairly simple matter. A bank of condensers may be giving trouble: fitting one or more new ones takes but a short time. The adjustment of a relay, cleaning of a contact, checking up insulation, or correct tuning adjustments indicated by readings in the indicating voltmeter, ammeter, or milliammeter on the front of the transmitter can easily be carried out. A red light shows that the current is on. If access is required to the interior of the set, the opening of a door or panel automatically cuts off the power. A knowledge of relays is an advantage in this respect, and is quickly gained in practice. Remote control lines have to be tested for insulation and continuity periodically.

The Superhet

The type of receiver almost generally in use is the superheterodyne, and the many adjustments required to obtain maximum efficiency from this type of receiver are carried out by referring to a chart of readings for each frequency. Lift the lid of this receiver and one finds that screening is most efficient. To remove a valve is quite simple, testing of the various valves is carried out by simply plugging a milliammeter into the various stages, a more thorough method of testing the various circuits is carried out with an Avometer.

With wireless sets installed in aircraft, the problem of maintenance is more difficult and of the utmost importance. Aircraft installation has to put up with hard knocks and atmospherical changes, for aircraft are sometimes left in the open for days on end. Vibration is absorbed by "slinging" the radio set on shock-absorbers in a cradle, that may be bodily removed from the aircraft to facilitate repairs. Aerial and earth systems have to be checked for efficiency of insulation. This is one of the chief problems of aircraft wireless and electrical gear, as insulation must be maintained up to certain standards.

Radio Workshop

Every hangar has its wireless work bench, and in warmth and comfort the WEM can carry out the overhaul and testing of his sets and components. The Avometer and Megger, most useful detectives of circuit faults, mysteries in themselves to the untrained amateur, become the mechanic's most useful guides. Inside the set, compactness and accessibility have been remembered, and the designer has taken care that the soldering iron can reach most places.

Nowadays a great deal of work is done on high frequencies, and the problems that arise from the use of these frequencies require a good knowledge of the principles involved. Not only is morse code used for communication of the air, but also radio telephony. The latter is also used for inter-communication between members of the crew in large aircraft. The marvel of being able to speak or hear someone who is a mile or two overhead and perhaps travelling at something like 300 m.p.h., has now become commonplace, but the man who has to look after the wireless sets knows that upon his care of the sets depends the results with the R/T. Faults are soon brought to light, when there is background noise, gruffness of speech, or merely a noise, and here the aeroplane itself can often solve the riddle.

Every aeroplane used for radio has to be carefully bonded. By that is meant the joining-up of all metal parts of the aeroplane by small pieces of copper wire, so that there is continuity, and bad electrical joints between members are short-circuited by the bonding wire. This is also a safety measure, to ensure that all metal members of the airframe are maintained at the same potential, so preventing a discharge due to a "static charge." This would often occur when flying through clouds or storms.

Interference

The engines of an aircraft generate a mass of high-frequency currents, from magnetos, leads, and sparking-plugs; all these have to be completely screened. Here the aero-motor engineer has to co-operate with the radio engineer to ensure clear speech.

The power for operating the aircraft transmitter is obtained from a generator driven by the engine. Generators do overtime work; they have the stresses of sudden acceleration and deceleration, and the moisture and oil which inevitably seem to get into generators. They are really fine precision instruments, and when on the workshop test bench and dismantled, require careful handling and inspection.

Between the men on the ground and the men in the air there exists a close liaison. Inevitably special wireless jargon has crept into use. We all know what an amp or an ohm is, and that a "dis" or a "short" can cause a great deal of worrying, but other words have their meaning, too, such as "juice," "revs," "using his foot" (used to describe a bad morse sender), and so on.

There is ample opportunity for the keen wireless and electrically-minded man in the R.A.F., and a practical one at that. He will undoubtedly learn a lot that will be useful to him on his return to civil life.

Open to Discussion

The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

Exchanging QSL Cards: Is it Desirable?

SIR,—I was very pleased to read the remarks of Mr. Cooper and "Thermion" on the QSL exchange racket. I have been fed up with this situation for some time and I heartily agree with them.

I would like you to impress upon your readers, many of whom are very hazy on amateur procedure, the idea of the QSL, and its value to the serious SWL and Ham, that a QSL is not a gaudy card which saves the listener from buying wallpaper for his "shack," but a card, sometimes very plain indeed, which reflects his skill at the controls of his receiver, and is always well earned, but never exchanged through the post without radio contact taking place first.

Also, for the above reason the exchanged card cannot be called a QSL since it verifies nothing, and has little to do with radio at all. It could be called an SWL card or some other name to distinguish it from the genuine article. I am not suggesting that the serious SWL should not refer to his cards as QSLs. I class him along with the Ham operator. It is the card exchange fiend who should be separated from the rest. No Ham would be found guilty of such an action, and most requests for a card on the exchange basis, would, I think, go into the waste-paper basket, and quite rightly so.

Having got that off my chest, I would like to say that I am a fairly new reader of P.W. and I like it very much, although I would like to see more mains circuits given, for the advanced constructor as well as the beginner, and the short wave section could be enlarged to include a station list, a review of conditions, new stations, and photos of QSLs from real DX stations.

I find the Club News and Open to Discussion columns very interesting, also the Radio Engineer's Pocket Book series.

At present I am using a Pilot 10-valve commercial receiver on short waves, but I have almost finished a communications receiver using English valves and having 1 RF stage, mixer, separate oscillator, 1 stage IF and 2 stages LF, and BFO, using nine valves in all. To improve this on the higher frequencies I am completing a two-stage pre-selector similar to the one recently described in P.W. and using two 6K7G Octal valves.

My TX was 6F6 tritet, or CO. and 6L6 PA. with a speech amplifier—modulator of 6C5, 6A6, 6L6, line-up, but of course this is now laid up with all the rest of such gear.

I will be pleased to hear from any reader of P.W. and to exchange views.—N. HORROCKS (2CUZ), 32, Sandbrook Road, Ainsdale, Southport, Lancs.

Manila and Lourenco Marques

SIR,—In the issue of PRACTICAL WIRELESS dated 10th February, I note a letter from a Mr. R. T. G. Davis regarding the reception of Manila and Lourenco Marques. As these stations have already been logged by me, I feel sure Mr. Davis and possibly other readers would be interested in the following information.

Manila: This station is KZRH and not KZRA, operating on 9,640 kc/s. It was logged on the 31st January from 15.10–16.00 G.M.T. and the call is "KZRH—The voice of the Philippines on a frequency of 9,640 kc/s." At 16.00 G.M.T. the station closed till "6 a.m. Manila time" (22.00 G.M.T.). Incidentally it can be easily identified by the "wisecracking" announcer employed in the afternoon session.

Lourenco Marques was logged on the 9th February, from 20.30–21.00 G.M.T. at Q5 R5/6 The call is CR7BE and operate on 9.64 mc/s or 31.10 m. from 19.00–21.00 G.M.T. Full details are: "The Radio Club of Mozambique—CR7BE—on a frequency of 9.64 mc/s or 31.10 m., at Lourenco Marques, Mozambique, Portuguese East Africa," preceded by four chimes. Address reports to P.O. 594, Lourenco Marques, Mozambique, Portuguese East Africa. Reports are wanted.

In conclusion, I would like to say that since taking P.W. I have gained many friends through the medium of "Open to Discussion," a column which I should like to see extended. Furthermore, I think that "Leaves from a Short-wave Log" ought to be reinstated as I, like many other readers, miss it very much.

Thanking you for a splendid magazine.—ROBT. WM. IBALL, Worksop, Notts.

Correspondents Wanted

SIR,—As a reader of your excellent wireless paper, I should like to get in touch with any other reader who, like myself, is actively interested in home recording.—P. LANDAUER, Burchetts Farm, Ockley, Surrey.

SIR,—I have been a reader of your fine paper for over nine months, during which time I have been interested in short-wave reception. I have been logging my stations on a 4-valve all-wave receiver, and here are some of my best catches:

The Ideal Radiogram

CERTAIN queries have been raised regarding the prices of the components needed for the Ideal Radiogram, which was recently described in these pages. Prices were quoted in the published lists of components, but in our issue dated February 10th we stated that these were subject to modification due to war conditions. It should therefore be noted that there are increases in the prices of certain parts supplied by the Premier Radio Company, and the following are the components and the current prices:

Mains Transformer, type S.P.352A, 15s.6d.

Smoothing Choke, type C 150/185, 13s. 6d.

8 Triad Octal Valves at 6s. 6d. each, 52s.

The Premier Radio Company can supply a complete kit for this receiver and a quotation will be supplied upon request.

FG1RJ, K4SKC, W3XFT, SM5VW, W2TAV, W1COO, LX1BO, OM4, VE1IX, ZBIL, OH2OI and PY2S. I operate on the 20m. and 40m. bands, and would be glad to exchange SWL cards. I would also like to get in touch with anyone interested in short-wave amateur reception who resides in my locality.—R. PIKE, Burlington, Albert Road, Parkstone, Dorset.

Freak Reception: DX Catches

SIR,—I started taking your excellent paper about twelve months ago, and all my knowledge of radio has been gained from it. I very much miss the "Leaves from a Short-wave Log," and am one of the many listeners who wish for its return.

Referring to Mr. R. Robertson's letter, I have picked the following out of my lists, the stations around 1,070 kc/s.: Charlotte (N.C.) 1,080 kc/s, WBT; Chicago (Ill.) 1,080 kc/s, WMBI; Cleveland (Ohio) 1,070 kc/s WTAM. I think WTAM would be the station heard.

I would like to correspond with any S.W. fan living in the U.S.A., who is also interested in stamp collecting. My best DX catches are Manila, KZRM (31.35m.), Georgetown, B. Guiana (48.92m.), Halifax, N.S. (48.9). RX is a commercial 4-valve superhet, antenna 75ft. long and running N.W. to S.E.—D. WILLETT, Main Street, Bagworth, Leicester.

SIR,—I read with interest recent letters in PRACTICAL WIRELESS concerning DX on the medium waves. Here is my experience. On the morning of February 24th, between 6.30 and 7.0 a.m. I heard a weak transmission at the bottom of the medium waveband giving the call W2JY. According to the dial the wavelength was 204 metres. The receiver was an old A.C. 4-valve superhet using an outdoor aerial.—S. JOHNSON (Matlock).

Prize Problems

PROBLEM No. 390.

BRADLEY had a four-valve battery set which had been in use for some time and which was highly satisfactory. He decided to apply some economy schemes to the receiver and accordingly purchased a smaller H.T. This worked quite all right, except that it needed more frequent replacement. He next considered the accumulator and tried to think of a way to avoid frequent recharging. To this end, as he did not wish to cut out any valves, he thought he would reduce the total filament current drain and to do so he connected the filaments in series instead of in parallel. When he tried the set with this modification, however, he could only obtain the faintest of signals. Why was this? Three books will be awarded for the first three correct solutions opened. Entries should be addressed to The Editor, PRACTICAL WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes should be marked Problem No. 390 in the top left-haud corner and must be posted to reach this office not later than the first post on Monday, March 11th, 1940.

Solution to Problem No. 389.

The method of connection which Greenaway adopted resulted in the valve in question being partially short-circuited by the dial lights and accordingly the valve worked very inefficiently and resulted in the poor performance. He should have connected the dial lights in series in the heater circuit.

The following three readers successfully solved Problem No. 388, and books have accordingly been forwarded to them: N. Shirley, c/o Soldiers' Home (Annexe), Whittington Heath, Nr. Lichfield, Staffs; D. Byford, 134, Mile End Road, Colchester, Essex; N. R. Broadbear, "Kolonga," Pennyacre Road, Teignmouth.

VALVES WHICH REQUIRE A LICENCE

As mentioned some time ago, it is now necessary to obtain a special licence for the purchase of certain types of valve. Under the Order issued under the Defence Regulations, 1939, it is stated that "No person shall, except under the authority of a permit granted by the Postmaster-General for the purpose, sell, purchase, let, hire, supply, dispose of, receiver it is first necessary to obtain the appropriate permit. This is quite a simple procedure, and the form is obtainable from any local *Head* Post Office. The form is known as T99G, and is in three sections. On each of these the name of the proposed supplier must be filled in, together with the other appropriate details, and it is then folded and is self-addressed to the Postal

Maker's Name	*Valves over 10 W anode dissipation, and up to and including 25 W*	*Valves over 25 W anode dissipation*	*Gas-filled Valves*	*Rectifiers*
Brimar	7C5	—	4039A	—
Cossor	2XP, 4XP, 42SPT, PT41B	420XP, 440XP	GDT4B, GDT4	405BU, 225DU
Dario	TL54, TD24, TF104, TF364	—	—	—
Ekco	OP41	—	—	—
Ediswan	MR75	ES60, ES75, ES75H, ES75X, ES100, ES250M, MR300	—	—
Ever Ready	S30C, S30D, A70E	—	—	—
Marconi	KT33, KT33C, KT44, KT66, PT16, PT25, PT25H, PX4, PX25, PX25A, LS5A, LS5B, B63	DA30, DA41, DA60, DA100, DA250, DEM2, DEM3	GT1, GT1A, GT1B, GT1C, GT5E, GT25E	GU1, GU5, GU2, GU20, GU21, GU8, GU9, U6, U14, U15, U17, MR1, MR2, MR4, MR6, MR7A, MR9 MR10, CAR2, CAR4, CAR6
Mazda	PA20, PP3/250, PP5/400, AC4/Pen, AC6/Pen, Pen 44, Pen 46, PP3521, ACP4	PA40	—	—
Mullard	ACO42, ACO44, DO20, DO24, DO25, DO26, PM24B, PM24C, PM24D, PM24E, Pen B4, Pen 428, Pen 650, EL6, EL50	DO30, MZO5·20, MZO5-60, MZ1-70, MZ1-75, MZ1-100, MZ2-200, MZ2-250, RG5-1500, RG5-6000, RG10-1500	—	—
Osram	KT33, KT33C, KT44, KT66, PT16, PT25, PT25H, PX4, PX25, PX25A, LS5A. LS5B, B63	DA30, DA41, DA60 DA100, DA250, DEM2, DEM3	GT1, GT1A, GT1B, GT1C, GT5E, GT25E	GU1, GU5, GU2, GU20, GU21, GU8, GU9, U6, U15, U17, MR1, MR2, MR4, MR6, MR7A, MR9, MR10, CAR2, CAR4, CAR6
Triotron	P469, K480, K433/10, 2A3, 6A6, 6L6G, 6V6G, 6N7G, 50, 53, 79	—	—	—
Tungsram	P12/250, P15/250, P15/250S, EL5, EL6, O-15/400 OS-18/600, P25/450, P25/500, P26/500, P27/500, P28/500, OS12/500, OS12/501, OQ15/600, APP4E	P30/500, OP37/600, OP38/600, P60/500, OP70/1000, 075/1000, P100/1250, OQQ150/3000, O-240/2000, O-250/2000, OQQ15/800, OS40/1250, OQQ55/1500, OQ71/1000, P101/1000, O300/3000, O1500/5000		V21/7000, PV75/1000, PV100/2000, RG250/100, RG250/3000, RG1000/3000
American Types	2A3, 2A5, 6A3, 6A5G, 6A6, 6B4G, 6B5, 6L6, 6L6G, 6N6G, 6N7, 6N7G, 6V6, 6V6G, 7C5, 46, 50, 53, 59, 79, 250, 2151	845, 842, 841, 807, 35T, 825, 300A, RK31, 756, RK20, RK46, 203B, 830B, 203Z, ZBI20, WE242A, WE284D, 203A, 838, 845, 852, RK38, 211, 805, HD203A, 150T, HK354, 822, 250TH, WE212E, 300T, 849, 500T	—	—

acquire or distribute any of the undermentioned articles." These include transmitters, spark coils, crystals and many other items and "Electronic valves capable of an anode dissipation exceeding 10 watts." In this latter category come many output valves, as well as mains rectifiers, and therefore when replacing such valves in a receiver, or when using them in a new Authorities. One section is returned to you and another to the supplier, and you can then collect the valve without difficulty. For the benefit of those who are uncertain regarding the valves which need this permit, the accompanying list gives the majority of the valves which are included and which are in more or less general use in commercial receivers or by the home-constructor.

Practical Wireless

BLUEPRINT SERVICE

These Blueprints are drawn full size.
Copies of appropriate issues containing descriptions of these sets can in some cases be supplied at the following prices *which are additional to the cost of the Blueprint*. A dash before the Blueprint Number indicates that the issue is out of print.

Issues of Practical Wireless ... 4d. Post Paid
Amateur Wireless ... ... 4d. " "
Wireless Magazine ... ... 1/3 " "

The index letters which precede the Blueprint Number indicates the periodical in which the description appears: Thus P.W. refers to PRACTICAL WIRELESS. A.W. to *Amateur Wireless*. W.M. to *Wireless Magazine*.

Send (preferably) a postal order to cover the cost of the blueprint, and the issue (stamps over 6d. unacceptable) to PRACTICAL WIRELESS Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

PRACTICAL WIRELESS CRYSTAL SETS.

	Date of Issue.	No. of Blueprint.
Blueprints, 6d. each.		
1937 Crystal Receiver	—	PW71
The "Junior" Crystal Set	27.8.38	PW94

STRAIGHT SETS. Battery Operated.

One-valve: Blueprints, 1s. each.		
All-Wave Unipen (Pentode)	—	PW31A
Beginners' One-valver	19.2.38	PW85
The "Pyramid" One-valver (HF Pen)	27.8.38	PW93
Two-valve: Blueprint, 1s.		
The Signet Two (D & LF)	24.9.38	PW76
Three-valve: Blueprints, 1s. each.		
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2 LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow)	22.5.37	PW35
Summit Three (HF Pen, D, Pen)	—	PW37
All Pentode Three (HF Pen, D, (Pen), Pen)	29.5.37	PW39
Hall-Mark Three (SG, D, Pow)	12.6.37	PW41
Hall-Mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-Wave Three)	13.4.35	PW49
Cameo Midget Three (D, 2 LF (Trans))	—	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	—	PW53
Battery All-Wave Three (D, 2 LF (RC)	—	PW55
The Monitor (HF Pen, D, Pen)	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P)	14.8.37	PW64
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	PW69
The "Colt" All-Wave Three (D, 2 LF (RC & Trans))	18.2.39	PW72
The "Rapide" Straight 3 (D, 2 LF (RC & Trans))	4.12.37	PW82
F. J. Camm's Oracle All-Wave Three (HF, Det., Pen)	28.8.37	PW78
1938 "Triband" All-Wave Three (HF Pen, D, Pen)	22.1.38	PW84
F. J. Camm's "Sprite" Three (HF Pen, D, Tet)	26.3.38	PW87
The "Hurricane" All-Wave Three (SG, D, Pen), Pen)	30.4.38	PW89
F. J. Camm's "Push-Button" Three (HF Pen, D (Pen), Tet)	3.9.38	PW92
Four-valve: Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P)	1.5.37	PW4
Fury Four (2 SG, D, Pen)	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	PW17
Nucleon Class B Four (SG, D (SG), LF Cl. B)	—	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P)	26.9.36	PW67
"Acme" All-Wave 4 (HF Pen, D (Pen), LF, Cl. B)	12.2.38	PW83
The "Admiral" Four (HF Pen HF Pen, D, Pen (RC))	3.9.38	PW90

Mains Operated.

Two-valve: Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen)	—	PW18
A.C.-D.C. Two (SG, Pow)	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve: Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow)	7.1.39	PW35C
D.C. Premier (HF Pen, D, Pen)	—	PW35B
Unique (HF Pen, D (Pen), Pen)	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	—	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2 LF (RC))	—	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen. Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	—	PW70
Four-valve: Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	—	PW45
Universal Hall-Mark (HF Pen, D Push-Pull)	—	PW47

SUPERHETS.

Battery Sets: Blueprints, 1s. each.		
£5 Superhet (Three-valve)	5.6.37	PW40
F. J. Camm's 2-valve Superhet	—	PW52
Mains Sets: Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valve)	—	PW43
D.C. £5 Superhet (Three-valve)	—	PW42
Universal £5 Superhet (Three-valve)	—	PW44
F. J. Camm's A.C. Superhet 4	31.7.37	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitone" Universal Four	16.1.37	PW73
Four-valve: Double-sided Blueprint, 1s. 6d.		
Push Button 4, Battery Model / Push Button 4, A.C. Mains Model	22.10.38	PW95

SHORT-WAVE SETS. Battery Operated.

One-valve: Blueprint, 1s.		
Simple S.W. One-valver	23.12.39	PW88
Two-valve: Blueprints, 1s. each.		
Midget Short-wave Two (D, Pen).	—	PW38A
The "Fleet" Short-wave Two (D (HF Pen), Pen)	27.8.38	PW91
Three-valve: Blueprints, 1s. each.		
Experimenter's Short-wave Three (SG, D, Pow)	30.7.38	PW30A
The Prefect 3 (D, 2 LF (RC and Trans))	—	PW63
The Band-Spread S.W. Three (HF Pen, D (Pen), Pen)	1.10.38	PW68

PORTABLES

Three-valve: Blueprints, 1s. each.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)	—	PW65
Parvo Flyweight Midget Portable (SG, D, Pen)	3.6.39	PW77
Four-valve: Blueprint, 1s.		
"Imp" Portable 4 (D, LF, LF, (Pen))	19.3.38	PW86

MISCELLANEOUS.

Blueprint, 1s.		
S.W. Converter-Adapter (1 valve)	—	PW48A

AMATEUR WIRELESS AND WIRELESS MAGAZINE CRYSTAL SETS.

Blueprints, 6d. each.		
Four-station Crystal Set	23.7.38	AW427
1934 Crystal Set	—	AW444
150-mile Crystal Set	—	AW450

STRAIGHT SETS. Battery Operated.

One-valve: Blueprint, 1s.		
B.B.C. Special One-valver	—	AW387
Two-valve: Blueprints, 1s. each.		
Melody Ranger Two (D, Trans)	—	AW388
Full-volume Two (SG, det, Pen)	—	AW392
Lucerne Minor (D, Pen)	—	AW426
A Modern Two-valver	—	WM409
Three-valve: Blueprints, 1s. each.		
£5 5s. S.G.3 (SG, D, Trans)	—	AW412
Lucerne Ranger (SG, D, Trans)	—	AW422
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
Transportable Three (SG, D, Pen)	—	WM271
Simple-Tune Three (SG, D, Pen)	*June* '33	WM327
Economy-Pentode Three (SG, D, Pen)	*Oct.* '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	*Mar.* '34	WM354
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen)	—	WM389
Certainty Three (SG, D, Pen)	—	WM393
Minitube Three (SG, D, Trans)	*Oct.* '35	WM396
All-Wave Winning Three (SG, D, Pen	—	WM400
Four-valve: Blueprints, 1s. 6d. each.		
65s. Four (SG, D, RC, Trans)	—	AW370
2HF Four (2 SG, D, Pen)	—	AW421
Self-contained Four (SG, D, LF, Class B)	*Aug.* '33	WM331
Lucerne Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2 LF)	*Feb.* '35	WM381
The H.K. Four (SG, SG, D, Pen).	—	WM384
The Auto Straight Four (HF Pen, HF, Pen, DDT, Pen)	*Apr.* '36	WM404
Five-valve: Blueprints, 1s. 6d. each.		
Super-quality Five (2 HF, D, RC, Trans)	—	WM320
Class B Quadradyne (2 SG, D, LF, Class B)	—	WM344
New Class B Five (2 SG, D, LF, Class B)	—	WM340

Mains Operated

Two-valve: Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.	—	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C.-D.C. Two (D, Pen)	—	WM394
Three-valve: Blueprints, 1s. each.		
Home Lover's New All-Electric Three (SG, D, Trans) A.C.	—	AW383
Mantovani A.C. Three (HF, Pen. D, Pen)	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	*Jan.* '36	WM401
Four-valve: Blueprints, 1s. 6d. each.		
All Metal Four (2 SG, D, Pen)	*July* '33	WM329
Harris' Jubilee Radiogram (HF Pen, D, LF, P)	*May* '35	WM386

SUPERHETS.

Battery Sets: Blueprints, 1s. 6d. each.		
Modern Super Senior	—	WM375
'Varsity Four	*Oct.* '35	WM395
The Request All-Waver	*June* '36	WM407
1935 Super-Five Battery (Superhet)	—	WM379
Mains Sets: Blueprints, 1s. 6d. each.		
Heptode Super Three A.C.	*May* '34	WM359
"W.M." Radiogram Super A.C.	—	WM366

PORTABLES.

Four-valve: Blueprints, 1s. 6d. each.		
Holiday Portable (SG, D, LF, Class B)	—	AW393
Family Portable (HF, D, RC, Trans)	—	AW447
Two H.F. Portable (2 SG, D, QP21)	—	WM363
Tyers Portable (SG, D, 2 Trans)	—	WM367

SHORT-WAVE SETS. Battery Operated.

One-valve: Blueprints, 1s. each.		
S.W. One-valver for America	15.10.38	AW429
Rome Short-Waver	—	AW452
Two-valve: Blueprints, 1s. each.		
Ultra-short Battery Two (SG, det, Pen)	*Feb.* '36	WM402
Home-made Coil Two (D, Pen)	—	AW440
Three-valve: Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
The Carrier Short-waver (SG, D, P)	*July* '35	WM390
Four-valve: Blueprints, 1s. 6d. each.		
A.W. Short-wave World-beater (HF Pen, D, RC, Trans)	—	AW436
Empire Short-waver (SG, D, RC, Trans)	—	WM313
Standard Four-valve Short-waver (SG, D, LF, P)	22.7.39	WM383
Superhet: Blueprint, 1s. 6d.		
Simplified Short-wave Super	*Nov.* '35	WM397

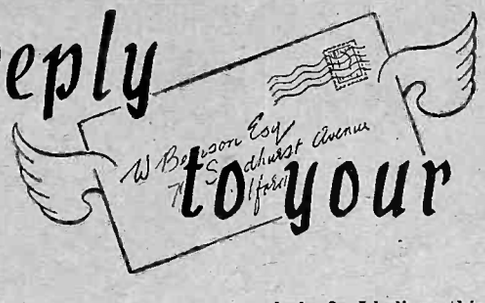
Mains Operated.

Two-valve: Blueprints, 1s. each.		
Two-valve Mains Short-waver (D, Pen) A.C.	13.1.40	AW453
"W.M. Long-wave Converter	—	WM380
Three-valve: Blueprint, 1s.		
Emigrator (SG, D, Pen) A.C.	—	WM352
Four-valve: Blueprint, 1s. 6d.		
Standard Four-valve A.C. Short-waver (SG, D, RC Trans)	*Aug.* '35	WM391

MISCELLANEOUS.

S.W. One-valve Converter (Price 6d.)	—	AW329
Enthusiast's Power Amplifier (1/6)	—	WM387
Listener's 5-watt A.C. Amplifier (1/6)	—	WM392
Radio Unit (2v.) for WM392 (1/-)	*Nov.* '35	WM398
Harris Electrogram battery amplifier (1/-)	—	WM399
De Luxe Concert A.C. Electrogram (1/-)	*Mar.* '36	WM403
New style Short-wave Adapter (1/-)	—	WM388
Trickle Charger (6d.)	—	AW462
Short-wave Adapter (1/-)	—	AW456
Superhet Converter (1/-)	—	AW457
B.L.D.L.C. Short-wave Converter (1/-)	*May* '36	WM405
Wilson Tone Master (1/-)	*June* '36	WM406
The W.M., A.C. Short-wave Converter (1/-)	—	WM408

In reply to your letter



Spares-box Converter

"Would an Eddystone Y coil do instead of the home-made coil you describe for the Spares-box S.W. Converter in your issue of February 3rd? I am not much of a hand at making coils, but have the Eddystone coil and would like to use this."—N. F. (Hythe).

THE coil required for the converter must have three windings—aerial coupling coil, grid coil and reaction coil. The Eddystone Y coil is a four-pin, two-winding component and thus would be unsuitable without modification of the circuit arrangement. This would not be difficult, the aerial series condenser merely being connected to the grid end of the grid coil. The 6Y coil would, however, be equivalent to the coil described and could be used without altering the circuit.

Reflector Aerial

"I noted in one of your back issues a reference to a reflector aerial for transmitting and receiving. There is one thing I am not quite clear about in this type of aerial and that is the spacing of the aerial and reflector. I assume that the reflector acts as an ordinary light reflector, but why put the reflector a quarter wavelength behind the aerial?"—J. B. A. (New Cross).

THE reflector must be of such a size and in such a position relative to the aerial that current will be induced into it. In accordance with standard A.C. laws the current will lag 90 degrees and will be radiated from the reflector. It is essential to so position the reflector that by the time the radiated wave has reached the aerial the phase of the wave will have shifted so that the radiations from the reflector and aerial are both in phase. This means that the reflector will assist radiation, and if you place the reflector in the wrong position the wave radiated from it will tend to cancel the aerial radiation. Actually this is what happens in the reverse direction, the aerial radiations cancel those of the reflector in the "back direction," and this gives rise to the directional effect.

Operator Handbook

"I am thinking of taking up training as a wireless operator, and have been told that there is a special book published which gives full details of the methods of procedure and other information relative to the operator's work on ship or shore stations. I should be glad if you could give me any details of this book and where it is obtainable."—B. B. (Wealdstone).

WE think you are referring to the Handbook for Wireless Telegraph Operators Working Installations Licensed by His Majesty's Postmaster-General. This is available from His Majesty's Stationery Office, and the price is 9d.

H.F. Choke Design

"I am trying to make up a few of my own components for quite a simple set, but could you please help me in the H.F. choke? I believe this should be as large as possible to exert its maximum choking effect. In this case is there any limit, or can I simply take any suitable former I might find and wind it full of wire? I have plenty of this in my spares box."—J. R. (Uxbridge).

THERE will be little advantage gained from using more than a certain number of turns. There is a possibility that beyond the effective point you may destroy some of the properties of the choke, due to the increased self-capacity which might result. The best plan is to make the winding in sectional form, that is, by splitting up the winding into a number of separate sections. This will take care of the self-capacity. The actual number of turns is not critical, provided that you use a few hundred (assuming that the choke is for medium and long-wave working). The gauge of the wire will, of course, in conjunction with the number of turns, affect the total resistance and thus have an effect upon the H.T. voltage drop, whilst the gauge must also be considered in conjunction with the current which will flow through the wire.

RULES

We wish to draw the reader's attention to the fact that the Queries Service is intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, from articles appearing in our pages, or on general wireless matters. We regret that we cannot, for obvious reasons—

(1) Supply circuit diagrams of complete multi-valve receivers.
(2) Suggest alterations or modifications of receivers described in our contemporaries.
(3) Suggest alterations or modifications to commercial receivers.
(4) Answer queries over the telephone.
(5) Grant interviews to querists.

A stamped addressed envelope must be enclosed for the reply. All sketches and drawings which are sent to us should bear the name and address of the sender.

Requests for Blueprints must not be enclosed with queries as they are dealt with by a separate department.

Send your queries to the Editor, PRACTICAL WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

A.C.-D.C. Receiver Design

"I wish to try my hand at building a small A.C./D.C. set, but I am not very familiar with this type of apparatus, although I have built two or three A.C. sets. Would you give me any ideas as to the particular specialities of this type of set, as distinct from normal practice in, say, the A.C. sets?"—L. G. (Ilfracombe).

FROM the point of view of normal radio technique, there is no difference, and the only departure in design is in the wiring of the heater circuits. There is, of course, no mains transformer in an A.C./D.C. set and the mains input is taken straight to a half-wave rectifier and to the "earth" line. The heaters of the valves are also fed direct from the mains, through a suitable voltage dropping or current regulating resistance, and it is usual to wire the heaters in series with the detector stage at the earth end of the line. Pilot bulbs for panel illumination are also included in the heater circuit as a rule, and to avoid interrupting the reception of radio due to the bulbs blowing they are generally shunted by a low value resistance. In place of the regulating resistance you can use a special type of flex known as a line-cord, if you can obtain one in your locality. We hope to publish a design in the near future which may be of interest to you.

Improving Superhet Selectivity

"I have a home-made superhet which has been quite good until the new Services programme came on the air, and now I find that I cannot get rid of the Home Service programme in the background. What is the best way of improving the selectivity of the set without going to too much expense?"—K. P. (N.W.11).

AN H.F. stage is the usual way of increasing selectivity, but we presume from your final remarks that this would be inconvenient. A small wave-trap in the aerial circuit might prove effective and should not be expensive, consisting merely of a coil and variable condenser in parallel. Another idea which you might care to consider is to open one of the I.F. transformers and separate the primary and secondary windings. These may often be opened wide so that there is practically no coupling between them, and then a small variable of low-loss design connected between the two windings. This may then be adjusted to give any desired coupling and thus introduces a form of variable-selectivity device. The condenser could be controlled from the panel through an extension control outfit.

REPLIES IN BRIEF

The following replies to queries are given in abbreviated form either because of non-compliance with our rules, or because the point raised is not of general interest.

R. A. N. E. (Chingford). If a field winding is used in place of the choke, then a higher mains output must be provided to allow for the voltage drop. You need at least 350 volts in this case. The meanings of the abbreviations will be found in our Encyclopaedia and other handbooks.

A. R. L. (S.W.6). Any good medium-impedance triode may be used. One of the so-called General Purpose valves would be ideal.

P. D. M. (West Acton). You will find all the data you require in last week's issue.

R. F. P. (Matfield). The trouble may be due to a faulty light switch in the house, or to a defect in the receiver. We suggest you have the set overhauled by the makers or their nearest local service agent.

F. I. (Southgate). Use two similar coils and couple them through a .0001 mfd. variable condenser.

D. E. M. (Bath). Ordinary carbon type resistances may be used quite satisfactorily.

J. D. (Glasgow). A mains transformer may be used and should be capable of delivering 4 amps.

H. R. E. (Redcar). The aerial is obviously useless and we suggest you try the effect of a mains aerial before going to any further trouble.

L. C. S. (Harlech). The valves are very old, but if you are satisfied that the emission is all right you could use them.

H. E. (Birmingham). It would be false economy to try the scheme as the current would be greatly increased and the accumulator would not last so long.

T. P. S. (Hythe). The meter has insufficient range to enable you to use it for the test in question. You could not convert this particular instrument.

I. O. (Durham). Both components may be used. Connect them in series in the particular arrangement you intend to try out.

The coupon on page 532 must be attached to every query.

FLEXIBLE LEADS AND CONNECTORS

(*Continued from page 514*)

Screened Leads

Rather different methods must be followed when dealing with screened leads, such as may be used for top-grid or top-anode valve connections or for pick-up leads.

The screening braid should be pushed back for an inch or so in the first place. Then the cotton insulation can be pushed back and the end of the wire bared. If the cotton is then slid along to the end of the bared portion it can be bound with thread, the binding being made so thick that it effectively prevents the metal braid from sliding along the lead so that it could come into contact with the bared end.

For top-cap valve connections it is nearly always best to use connectors of the hooded type, since they improve screening. They are generally provided with a small internal soldering tag, to which the ends of the lead can be attached and also with two "ears" on the outside which can be clamped round the screening braid by gripping with a pair of pliers. In addition to making connection to the braid in this way, it is best to apply a spot of solder between the cap "ears" and the braid. This must be done with a clean, hot iron, and the iron must be kept in contact with the braid for only a couple of seconds; if it is held longer than that, the insulation beneath the braid will burn and dirty the metal so that the solder will not adhere properly. In addition, the insulation might possibly be impaired.

Earthing of the screening braid can be carried out most easily by fitting a small metal bridge over it, the bridge being screwed to the metal or metallised chassis. It is important that this earth connection should be sound if the screening is to be effective.

RADIO IN THE DESERT

OFFICERS and airmen of the R.A.F. "carrying on" in the deserts of western Egypt and Iraq, are specially interested in two things—the "inside-story" of the way the air-war is going, and the latest developments in Air Force equipment. These were the questions most frequently asked of Captain Balfour, Under-Secretary of State for Air, during his recent 7,000 miles air tour of R.A.F. stations in the Middle East.

The men's own ingenuity has added a number of "home comforts" to those officially supplied. Hot plates have been made from old petrol-cans; old aircraft packing cases have been converted into sports pavilions and "nineteenth holes" for desert golf courses. Open-air cinemas are run by the airmen themselves in these remote spots out in "the blue," hundreds of miles from a big town.

Modern air and radio developments have taken much of the monotony and risk out of desert life. Big load-carrying aircraft have ended the "canned food" era, since fresh foodstuffs, as well as water and fuel supplies, are now regularly flown to the desert outposts. And although the health of the men is remarkably good, it is a comfort to know that in case of critical illness a patient could be taken by air to a modern hospital in a matter of hours.

A new use for the radio is to give warning of approaching dust-storms—one of the bugbears of desert life, and at one time a menace to flying. Such a warning sent Captain Balfour racing back from a desert air station to Cairo at 300 m.p.h. Half an hour later the dust-storm arrived, with "visibility—50 yards."

Classified Advertisements

Advertisements are accepted for these columns at the rate of 2d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 2/- per paragraph). Display lines are charged at 4/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical Wireless," Tower House, Southampton Street, Strand, London, W.C.2.

RECEIVERS, COMPONENTS AND ACCESSORIES

SOUTHERN RADIO'S BARGAINS.

ALL GUARANTEED. POSTAGE EXTRA.

5/-—Parcel of useful Components, comprising Condensers, Resistances, Volume Controls, Wire, Circuits, etc. Value 25/-. 5/- per parcel.

15/-—Service Man's Component Kit. Electrolytic Condensers, Volume Controls, Resistances, Tubular, Mica, Paper Condensers, Valve Holders, etc. 120 articles contained in strong carrying case, 9" x 7" x 7", 15/- the Kit.

21/-—Small Trader's Parcel of Components. 150 Articles comprising all types Condensers, Valve Holders, Resistances, Chokes, Coils, Wire, etc. Value 85/-. 21/- the parcel.

5/-—100 Wire-end Resistances, assorted capacities. ½ and 1 watt, 5/- per 100.

ORMOND Loud-speaker Units, 2/6; Crystal Sets, 5/6; Westectors Type W2, 2/6; Crystal Detectors, 2/-; Crystals, 6d.; Marconi V24 Valves, 9d.

2/-—Tool or Instrument Carrying Cases, ex Government Stock; Wood, 9" x 7" x 7", 2/-. SOUTHERN RADIO, 46, Lisle Street, London, W.C. Gerrard 6653.

BANKRUPT Bargains. Good stock of new receivers of all types. Most types valves, service goods, speakers. Please state requirements for quotation.—Butlin, 6, Stanford Avenue, Brighton.

TRANSFORMERS for L.T. Rectifiers for charging and safety, 12-volt lighting, from 12/6.—Thompsons, 176, Greenwich High Road, S.E.10.

COULPHONE RADIO, 22, Grimshaw Lane, Ormskirk. Collaro A.C. Motors, 12in. turntable, 25/-; with pick-up, 40/-. Rola G.12 energised speakers, 52/6, P.M. 65/-. Brand new goods. 1½d. stamp list.

VAUXHALL.—All goods previously advertised are still available; send now for latest price list, free.—Vauxhall Utilities, 163a, Strand, W.C.2.

5/- BARGAIN PARCEL comprising Speaker Cabinet, 2 Drilled Chassis, condensers, resistances and many other useful components. Worth £2. Limited number. Postage 1/-.—Bakers Selhurst Radio, 75, Sussex Road, South Croydon.

RADIO CLEARANCE, LTD.—All lines advertised in last week's issue still obtainable.

RADIO CLEARANCE, LTD., 63, High Holborn, London, W.C.1. Telephone: HOLborn 4631.

BANKRUPT BARGAINS. Brand new 1939 models, makers' sealed cartons, with guarantees, at less 40 per cent. below listed prices; also Midgets, portables, car radio. Send 1½d. stamp for lists.—Radio Bargains, Dept. P.W., 261-3, Lichfield Road, Aston, Birmingham.

CABINETS

A CABINET for Every Radio Purpose.

SURPLUS Cabinets from noted makers under cost of manufacture.

RADIOGRAM Cabinets from 30/-.

UNDRILLED table, console and loudspeaker cabinets from 4/6.

INSPECTION Invited.

H. L. Smith and Co., Ltd., 289, Edgware Road, W.2. Tel.: Pad. 5891.

MORSE TRAINING

WIRELESS CODE COURSES. "Book of Facts" Free.—Candler System Co. (L.O.), 121, Kingsway, London, W.C.2.

COMMUNICATION RECEIVERS

THE famous HALLICRAFTER SX23, released by the makers only in July, 1939, can still be supplied by Webb's Radio at

PRE-WAR PRICES.

We fortunately had good supplies delivered in August. NO price increase on present stock of this model only, £33 10s., H.P. terms available. Write for descriptive booklet.—P. Webb's Radio, 14, Soho Street, London, W.1. 'Phone: Gerrard 2089.

RADIO MAP AND GLOBE

WEBB'S RADIO MAP of the World enables you to locate any station heard. Size 40" by 30" 2-colour heavy Art Paper, 4/6. Limited supply on Linen, 10/6. WEBB'S RADIO GLOBE—superb 12" full-colour model. Radio prefixes, zones, etc. Heavy oxydised mount. Post Paid, 27/6.—Webb's Radio, 14, Soho Street, London, W.1. 'Phone: Gerrard 2089.

PUBLIC APPOINTMENTS

AIR MINISTRY.

AERONAUTICAL INSPECTION DIRECTORATE. Vacancies exist for unestablished appointments as Examiners in the General Engineering and W/T and Instrument Branches.

QUALIFICATIONS.

All candidates must have good general education, be able to read drawings, understand specifications, use micrometers and other measuring instruments.

(a) Applicants for the General Engineering Branch must have had practical experience in an engineering works. An elementary knowledge of materials testing is desirable.

(b) Applicants for the Instrument Branch must have knowledge of physics and training in light engineering or instrument making. Candidates with knowledge of optical instruments are also required.

(c) Applicants for the W/T Branch must have practical knowledge of W/T and electrical equipment with technical training in radio communication equal to City and Guilds final examination standard.

APPLICATIONS from candidates previously interviewed and declared unsuccessful will be considered provided the necessary additional experience has been gained.

ACCEPTED candidates will undergo a period of training in inspection as applied to the above subjects, not exceeding three months, and will be paid £3 10s. 0d. weekly during training. Subsistence allowance of £1 5s. 0d. weekly during training is payable to married men normally residing outside the training area. On successful completion of training, candidates will be appointed as Examiners at a salary of £246 9s. 0d. per annum (payable monthly in arrear) if service is satisfactory, and must be prepared to serve in any part of the United Kingdom.

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