PLANNING YOUR RECEIVING STATION—

A NEWNES PUBLICATION

Edited by F.J.CAMM


March, 1941.

PRACTICAL TELEVISION

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<th>22 Ranges of Direct Readings</th>
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PRA. 341
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Opportunities in the Air Force

THE Air Ministry has asked us to announce that vacancies still exist in the R.A.F. for technical officers for employment on engineering, armament and signals duties. Naturally, our readers will be most interested in the signals section, and the qualifications required are: applicants must be holders of electrical engineering or science degrees with experience of wireless, or holders of technical college or approved institution diplomas and two years' experience in tele-communications engineering, preferably on the radio side. A number of posts is also available for candidates possessing a sound theoretical knowledge of elementary electricity and magnetism, of the principles of wireless telegraphic and telephonic communications, and of transmitter circuits, modern wireless receiving apparatus, and apparatus for the measurement of high-frequency potentials and currents. Some practical experience in addition is desirable, and specialised knowledge in one or more of the practical aspects of tele-communications would be an asset. Commissions in the R.A.F. V.R. will be granted for the duration of hostilities to suitable applicants between the ages of 21 and 50 years, possessing the requisite personal and technical qualifications.

Candidates should apply in writing to the Air Ministry, S.7(e), Adastral House, Kingsway, London, W.C.2., giving full particulars of qualifications, training and experience. Those who are engaged on the production of aircraft, engines or accessories, or on other important national work, should not submit qualifications without first consulting their employers as to the possibility of their being spared for R.A.F. duty. Candidates who have previously applied are requested not to renew their applications.

The Services have already paid tribute to our efforts in helping to provide and to train personnel for the wireless sections of the Services, and many hundreds of our readers are already in the Services. All of those who write to us state that they have obtained their training and experience as a result of being regular readers of this journal and the books we publish in connection with it. Additionally, members of our staff are in the Services helping to train the new recruits. They have stepped out of the pages of this journal into active service, and have replaced the printed for the spoken word at the time of the nation's need. We have received a large number of letters from readers who have made their acquaintance. Many other readers write to say that wherever they are in the Services they are able to find readers of this journal, and quickly to make friends with kindled interests.

Our Technical Books


Not all of our readers, however, are engaged in the wireless branch of the Services. Many of them are in the Royal Air Force, and they will find our "Aeroplane Maintenance and Operation" series of great value, for they cover practically every branch of the subject. The practical men are using our "Practical Mechanics Handbook," "Engineers' Manual," "Workshop Calculations, Tables and Formular," whilst instrument makers are finding our new volume, "Watches: Adjustment and Repair," of value. Those in charge of Diesel engines are buying "Diesel Vehicles: Operation, Maintenance and Repair."

Our All-dry Portable

RESPONDING to a popular demand, this month we give constructional details for an all-dry battery-operated portable superhet. As will be seen, it is most compact, very easily built, and it has an excellent performance. Those engaged on A.R.P. or shelter work, men in the Services, and those remote from home and accumulator charging facilities, will welcome the publication of this design which, of course, carries the Practical Wireless guarantee; which is that provided the components specified are used, we undertake to service it, free of charge, if carriage is paid, should the receiver fail to function in the manner claimed.
New Uses for Old Components

In this Article the Experimenters Show How Many Old Components Can be Used Successfully, and How Some of Them Can be Modified so that They are Brought More Up to Date

The use of old components—probably relegated to the junk box years ago—is an evergreen topic. Today, when new parts cannot always be bought as readily as before the war, and when economy must be our watchword, it is of more than usual interest. We are often asked if such-and-such an old part could be used in a Practical Wireless receiver; that is, in a receiver of which full details are published. We are nearly always compelled to answer in the negative, since Practical Wireless designs are always carefully worked out for one set of components, and one only.

When building a single set to his own design, however, the constructor can well try the effect of using odd parts, and he will often be successful, since his hand will probably not be planned with quite the same thoroughness that must be followed in our laboratories. The experimenter has still more scope, because he is primarily interested in testing and experimenting with all kinds of circuit arrangements. A circuit which is rather outside the usual channel will often interest him far more than will one of more stereotyped pattern.

Variometer Tuning and Reaction

One of the oldest components still to be found in many spares boxes is a variometer. You may say: “Yes, but that died a natural death nearly 20 years ago.” Perhaps it did, but that is no reason why it should not be tried in conjunction with modern valves. Many readers will remember that the variometer was used largely because of its efficiency; it does not require any added variable capacity for tuning, and since no taps are taken from the windings, there are no “dead-end” losses. Its use was very largely confined to crystal sets, for which it made an excellent aerial tuner in the days when a high degree of selectivity was not essential.

One method in which a couple of similar variometers can be used in a single-valve or Det.-L.F. receiver is shown diagrammatically in Fig. 1. It will be seen that one is in the aerial circuit, while the other replaces the reaction winding in the anode circuit. The reaction variometer serves as a reaction control operating in conjunction with the self-capacity of the detector valve, for which a small power or L.F. type is most satisfactory for the circuit illustrated.

When the anode circuit is tuned to the same frequency as the aerial circuit, feedback takes place through the inter-electrode capacity of the valve. The valve then oscillates just as it does when using “swinging-coil” or capacity-controlled reaction. Incidentally, reaction increases the selectivity of the set to a marked degree.

Another Reaction Circuit

If you have only one variometer, you can modify the circuit shown in Fig. 1 to that given in Fig. 2. In this case the anode circuit component is replaced by a couple of similar coils, one of which is made to move in relation to the other. The coils may be made by winding about 250 turns on two flat bobbins, as shown in Fig. 3; the bobbins can be made by using a few pieces of shellacked cardboard or fibre clamped together by means of a screw and nut. One of the coils is mounted rigidly on the chassis or baseboard, while the other is carried on a fibre, bakellite or wooden arm so that it can be moved over the other one.

It is important that the connections to these two coils should be in the correct “sense,” so if you cannot obtain any reaction when the set is first tried, reverse the leads of one of the coils—it does not matter which. Should you find it too much trouble to make bobbins for the coils, wind the turns (cotton-covered wire between 30 and 36 gauge is suitable, whatever the form of coil holder) and wind the turns together with thread, form the hank into an approximate circle and mount the two windings in a manner similar to that shown in Fig. 3.

“Swinging” Coils

Plug-in two-pin coils and “swinging” coil holders are not very widely used nowadays, but they can quite well be pressed into service, especially for short-wave receivers. Thus, if you have a three-coil holder (centre one fixed, the other two movable), you could use it very well in a circuit of the type shown in Fig. 4. The left-hand coil is an aperiodic aerial coil, the centre one is the grid tuner and the right-hand coil is for reaction. Since the use of a swinging coil alone is not sufficiently precise for short-wave reaction control, a .0002-mfd. (capacity not very critical) condenser is used in addition. This is operated in the usual manner after finding the best position for the reaction coil. Movement of the aerial coil serves to vary the degree of aerial coupling and therefore the degree of selectivity. It also has an effect on reaction coupling, and when set to its optimum position for any particular waveband, both selectivity and sensitivity will be at maximum, and smooth control of reaction should be possible. Still there would be a “dead-spot” in the tuning range—that is, a part of the condenser scale over which oscillation cannot be obtained—a small movement of the aerial coil should remove it.

Rewinding Two-pin Coils

With regard to the size of the coils, it will generally be found that the reaction coil should be slightly larger than the grid coil, and the aerial coils about two-thirds the size of the grid coil. It is probable that the only coils available will be for the medium-wave range (numbers between 35 and 75) or long-wave range (10 to 250). In that case, the windings can be stripped and new windings put on. Assuming that the coil former has a diameter of about 2 in., the approximately correct numbers of turns for the 20, 31 and 49-metre bands, using the .0016-mfd. tuning condenser shown, will be 8, 12 and 16. The wire should be about 22 gauge for the smallest coil, and may be as fine as 26 gauge for the largest of those mentioned and still finer for any larger coils. The aim should be to accommodate the required number of turns side by side.
When a fair number of coils is available they can all be rewound to form a complete set tuning from, say, 19 to 80 metres. All can be used in any of the coil holders, bearing in mind the general rules with regard to relative sizes that we mentioned above.

Use for a Neutralising Condenser

Another component which many will find in the junk box—especially those whose wireless days go back to the '20s—is a neutralising condenser. This was used originally for neutralising the internal electrode capacity of valves used for H.F. amplification, before the time of the S.G. and V.M. The maximum capacity is generally in the region of 15 mmfd., which is ideal in series with the aerial to lead to a short-wave receiver working on wavelengths below about 20 metres. These condensers are of the variable type, and the capacity can generally be varied very gradually from minimum to maximum due to the mounting of the moving ‘vane,’ generally an aluminium tube on a threaded spindle; this tube is moved into and out of a larger tube which forms the fixed ‘vane.’

Renovating Valves

Here is a hint which we give with a good deal of reserve, because it does not always work. Very often an old triode valve of the dull-emitter type (not the bright emitters which many readers have almost forgotten, and many others probably never seen) can be given a new lease of life by subjecting it to the brutal treatment of connecting a H.T. battery across its filament. Actually, a start should be made by tapping off about 24 volts from the H.T. battery, connecting one lead to one of the filament pins and very quickly ‘flicking’ the other against the second filament pin. With the old type of dull emitter this often has the effect of producing a new electron-emitting coating on the surface of the filament. This is because the older D.E. valves had filaments coated with a so-called rare earth; after continued use of the valve, and if the filament did not burn out in the meantime, this coating was shed off, leaving the valve in a practically useless condition, although the filament would still glow. Remember that the treatment described is applicable only to old-type valves, and also that it will often have the effect of burning out the filament instead of improving its emitting qualities. Remember also that these old valves were far from efficient as compared with modern standards and cannot be made to perform as well as those we buy to-day.

A Use for a Damaged Transformer

Burnt-out L.F. transformers can often be used satisfactorily as L.F. chokes in the anode circuit of the detector valve. It is always the primary which burns out, and the secondary is generally quite sound. It is this winding, therefore, that is used by connecting it as shown in Fig. 5. The choke, it will be noted, takes the place of the anode resistance in an R.C.C. stage, and is in some respects better than a resistance because it does not cut down the H.T. voltage to such a marked extent.

While referring to the detector anode circuit it might be mentioned that a large two-pin plug-in coil (size 500 upward) can be used as a good H.F. choke in a short-wave receiver. One of 1,000 upward is suitable in a medium- and long-wave set, and a 75 or 100 can be used efficiently in a short-wave receiver down to about 50 metres; below that wavelength a still smaller coil is suitable. It should not be placed close to the aerial coil, to which it should be at right angles.

ITEMS OF INTEREST

A Ticklish Repair Job

A job for which there are few competitors, if any, was performed recently by James Baysore, Mason, Ohio, “cloud specialist” for station WLW, Cincinnati, U.S.A. Clinging to a perch on top of Carew Tower—844 feet high, he repaired a short-wave aerial which had torn loose in the high wind.

He ascended the pole, which rises above the observation platform of the skyscraper, 48 stories above the street, by means of metal steps clamped to the flag mast. The aerial, consisting of a network of copper wires, picks up broadcasts from WLW’s mobile unit. The short-wave impulses are caught by the aerial, transferred over a ground wire to WLW’s master control room five miles away, then relayed to the transmitter and tower at Mason, Ohio, 20 miles north of Cincinnati.

Repairs were necessary on the aerial after it was loosened by wind. Also on the flag pole is the Crosley Corporation’s television aerial. Baysore handles all of WLW’s “high altitude” work both in Cincinnati and Mason. For his ticklish job he was dressed like an Arctic explorer, with four layers of clothing wrapped around him. The hardest job, he says, is to keep his own safety which depends on a life-belt, and a safety catcher on each step of the pole.

Listening Posts

A new feature inspired by the inconsistencies of German propaganda broadcasts has been introduced by the B.B.C. in its overseas transmissions. At 5 a.m. B.S.T. in the North-American transmission, each night of the week except Friday and Saturday, a resume will be presented of the statements made in the previous twenty-four hours on the German short-wave stations; these will be compared with what was said on Germany’s medium wavelengths, and the notable differences between the stories told to the home audience and to the world at large will be demonstrated. The feature will also reveal the striking disparities between the different short-wave transmissions; one version is prepared for the United States, another for Latin America and yet another for the Near East. These varying accounts of the German point of view will be translated and broadcast by the B.B.C. without comment.

The feature, under the title “Listening Post,” incidentally demonstrates to the world one result of the work of the B.B.C.’s monitoring service which, throughout the twenty-four hours, listens to, and when necessary, makes recordings of, the transmissions from enemy stations.

The training of wireless operators for the R.A.F. still proceeds apace, and in the illustration wireless operators are seen leaving an aeroplane after a practice flight.
Problems of Amateur Receiver Design—7

The Coils and I.F. Transformers Required for Superhet Receivers : All-Wave Working with "Straight" and Superhet Circuits

By FRANK PRESTON

Last month I referred to the principal types of tuning coil used in the aerial and inter-valve circuits of "straight" receivers, pointing out the chief advantages of the different arrangements. To some degree, all of the points raised in that article are applicable to the initial stages of a superhet., especially when it incorporates one or two stages of H.F. amplification—prior to the frequency-changer. The differences occur in respect of the oscillator and intermediate-frequency amplifier stages, since the requirements here are entirely different from those relating to tuning circuits which have to cover the ranges of signal frequencies.

Tuning the Oscillator

In the first place we can consider the oscillator-tuning circuit. As most readers are aware, this must always be tuned to a frequency higher than that of the signal by an amount equal to the I.F. Thus, if the aerial and other tuning circuits preceding the frequency-changer were tuned to 1,000 kc/s the oscillator should be tuned to 1,465 kc/s, assuming the generally-correct for the tuned windings and, therefore, with the condenser section used with the coil. The fixed series condensers have a lower maximum capacity than have the other condenser sections. Additionally, the values of the condenser section used for oscillator tuning are differently shaped from the others—in the majority of cases—in order that the resonant frequency of the oscillator circuit may change in such a manner that it shall always differ from that of the input tuning circuits by the same amount. This is a point which is often misunderstood, so it may be worth while to go into it a little more fully.

If the receiver is to cover a wavelength range of 200 to 600 metres, the signal-frequency tuning circuits must cover the frequency range of 1,500 to 500 kc/s, whilst the oscillator must tune from 1,065 to 965 kc/s. It will be seen that whilst the frequency of the S.F. circuits is varied in the ratio of three to one, the ratio of the oscillator circuit is varied only in the ratio of approximately two to one.

Choice of Oscillator Coil

The above explanation is rather by the way, because this series of articles is intended primarily to be of interest to the constructor and not necessarily to the student. But the explanation will help the constructor to appreciate the importance of choosing the oscillator coil, not only to suit the I.F. transformers to be used, but also to suit the gang tuning condenser. It would, for example, be futile to obtain a 110 kc/s oscillator coil to match the other tuners if the superhet-type gang condenser were designed for a 465 kc/s oscillator coil. Similarly, if both coil and condenser were correct for 110 kc/s they could not be used in conjunction with 465 kc/s I.F. transformers. The point of importance is that it comes into prominence when buying components from dismantled commercial receivers; when this is done, care should be taken to obtain the full set of tuning components from the same receiver. It is, of course, far better to buy proper components designed and made for constructor use, but this is not always easy at the present time when component factories are busily engaged in fulfilling Service contracts.

Another point which should be borne in mind in the same respect is that certain oscillator coils are designed for use with standard (not superhet-type) gang condensers. These coils generally have built-in fixed padding condensers wired in series with the tuned windings and, therefore, with the condenser section used with the coil. The fixed series condensers have the effect of reducing the effective capacity of the tuning-condenser section and of ensuring that the rate of change of frequency is correct. It is still of the utmost importance, however, that the coils are used in conjunction with the appropriate I.F. transformers.

Oscillator Connections

The usual method of connecting the oscillator coil (which consists of a tuning and reaction winding) is as shown in Fig. 1, where it will be seen that the tuned winding is in the grid circuit of the oscillator, the untuned or reaction winding being in series between the oscillator anode and H.T. +, generally with a decoupling and voltage-dropping resistor in circuit. A pentagrid valve is shown, but the same general arrangement would be followed when using an octode or a triode-pentode. When using a triode-hexode, however, it is found better to use slightly modified connections, as shown in Fig. 2. Here it will be noticed that H.T. is supplied to the oscillator anode through a parallel-feed circuit, the reaction winding being isolated electrically by means of a fixed condenser, which also serves as a decoupling condenser along with the decoupling resistor. Another modification which is sometimes found desirable, consists of including the tuned winding in the oscillator anode circuit, with the reaction winding in the grid circuit. This is often found to be better than using the connections shown in Fig. 2. In the case of a semi-experimental receiver it is well worth while to try the effect of reversing the positions of the windings shown in Fig. 2.

Resistor Values

In both Fig. 1 and Fig. 2 the oscillator-anode decoupling resistors are given a value between 50,000 and 100,000 ohms. These are average, but the optimum value is, naturally, dependent upon the voltage of the H.T. supply and the particular frequency-changer in use, and it is therefore best to work to the figures supplied by the valve maker using the simple resistor-calculation formula given in a previous article of this series. The value of the grid leak also varies in some measure according to the particular valve employed, although in many instances it is found that results are not affected by altering the value outside the range of 50,000 to 250,000 ohms. Valve makers generally give some guidance on this point in the instructions provided with the valve.

The I.F. Coils

Having settled the main questions concerning the oscillator, we can turn to the I.F. stages. As we have seen, the I.F. transformers must be chosen to match the intermediate frequency provided by the oscillator. Knowing that, however, we have a wide field from which to choose...
March, 1941

PRACTICAL WIRELESS

our transformers. In most cases they may be of the simplest possible type, consisting of two plain windings, placed adjacent to each other and each tuned by means of a built-in pre-set condenser. The connections are shown in dotted lines in Fig. 3.

When additional selectivity is required there are two main methods of securing it: by moving the primary and secondary windings to and fro or both the transformers so that they are further apart; by using a centre-tapped secondary, as shown by a broken line in Fig. 3. The former method is convenient when the windings are already separate and when the screening can is removable, but it is not always a practical proposition. On the other hand, by using the centre-tapping there is sometimes a greater loss of efficiency. This loss may be offset by the reduced damping on the secondary, however, especially when using a double-diode second detector. It would then probably be most satisfactory to make connection to the end of the secondary of all transformers except the immediately preceding the second detector.

It should be mentioned in passing that if the windings are moved apart it will probably be necessary to re-set the trimming condensers after each experimental movement.

Increasing the Band-width

In some instances it might be found that tuning is too sharp, with the result that quality suffers. The windings of one of the transformers (probably the first) may be moved in a little closer together. A simple alternative method, which is not to be strongly recommended, is to connect a fixed resistor in parallel with the primary winding of the L.F. transformer. This resistor is also useful when difficulty is experienced in keeping the receiver completely stable, but again the method is not recommended except in extreme cases, since it must cause a certain loss of efficiency. The parallel-resistor method is more often used in conjunction with a switch, as shown in Fig. 5, so that it can be included in the circuit on long waves (when the instability is generally most troublesome, if it occurs at all) and switched out on medium waves. The on-off switch can be made to operate automatically by means of the ordinary wave-change switch.

Variable-selectivity L.F.'s

In nearly every case it is better to have a form of variable selectivity than to make the tuning extremely sharp or unduly flat. There are various types of variable-selectivity transformers on the market, in the simplest of which one of the windings is mounted on a rotor so that it can be turned in respect of the other in order to give various degrees of selectivity. The other arrangement, which is convenient, and which can be applied to ordinary transformers, is to connect a variable or pre-set condenser between the (potential-voltage anode) ends of the windings; this is indicated by means of chain lines in Fig. 3. Coupling is increased by increasing the coil of the condenser, so it is inserted in the first place to set the windings fairly well apart. This is especially important if the pre-set condenser used has a compensating (negative) capacity; otherwise, better, however, to use a variable condenser—one of the solid-dielectric type is convenient—of one-half the capacity indicated in Fig. 3.

Another excellent method of obtaining variable selectivity is by using an L.F. transformer with an extra tertiary or damping winding, as shown in Fig. 4.

The winding is generally placed between the other two and is connected only to a variable resistor. As the value of the resistor is reduced the damping effect of the "floating" winding is increased, and vice-versa. The value of the variable or tap resistor shown is not necessarily that which is most suitable in all cases, and the recommendation of the component manufacturers should be followed. When variable selectivity is employed it is generally sufficient to have it applied to the first L.F. transformer only. If the other transformers are set to give a bandwidth rather wider than that required for good quality, it should be possible to reduce the selectivity in a satisfactory manner.

All-wave Tuning

Mention has not been made of all-wave tuning so far, but this does not call for very much attention here, since the arrangement of windings will be similar to the arrangements already described. Many manufacturers have a standard method, and nearly always the best, is to have what amounts to a set of coils, each complete in itself, although all are mounted in one unit, and a rotary switch is provided for system for bringing into circuit whichever is required for the waveband to be covered. Thus, we have the connections shown in Fig. 5, where an aerial tuner is indicated. Precisely the same arrangement would hold good for inter-valve coils and for oscillator coils, and the various rotary switches employed are ganged together by mounting them on a common spindle. This is the method adopted by manufacturers of all-range tuners and all-range coil assemblies, and it is far more economical than the older-fashioned method of using a single coil suitably tapped.

Review of Broadcasting in 1940

In reviewing broadcasting during the year 1940 the tremendous part it is playing in the country's war effort inevitably overshadows all the other activities of the B.B.C. and despite the war-time difficulties, the B.B.C. has continued to provide manifold services for an audience which listens more attentively than it did in peace-time and which has grown considerably despite war-time difficulties of reception. But, naturally, it is in foreign broadcasting that the biggest strides have been made, and to-day listeners in every corner of the Continent can hear "The Voice of Britain", as it reaches them in an ever-growing variety of tongues.

Day and Night Transmissions

In 1940 the B.B.C.'s Home and Overseas services involved ceaseless transmissions day and night throughout the twenty-four hours. Before the end of the year the B.B.C. was broadcasting in thirty-two languages—seventy-five separate news bulletins (a quarter of a million words) were being radiated every day, apart from the many other programmes devised purely for listeners overseas. News editors and programme builders with special knowledge of foreign countries, and linguists of thirty different nationalities, were numbered in the B.B.C.'s war-time staff.

Summed up, the year 1940 represents an accumulation of broadcasting resources in terms of personnel and equipment that is still growing and is not even yet within sight of its peak.

Democracy demands that the British people should be taken into the confidence of their leaders, and by the time Mr. Churchill became Prime Minister listeners had already learned to look to him for his realistic statements on the war and the problems with which the nation is confronted. He gave ten broadcasts during the year—six as the nation's Prime Minister, which were relayed to the world. Lord Halifax, Mr. Attlee, Mr. Ernest Bevin, Mr. Herbert Morrison, and other members of the Cabinet also broadcast during 1940; while Mr. Duft Cooper, Minister of Information, spoke on a number of occasions. Lord Woolton, Minister of Food, has also become a well-known microphone personality.

Crisis in France

During the crisis in France in June, broadcasting became an essential means of communication from this country to the Polish and Czech armies fighting in France. The facilities of the B.B.C.'s European services were made available to the Polish and Czech military administrations in London. Messages were transmitted instructing Polish and Czech soldiers to keep in touch with the British Command. General Sikorski himself spoke in the Polish and French services on June 19th. Czech pilots in France were told to fly their machines to Britain, and those in North Africa were advised to report to the nearest British post. Broadcasts of similar importance in the conduct of the war were made from time to time for the purpose of giving instructions to the merchant ships on the high seas. How many sea captains steered their ships to British ports as a result of messages broadcast by the B.B.C. may never be known, but the high percentage of the merchant fleets of enemy-occupied countries now serving in the Allied cause is proof of the value of these broadcasts.

At the request of the Polish Ambassador, the B.B.C. introduced a series of broadcast messages during the invasion of Poland by which refugees were able to convey news of their safety and whereabouts to friends and relatives.

The North American service was also one of the year's big developments and there were many daily transmissions of new programmes, including news bulletins, variety and feature programmes and the "Britain Speaks" series by such well-known broadcasters as Vernon Bartlett, J. B. Priestley and Leslie Howard.
The King's Broadcasts

The King's broadcast on two occasions during the year. On Empire Day, at a time when the fate of the B.B.C. in France and Belgium was at stake, he spelt out words of encouragement to the people in the British Commonwealth. The institution of the "George Cross" and the "George Medal" were the occasion of the King's second broadcast on September 23rd. In the course of it the sirens were heard sounding the "raiders passed."

The Queen broadcast on April 13th, on the eighty-fifth anniversary of the founding of the Y.W.C.A. On June 14th, the day that Paris fell, Her Majesty broadcast in French to the women of France, conveying the sympathy and admiration of the women of this country.

The most memorable day in the year's broadcasts to children was on Sunday, October 15th, when Princess Elizabeth broadcast a message in the Children's Hour to the children of the Empire. Princess Margaret, who was standing at her sister's side, also made her maiden speech over the air by bidding their listeners "Good-night."

Programme for the Forces

One of the B.B.C. earliest war-time innovations was a special programme for the Forces, and during the winter of 1939-40 it was the greatest boon to our men on the Western Front. Since the Battle for Britain began, its popularity is perhaps even more enhanced, and it is so much the Services own programme that they themselves often provide much of the material.

With all the rapid expansion in these other directions, there has been a shift in emphasis in the quality of Home Service programmes. Listeners have been kept informed of the march of events by experts who give the background to the news and explain the significance of moves in the domestic, the diplomatic and the military spheres. For instance, the Sunday-night postscripts by J. L. Prestonley and the War Commentaries by St. Philip Doubert became outstanding events.

This brief outline gives some idea of how the B.B.C. did "go to it" in 1940—a year of abnormal and strenuous activities.

COMPETITION RESULT

"How the War has Affected my Radio Hobby"

SPACE prevents us from publishing all the winning essays in complete form, so we are giving below extracts of those whose writers have already been announced.

G. N. Green, of Ruislip, describes how during his work of national importance, radio helps him to secure a welcome break. He is a P.W. worker, and finds that he has little time for the practical side of wireless, but he is able to devote more time to the reading and studying of technical matters. When my duty at my A.R.P. post allows I read PRACTICAL WIRELESS and I am pleased to note that my colleagues are also becoming more and more interested in wireless, where they have had the opportunity of reading my copy of PRACTICAL WIRELESS.

For my part, I am very interested in short-waves and I intend to try out a number of circuits, selected from back numbers of PRACTICAL WIRELESS, when we have won this war. I have read about and enjoyed making many sets from the times when my journal first appeared. I have been interested in wireless since the age of eighteen years, and I am now forty-one years. Am I fool of it? Indeed; in fact I used to be interested and am looking forward to the days of peace when I shall be able to return to my wireless den again and carry on with the good work.

A Scottish reader, Arthur McGea, of Drymen, uses a theme which applies, I imagine, to many others. He explains: "War has had a curious effect on my radio hobby, as it was about the time when the last one ended that a friend and I bought a set which brought us nothing more than Morse and a lot of trouble. However, we were keen, so at a later date we built a set which brought us nothing more than Morse and a lot of trouble. However, we were keen, so at a later date we built a set which brought us something more than Morse and a lot of trouble. However, we were keen, so at a later date we built a set which brought us something more than Morse and a lot of trouble.

But up to the present my interest has, perhaps, suffered; lack of facilities for construction have so far prevented me from building the short-wave portable equipment on which I have set my heart. But now, as part of my duty, it has become the absorbing interest of my spare time. I have joined the R.S.G.B. and am a regular reader of PRACTICAL WIRELESS, which whets my appetite for the practical side of the subject.

H. T. Betteridge, now serving with the R.A., strikes a most interesting note. "The war has given me radio as a hobby. Since as a schoolboy I played with crystal sets my career and outdoor interests have been those of my family. When war broke out I was robbed of the thrill of testing my new set, but I now picture it already waiting for me to put it through its paces when my leave comes. I have fancied several circuits and I am keeping them together, with all the notes and information you have given, ready for use at a later date, but if the set I have given me the results I expect, I wonder whether I shall leave it alone or shall I see and build something which you might have or will publish that will offer even greater appeal to me."

"The Birth of a Business" would be a good sub-title for the entry received from Lawrence McGea, of Bristol.

When war commenced, I was a relay station operator, but later obtained a position as a radio service engineer. Unfortunately, the firm had to close down owing to the shortage of trained men. My friend and I were devoting our spare time to experimental work and, occasionally, to a certain amount of radio servicing, but as time went on we found that we had more work than we could cope with. The increase demanded more space and better facilities, as I had no knowledge or Morse workshop which we happened to know was vacant. We carried out all the work, black-out fittings, construction of benches and shelves, etc., ourselves, and recently we have been able to build a radio switchboard and telephone for our shop, and to construct a receiver-amplifier of the rack type which we have designed.

Another reader in the R.A.F. explains how the training he has received since being in uniform has opened up fresh ground for him; his name is W. E. Austin, Brightlingsea.

Before the war I was an ardent short-wave listener, but my interest was confined to a few leisure hours experimenting and listening. Now that we are at war, those pleasures have been denied me, to some extent. Before the war I had now notion of the practical side of my course, which I have found extremely interesting and instructive. Before I joined up, my listening was restricted to radio telephony, as I had no knowledge of Morse. But now that I am able to operate with Morse I realize how much I have missed in the past. After the war, I am hoping to obtain an transmitter and build into the grand band of British 'hams' in their experiments. With the help of PRACTICAL WIRELESS, I hope to design and build my own apparatus, such as transmitters, receivers and the other gear necessary for an amateur station.

G. R. Nivelli, of Greenwich, looks ahead, and seeks respite and enjoyment in anticipation of what the future holds for the radio enthusiast.

My radio activities have been somewhat curtailed by the war, but I still follow with keen interest through the medium of PRACTICAL WIRELESS, a hobby that has been developed from the days of crystal and reflex circuits. The monthly appearance of PRACTICAL WIRELESS is certainly well worth waiting for; a real achievement when one appreciates the difficulties of production. Until recently, I have been carrying out some very interesting experimental work connected with L.F. amplifiers for record reproduction. An occasional DX listener finds the short-waves, I am, I find, a very good tonic.

What shall I build after the war? Shall we find any big developments, when we get back to production? I have recently, I have been carrying out some very interesting experimental work connected with producing better components for constructors.
March, 1941

PRACTICAL WIRELESS

ON YOUR WAVELENGTH

The B.B.C. Accent

WHAT a welter, what a mass of letters agreeing with me, letters pointing the wastepaper basket! I am here, in writing, to temper justice with mercy for the victims.

But I see that I am not alone in criticising, however mildly, the B.B.C. for daring to take upon itself the role of national lexicographer and flanging such authorities as the Oxford dictionary. Here is one gem from the Daily Mirror: "As the B.B.C. are certainly carrying on a wonderful job; the pronunciation of the announcers is perfect." I presume here that the critic is referring to accent rather than to pronunciation. However, this quotation is from a letter sent by a lady.

A fair young lady at Clendon resides. After hearing the lady decides, that's it, just perfect English, the way they announce. Or who is after other suggestion of home? Having publicly stated she thinks them just fine, perhaps she's hoping they'll call round and see her some day.

This is a comment by Torch. However, interwoven with the question of B.B.C. accent is that of the Northern accent, which I gently jibed last month, and Torch further comments thus:

What all thee, Torch'm our bird? As the dozzen like Lancashire foak, Nor Yorkshire, neither. It seems, as Knobby's always spoken, We allus thought well of thee. In radio fan's in't North, As we buy th yellow-backed bun, One we know it's good money's worth. So these shouldn't turn against us.

We're bound to tests mid sum, As we keep us to agree. We know the lady's greatly foak in't North, Ay, na' many a lot in't South, Pity the homey's not other in't sou. By speech as coons near o'th mouth. It's their deeds or counts, as, 't' Souther.

Ay, they don't forget as they're brooks in spite of their accent's speech. * * *

Well, we dummys bear thee no malice, and lad. Or we'd tell thee so to th face.

Ay, we still think our Torch'm a greatly chap. If we didn't we'd wade 2 places!

A Critic from Dorking

I HAVE received a number of postcards from W. R. C., of Dorking, who always omits to include his address. This critic sends suggestions for articles he would like to see in this journal. Had he included his address I would have been able to indicate to him that all of his suggestions have formed the subject of articles in previous issues. One of his suggestions was that we should publish how to make a series aerial condenser!

The Purchase Tax and Repairs

HIS Majesty's Customs and Excise Department have removed the wrinkles from the brows of many dealers on the question of Purchase Tax and repair work. Manufacture of wireless apparatus is defined as making goods or performing any process in the course of making goods. It does not cover repairing or reconditioning an article, provided that the operations are carried out purely and exclusively to involve the making of what is virtually a fresh article. Therefore, liability to register as a manufacturer does not arise from reconditioning and repair work. Liability to register as a wholesaler may occur if the reconditioned or repaired goods, being the property of the repairers, are intended for resale to retailers, but not if they are disposed for resale to consumers. Sales by registered persons are not exempt from tax on the ground that the goods are second-hand or reconditioned, but no tax is chargeable on sales of such goods where transactions are between retailers and their customers, and the same applies if a registered firm is dealing with the goods in its capacity as a retailer.

A.G.M. of the R.M.A.

At the annual general meeting of the R.M.A., the following firms were elected to the council: Messrs. Belling and Lee, Plessey, Bulgin, Westinghouse, Bush, Cisco, G.E.C., Marconi, Murphy, P.V., Ultra.

That Intransitive Verb

I HAVE received an interesting letter from G. W. S., of Ickenham, and this is what he says:

"Since the inception of PRACTICAL WIRELESS, I have seldom, if ever, failed to gain much pleasure in the perusal of 'On Your Wavelength,' and in reflecting on the forceful personality so well expressed in those gems of satire which sparkle among the more general items of topical interest for the radio fan. "My December issue of PRACTICAL WIRELESS reached me unfortunately, rather late, the delay being doubtless due to the exigencies of the transport system in the Christmas rush. 'Picture my delight on turning to page seventeen to read in paragraph one, another of those satirical cameo criticisms of the

Our Roll of Merit

Our Readers on Action Service—Thirty sixth.

S. Thomas (Pte.), Chaplow.
A. Warner (Signalman), Home Forces.
J. N. Harris (Driver), R.A.S.C., House Force.
J. C. Holland (Sub. Lt.), R.N.P.O.
R. M. Nelson (Pte.), Shetlands.
F. G. Stanley (Pte.), Lascelles.
- G. R. Hughes (Sgt. R.A.M.C.), Limerick.

B.B.C.—this time with our old friend 'Thermion' in a new role—that of cross-examining critic to the announcing fraternity. A fair diallum, is it, who wells under questioning for and I am here, to temper justice with mercy for the victims.

Now, I wholeheartedly agree, Thermion, that the unique position of the B.B.C. is one that necessitates that their grammar should, at all times, be exemplary. But I am noting to submit that, though the example instance in particular indicated, viz: 'I will play you 'So and So' is incorrect, when judged by rigid grammatical standards, it conforms with conventional expressions of type.

'As I will pay you two shillings or I will send you PRACTICAL WIRELESS or I will buy you a far coin.'

"Moreover, Thermion, I cannot agree that the verb 'to play,' even though used in the specified sense, is intransitive.

My own conclusion on the incident is that the goods are second-hand or home or conventional grammar, which, I hope you will agree, is not the same as committing a grammatical error. So much for B.B.C. grammar. Having the day sooner than we fight against are utterly and completely destroyed, and we can look forward to an era full of promise of discoveries and developments in our own particular branch of science.

Then also, we shall see our desires realised in the fulfillment of the promise stated in the PRACTICAL WIRELESS will revert to weekly publication, with our old friend, to whom I have already mentioned this note, sporting his inimitable style in 'On Your Wavelength.'

Flying Without Wings

MAGIC lanterns and darkened rooms are used for the ground training of R.A.F. bomber crews in the 'Cubicle Trainer.'

The screen is hung on one side of a large room. On the opposite side stands a row of half-a-dozen glass-fronted cabinets—hence the name. Each of these cabinets contains a pilot, navigator, wireless operator and a wireless operator. Outside the cubicle sits the instructor, who is in touch with the half-dozen crews by wireless only. By sending them on a flight" to say, Milan, he gives them an exercise in navigation. Every few minutes a slide of an aerial photograph showing landmarks over which they would pass if in actual flight is thrown upon the screen. They see the slide through the glass front of their cubicles.

As the cubicles the crews are "briefed," just as bomb crews are "briefed" at an operational station before going on a real raid. They are given their objective, and the instructor directs the route which they are to follow. From the moment of "taking off" the navigators begin to plot their course on a chart.

Not all the pictures on the slides are easily recognised, but the crews would soon be "lost" if the wireless operator were not there to pick up a bearing from the "ground"—that is, from the instructor outside. Sometimes the slides of towns or landmarks which are just off the route are deliberately shown. If the navigator recognises them he will know from his maps just how far he has drifted and drift from his correct course. If he fails to recognise them he will again need the wireless operator to get a 'fix' from the "ground" and to establish his position.
The History of the Radio Valve: 1900-1916

Dr. de Forest Reviews His Early Adventures During His Development of the Vacuum Valve

The evolution of the radio or "audion" valve as it was known, is a very interesting story, and one that is not at all well known. Most radio men assume that it was accomplished through a fling of inspiration. But this is not true. It came about through hard work.

Just over forty years ago, I entered into the development of wireless telegraphy, and knowing at that time what Marconi had been using, there were many unnecessary complications. I didn't have a clue, but I went to the library in night, and spent many days in the Western Electric Telephone laboratory. In my room was a little work coil with which I generated my electric waves. One night, when I made this coil spark, I noticed the light of the Webbach gas burner on the wall dimmed very perceptibly. It occurred to me that the electric waves were acting upon the incandescent gases surrounding the gas mantle.

Gas Detector

In 1903, I had a chance to get into laboratory work and investigate the gas detector, as I called it. I used the Bunsee burner in these experiments, and proved that heated gases were actually responsive to electric waves.

By 1905 I had advanced to the point where I was using a carbon filament to heat the attenuated gases in a glass tube. In connection with this bulb, I used, as I had always used in my gas-flame experiments, a receiver with an H.T. battery connected between the plate and the filament in the bulb. The device was not a rectifier, but a genuine relay detector whereby the electric waves produced marked changes in the battery current which was flowing through the tube.

The Third Electrode

In 1906 I removed the antenna connection from the plate electrode and connected it to a simple piece of tinfoil wrapped around the cylindrical tube. This proved to be a great improvement over my preceding arrangement. I next placed this controlled electrode within the tube in the form of another plate on the opposite side of the filament from the first plate. This third electrode within the tube was a marked improvement, and I decided that I could still further improve the device if I worked it between the filament and the anode electrode.

At this time I had in mind a telephone repeater, or relay, and took out a broad patent on the three-electrode valve I used. In addition to the filament battery, and the plate or H.T. battery, I used a G.B. battery in series with the controlled electrode. My patent was that I used this battery to bias "negatively" the controlled electrode, but I did not claim this arrangement in my patent. As the result of this omission on the part of my patent attorney, Mr. Lowenstein later secured a patent on the negative grid-bias which for years was a controlling patent in radio litigation. The negatively-charged controlled electrode was of much more value when audion was used as a telephone relay, than as a wireless detector. From my earliest experiments I continued to use a blocking condenser in a series within the controlled electrode.

Although my first valves were low vacuum, they were nevertheless quite gaseous, and permitted me to use only 22 volts on the plate. Gradually I began to exhaust my valve to a higher vacuum, so that I could apply higher potentials to the plate, thereby increasing the power which could be used.

In 1908 I changed from the cylindrical to the spherical type of tube. In 1907/8 I began to use two filaments in parallel. One of these was a spare. The free end of the filament was brought out of the bulb, and when the first filament burned out, the second one could be used simply by winding a spare wire around the base of the bulb. In 1906 the name "audion" was applied to the device by my assistant, Mr. Babcock.

"Double Audions"

In 1909, in order to increase the conductivity of the valve and to enable the use of larger energy, we used two plates and two grids, usually connected in parallel. We called these "double audions," and sold them at a higher price than those using the single plate and grid.

In 1909 I first used the grid-leaf, for when I wanted to get a really high vacuum I found that the anode would block, and I provided that a good condenser was used in the grid connection. To avoid this, I used a high-resistance grid-leaf. Our panels were of hard rubber in those days, and my first grid leak was simply a pencil mark in the panel connecting the grid and filament binding posts. With this device, the "audion" became very popular in 1909.

A Two-valve Amplifier

In 1911 I moved to San Francisco as Research Engineer for the Federal Telephone Company. In 1912 that Company was establishing long-distance telephone calls from San Francisco to Honolulu. They used a buzzer and tickler system, but it was very sensitive, and could not easily read the messages from Honolulu, so they asked me what I could do in the developing of an amplifier. I again went to work on my vacuum tubes. From New York I got a supply of "audions." I now got the amplifier to work without much difficulty, first singly, and then two audions in cascade. The greatest voltage I could use was 50 to 60 volts because the vacuum was not sufficiently high at that time. So I took all of the valves to San Francisco to a maker of X-ray tubes. He re-tubulated them and got a much higher vacuum. I could then easily use 200 volts of H.T. battery, I always used individual H.T. batteries, one for each amplifier stage. As a result of these experiments, I developed the cascade amplifier into what later became an invaluable device. On one occasion, after breaking my last good valve, I tried to make one audion do the work of two, feeding the output energy back into the grid circuit. This set up a terrific howl in my headphones. That was the first feedback circuit in radio history. At that time, instead of using the transformer, I tried the auto-transformer, or choke-coil, and found that I could couple the second audion with the first in that manner.

Tungsten Filament

In 1913 I got back to my own laboratory in New York. One of the first improvements thereafter was made by Dr. Hudson. He experimented with the tungsten filament, wrapped a fine tantalum wire around the tungsten, and got a much higher vacuum; called it the "Hudson X" filament. The "hams" clamoured for these audions. In the same year, in my own laboratory, I began to use a feed-back circuit for use both as a receiver and as a transmitter. I also began to make these valves in my own plant, but I encountered plenty of trouble in mastering this complex art in those early days.

Transmitter Valves

The next step was towards the type of transmitter valves we see to-day. About that time, in 1915, the Western Electric Company adopted the same design for their transmitter valves with the chief difference that they used oxide-coated filaments. The Western Electric Company erected a transmitter in connection with the first New York - Washington telephone link. As a result of these developments, we were soon able to telephone the Eiffel Tower, in Paris. From that point progress in valve construction became a matter of engineering design, The entire progress of America in World War I was founded on what had been done for enormous quantities of these valves, and during this time the General Electric Company, as well as Westinghouse, began to build them.

The history of the radio valve for the last twenty-four years is too well known to bear repetition.—Radio News.

Everyman's Wireless Book

5c. or by post 5d. from George Newnes, Ltd., Tower House, Southampton St., London, W.C.2.
Modern Factory Production Methods—6

Factory Inspection Technique is Explained in This Article. By “SERVICE”

Identification Methods

With all the above inspection stages to be maintained at a high standard it will be appreciated that an important item in factory production is the identity of work done, with the inspectors doing it. Every component, chassis and complete receiver that has been examined must bear a stamp or label indicating that the unit has been inspected, and that no-and-so inspector passed it. The indication may take the form of a rubber stamp which leaves an impression on the unit which may be readily distinguished at a later date. Often a circle with a number inside is used, the number being registered as referring to a particular operator. Various shapes of stamps may be used to indicate different operations. A circle may mean performance test, a triangle the mechanical examination of condenser drives, soldered joints, etc., a square for cabinet inspection, and so on.

Very small items, such as pick-up coils, cannot be stamped in this way, and often a spot of paint is used to indicate the inspection stage, the colour being used to identify the operator concerned.

Final tests on a complete model immediately before packing for transit are generally recorded by the tester putting his stamp on a label which is tied to the receiver or inserted into the instruction book. If any complaint is made when the set is delivered the label should be sent back to the factory to enable investigations to be made.

Cross-checks

Many readers of Practical Wireless who have in the past been service engineers working on their own, may find themselves in jobs in mass-production factories where the above-mentioned checks and cross-checks are in operation. They must not take these precautions in the wrong spirit, and think that they are being constantly spied upon; the system is as much for the benefit as for the factory authorities. It safeguards the conscientious worker against the slacker, so that instead of a whole group of operatives being condemned as inefficient because of the large percentage of rejects in their production, the actual operatives responsible can be identified and suitable action taken.

By “suitable action” it does not always mean the dismissal of the employee. It may be found that it is impossible to carry out an inspection as thoroughly as it would be desirable. Certain parts of the component or chassis may be inaccessible or invisible to visual inspection while electrical tests give an O.K. result.

For example, an inspector may pass a
chassis as being up to standard with regard to sensitivity after trimming, and put his stamp on the chassis after it has passed inspection and is about to be sent out. If, however, after a lapse of a day or two, while the chassis is proceeding through the stages of mechanical inspection, fitting to the receiving set or label, and finally sent out, it is found that the type of trimmers used in the receiver shift under the rather rough treatment they go through on a factory floor, it is entirely set back. The operators gauging the receiver and passed by the inspector, who may have handled the chassis immediately afterwards, before it reached any rough treatment, the trimmers may shift during subsequent stages and so cause the receiver to be rejected at the final test.

It will be seen, therefore, that a good inspector must stand up for himself if he feels confident that he can do the inspection expected of him no matter what may be the opinion of the designer or manufacturer, and is acting on the whole truth. That is why in a large factory the inspectors are controlled entirely by a management presided over by the chief inspector, to whom alone, and to whom alone, the final word rests. Although working on a production floor they do not come under the authority of the men in charge of the production, whereas, generally, it is the department from the floor as many receivers or components as possible. If this were not so, impartial criticism and investigations would not be maintained, and the quality of the product would certainly deteriorate.

Meeting of Inspectors

It is usual to hold a meeting of inspectors periodically—say, once a week—where complaints, suggestions, etc., can be talked over. By means of the rubber stamp inspected, it should be possible, even after the test, to identify the chassis was then passed over to cheap labour under the rather rough treatment it may have undergone, and then rejected at the final test.

Types of Faults

An essential part of the inspection department's routine is to compile statistics giving details of the types of faults for which the chassis have been rejected, and giving these figures as a percentage of the work done.

For example, if a certain group of operators reported that 100 pass through their hands merely reject one for rough track, one for bad contact and four because they were broken. These figures not only show the type of faults occurring but also which is the more serious, so that the matter may be taken up with the supplier or maker. The most serious faults—breakages—may be found to be due to rough handling between departments, and a better way of carrying the components or packing them would overcome the trouble.

In large factories everything of this nature must be reported upon, and copies of the report issued to the other departments.

Chassis which are rejected by the inspectors will either go through the assembly line again, or will be handed over to a separate group of expert fault-finders, depending upon the reason for the rejection of the chassis.

If the inspection had rejected the chassis in the early part of the assembly line it is put back to be seen at the beginning of the line to be picked up by the operator responsible for the fault to go over the work again. If, on the other hand, it was found to pass its final test it will be handed to the fault-finders for examination.

Club Reports should not exceed 500 words in length and should be sent to the Editor at the end of each month for publication in the next issue.

YOUTH RADIO CLUB FORMED IN PRESTWICH

Organiser: R. Lawton, 40, Dalton Avenue, Thatchfield Avenue, Prestwich.

A special meeting of this new club was held at the Heys School, Prestwich, on January 10th, for young people between the ages of 14 and 19 interested in radio. The purpose of this meeting was to find out if a radio club for young people was wanted. The attack was made at the beginning of the meeting and during the meeting, and the suggestions made during it were adopted without any difficulty. It will be well received, and it is hoped there will be a good attendance there and then to appoint the following youth officers to take over various duties in the club:

- Secretary: Mr. Peter Dean, Prestwich
- Chairman: Mr. J. H. Dubois, Prestwich
- Technical Adviser: Mr. A. A. Croke, Prestwich
- Technical Adviser: Mr. G. E. Kenny, Whitefield
- Morse Instructor: Mr. A. D. Croke, Prestwich
- Morse Instructor: Mr. R. E. Lawton, Secretary of the North Manchester Radio and Television Society

Test Equipment

These men know the whole assembly of the chassis from A to Z, and soon acquire the ability to drop to the cause of any particular fault for which the chassis has been rejected. They are supplied with a real test equipment, because it is essential that they should grasp the fault as quickly as possible. Often, they work with cathode-ray oscilloscopes, and find that if some particular form of distortion is causing trouble. By injecting a pure sine-wave signal from an audio-frequency oscillator into the chassis and examining the oscillograph at each stage by means of an oscillograph, the part of the circuit where the distortion is produced is soon located.

Some firms employ only a few skilled men to find the fault, and to mark on special labels the reason; for example, "faulty oscillator coil assembly—reject." The chassis is then passed over to cheap labour for the component to be changed, and for the complete chassis to be taken back to the test gear for approval.

Other manufacturers prefer to have repairs carried out by their own technicians themselves. It just depends upon the regularity of feedback, and the costly points have been out.

Service Liaison

With regard to any faults found during production, it is important that a liaison should exist between the inspection department and the service department. It is possible that a mistake may be made in a large factory because of misunderstanding, is allowed to pass through the inspectors and away into the packing department before the fault is found. But there is a type of fault which may arise to a whistle on a certain frequency due to instability, and the inspection had not been instructed to try out the receiver to a whistle. The fault may affect only a few joints, or the faults occurring have also some effect on the service department. Thus, the radio may be incorporated into a notice for distribution to the company's own service department, and to their dealers. Thus, a direct fault is met with, and in the field a remedy may be applied.

RADIO CLUBS & SOCIETIES

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Experimental Coil Tappings

To effect the tapping of a coil, a crocodile clip is used in the appropriate position on the coil windings. I found that every time I removed and replaced this clip, the dial readings of the tuning (and sometimes even the reaction) changed. I later tried altering the coil as shown in the accompanying sketch. A piece of thin brass strip is cut to a suitable size and fixed securely to the coil. The clip can then be slipped to the tag without fear of upsetting the capacity of the circuit.

A Multi-change Circuit

The following is a novel circuit I rigged up for a young friend, in order to study the effect of various circuit arrangements in a crystal set. It would be equally applicable to the H.F. stage of a receiver. Three coils are used, the two left-hand ones (in the circuit diagram) being on the one former, and the right-hand one separate. The left-hand one is 50 turns, the centre 60 turns, and the right-hand one 150 turns—all on a 2in. former.

A novel dodge for studying coil tappings for a crystal set.

Plugs and sockets are used throughout. The following are the circuits which can be "switched" on in a moment or two.

2. Circuit with condenser in aerial lead: M-K, L-F, N-L, O-C, Q-O.

Home-Made Coil Formers

Recently, I desired to wind two coils, but as no tubes were available at the time I utilised some small round cartons which usually contain pepper, etc.

First, I selected two of the required diameter and thoroughly dried them in the oven, whilst still hot, a coat of shellac was applied, both inside and out to render them damp-proof. For tags I cut some pieces of light metal, in the shape of a cross, as shown in the sketch. Two "arms" of the cross are bent, and these are pushed through slits cut in the end of the tube, being firmly bent over on the inside to hold them in position.

That Dodge of Yours!

Every reader of "Practical Wireless" may have originated some little dodge which would interest other readers. Who may not pass it on to us? We pay 21/-10-0 for the best hint submitted, and also other items published on this page we will pay half-guineas. Turn that idea of yours to account by sending it in to us addressed to the Editor, "Practical Wireless," George Newnes, Ltd., Tower House, Southamptom Street, W.C.2. Put your name and address on every item. Please do not enclose queries with your hints.

Special Notice

All hints must be accompanied by the coupon cut from page iii of cover.

The top or short arms of the tags are then bent outward from the tube, and these are used for anchoring the ends of the windings, a small hole being made in the cardboard beside each tag to enable the wire to be threaded through.

A Vice-clamping Hint

If the kitchen table is used as an occasional work-bench, and you wish to use a small vice, here is an effective method of fixing it to the table.

A piece of wood of suitable width and thickness is cut to a length equal to the width of the table, and clamps having holes bored in them, as shown in the sketch, are held in position on each end of it by means of wood screws. The vice is then bolted to this piece of wood so that after using the whole thing can be lifted off in one piece and put away till again required for use.

It will be found that as the clamps are screwed to the piece of wood, the relatively large surface of the latter bearing down on the table top, ensures that the Vice is held immovably to the table without causing any damage thereto.

A useful method of making experimental coil tappings.

The Practical Wireless Encyclopaedia

By F. J. Camm

A complete guide, in alphabetical order, to the construction, operation, repair and principles of every type of wireless receiver. Includes definitions, formulae and complete instructions on the making and mending of various wireless components. 392 pages. Over 500 illustrations.

For all bookstalls, £1-10-0, or by post £1 from George Newnes, Ltd., (Book Dept.), Tower House, Southampton Street, London, W.C.2.
A NOVEL AUTOMATIC TUNING UNIT

How an Ordinary Telephone Dial Can Be Utilised for the Purpose

PUSH-BUTTON and other methods of automatic tuning have become very popular of late, and nowadays there are not many receivers on the British market that do not employ one or other of these devices.

The telephone dial lends itself very readily to this type of tuning, both for its simplicity of operation and easy adaptation for remote control. In spite of this, it is not widely used amongst home constructors, owing apparently to their lack of knowledge of the fundamental principles of the circuits involved. This article is intended to fill this gap, and once the elements of the simplicity of operation and easy adaptation for remote control. In spite of this, it is not widely used amongst home constructors, owing apparently to their lack of knowledge of the fundamental principles of the circuits involved. This article is intended to fill this gap, and once the elements of the simplicity of operation and easy adaptation for remote control are clearly explained to the amateur, he will be able to adapt the principle to his own particular requirements.

The Dial

The dial, and its accompanying mechanism the uni-selector, can be purchased for a few shillings from advertisers in PRACTICAL WIRELESS. Not those who have never handled a telephone dial a brief description is here given. From the front view we see a round dial with ten finger holes in it which are numbered "1" to "0." To dial a number

- Fig. 1 (Left).-Circuit diagram showing the contact springs, and position of uni-selector unit.

the finger is placed into the hole containing the figure required and the dial is pulled round to the stop, and then released; the dial laterally returns to its original position, and in doing so sends out a number of impulses corresponding to the figure dialled. At the back, two sets of springs are fitted; the pair on the top of the dial are termed the "off-normal" springs; these springs have contacts fitted to them which are closed as soon as the dial is rotated (i.e., when the dial is off its normal position). On the right of the dial will be found the impulse springs; these contacts are normally open, and they open and close as it returns to its "home" position. The number of makes and breaks depending on the number dialled. The springs can be seen in Fig. 1.

The Uni-selector

This has the appearance of a complicated piece of mechanism, but actually it is very simple. First there are a number of banks of contacts; in a small uni-selector, such as is suitable for our purpose, there will be found four banks of twenty-five contacts forming a quadruple arc; in addition there is a homing arc. The purpose of the homing arc will be made clear later. Five wipers are mounted on a spindle so that when the latter is turned, the wipers sweep over the springs, the brushes connecting the wipers being brought out to contacts at the top of the uni-selector. An electro-magnet is mounted so that when energised an armature is attracted to the poles, and in doing so a pawl and ratchet arrangement pulls the wipers round to the next contact. There are also a pair of spring contacts fitted so that their contacts are broken when the armature operates; these springs are called the off-normal or interruptor springs, and they are usually fitted in conjunction with the homing arc. The electro-magnet requires about 50 volts to operate.

Operation

Figs. 1 and 2 show the method of connecting up the circuit so that the operation of the dial will cause the contacts of the uni-selector to be connected up to the desired circuit. The main switch is not absolutely necessary, as no current is drawn except when the wipers are rotating, but it is put in as an added precaution to avoid wasting power when not required.

- Fig. 2.-Method of connecting the uni-selector contacts to the band-pass H.F. and detector stage of a receiver, using pre-selector condensers.

Fig. 2 shows the method of connecting the uni-selector contacts to a circuit; for the purpose of simplicity, part of a receiver is shown with one band-pass H.F. stage and detector with pre-selector condensers, each of which is tuned to the required station. This is a very well-known method, so it will not be dealt with in detail here.

It will be observed that the first set of contacts are not used, as these form the normal or home position of the uni-selector, but are the second set used, for it will be seen that as soon as the dial is off-normal the selector will automatically step to this contact. Assuming that 1 is dialled; on rotation of the dial, the off-normal springs are operated and the circuit is completed from one side of the battery, through the electro-magnet, to the impulse springs, via the off-normal springs, and back to the other side of the battery. When the dial is released it returns to normal, and the impulse springs will open once, then close, thus the armature will restore, and then operate again, and so the wipers will move another step. Finally, when the dial comes to rest, the off-normal springs will open and the armature restores; therefore, we get two impulses when one is dialled, three when two is dialled and so on. Contacts number 2 should therefore be left free.

Let us now assume we require number 3 station. For the reasons explained above it will be clear that this station will have to be connected to contact number 3. The brushes of the wipers should be earthed (omitting, of course, the wiper on the homing arc). Three is now dialled and number 3 pre-selector condensers are connected via the contact bank and the wipers to earth, and so the station number 3 is obtained.

It will be noted that the off-normal springs of the dial consist of two pairs, and as only one pair is required for operating the uni-selector, the other pair can be made to mute the condensers whilst dialling a station. This will prevent the sound of stations that are passed through in the process of dialling being heard. The muting can be done by short-circuiting the loudspeaker direct, or by the employment of a relay.

Homing

When it is required to restore the uni-selector to its normal position, use is made of the homing arc. Fig. 3 shows the
connections. The battery is taken to one side of the electro-magnet and then to the interrupter springs; the other side of the springs is connected to the homing wire. The homing wiper is then taken to the homing press button (H). The armature restore the interruptor springs, and so the circuit is again made, once more open. This series of cycles will continue until the homing wiper comes to rest after dialling 1, and before the dial is rotated for the next figure. If it is desired to avoid this a separate muting button for the loudspeaker could be employed; or a better way would be to use a slow-release relay that is operated by the dial's off-normal springs. The numbering now proceeds 10, 20, and so on to 00. This brings us to the 22nd contact. Now there is 100, 200, 300 left. This brings us to contact 25. We could now use the second contact by dialling 500, which takes the wipers all round the uni-selector, and back to the second contact.

By using the above scheme a maximum of 24 circuits is obtained. If all these are not required it can be arranged to avoid unwanted bursts of music through without having a separate muting circuit. That method is to leave the "O" contact free (i.e., contact 12). The numbering then proceeds 01-02 and so on to 09. The next contact (00) is left free, and then we have 001, 002, etc.

The uni-selector should be mounted in the receiver itself but the dial and homing button could be placed at any distance away. Moreover, wherever there is an extension loudspeaker, a dial could be fitted in conjunction with it—a novel yet simple method of remote control.

Another point worth mentioning is that to avoid a multiplicity of leads, one side of the operating battery could be earthed and the remote dial circuits completed through earth. Fig. 4 shows how this can be done.

The scheme lends itself to infinite variations for remote control work: for instance, lights can be switched on and off by dialling a number, but it must be remembered that the uni-selector contacts are not designed for very heavy currents, and so relays should be employed to avoid trouble from this source.

### Using Obsolescent Coils

Now is the Time to Bring Back Into Service Those Coils in the Spares-box, and so Reduce Demands on Raw Materials

Feature of the T.D., apart from its selectivity and sensitivity, is that it is not so susceptible to medium-wave break-through when the long waves are being received, as some of similar construction.

**Types T.G., S.C. and S.R.**

These are of the larger diameter types, embodying wave-change switch. The S.C. model is suitable for tuned-grid coupling or aerial circuits, but no reaction coil is fitted. It should be noted, however, that a coupling condenser—suitable for the windings—is embodied in the actual construction.

The S.R. has a reaction winding, but no coupling condenser. It is not really designed for use in the aerial circuit, but it can be used in such positions when a high degree of selectivity is not desired. Typical circuits are shown in Fig. 2.

**Types R.M.1S, 2S and 3S**

These are dual-range aerial with variable coupling and wave-change switch: dual-range aerial with variable coupling, reaction winding and wave-change switch; and dual-range H.F. coil with reaction winding and wave-change switch respectively. The connections are shown in Fig. 3.

As there appears to be quite a number of six-pin coils still in existence, we will conclude the Colvern group with the M.M. series. These were designed to cover 20 to 2,500 metres in four steps, the bands and

---

**Fig. 1.**—For a single tuned circuit receiver, this coil gave very satisfactory selectivity.

**Fig. 2 (left).**—The Colvern T.G.S.C. and T.G.S.R. are most suited to circuits with H.F. amplification.

**Fig. 3.**—An efficient S.G. Three can be built around these types.
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Coil numbers being M.M. 31, 20-45 metres, M.M. 32, 40-85 metres, M.M. 3, 200-600 metres and M.M. 3X, 830-2,500 metres. The connections are shown in Fig. 4.

Lissenc Coils

Types L.N. 5180 and 5314. These are of the dual-range air-cored pattern, without wave-change switch. L.N. 5180 differs from the 5314 in one respect: it has a variable

condenser—0.002 microf.fd.—built in and arranged to act as an aerial series or coupling condenser, thus allowing more control over the selectivity of the tuned circuit, than is possible with the wave-change coupling described in Fig. 5. The coils are designed, primarily, for use in receivers without a.h.f. stage. However, they may be used in any circuit, and provided the coil is spaced far enough apart to prevent an interaction between their fields. They are not canned; therefore the above precaution must be taken.

A suitable 3-value circuit for the Lissenc coils is shown in Fig. 6.

They are not really suitable for ganged circuits as the windings are not specially matched, but it is possible to use one coil of each type in a resistance-coupled band-pass arrangement provided that a little care is taken with the layout, and the use of the coupling resistance. The maker's suggested circuit is shown in Fig. 7.

The two coils can be identified quite easily. The L.N. 5180 has a moulded top to its bobbin, whereas the L.N. 5314 has a knurled knob connected to the small variable condenser which is housed inside the coil former.

Solution to Problem No. 416

Yeeomans was either ignorant of or overlooked the fact that when coil mutuals are equalized, the resultant selectivity is only half that of one. When making the modifications, therefore, Yeomans reduced the value of the smoothing condensers, with the result that hum became pronounced.

The following three readers successfully solved Problem No. 415, and have accordingly been awarded £1.0.0.

A.C. TWO-VALVE AMPLIFIER—CORRECTION

In the specified list of components for the above-mentioned unit, which is fully described in our issue dated February, 1941, an error was made in giving the maker's name of the valveholders. These should have been specified as Celestion Amphenol, and not Amphenol Amphenol as published.
Radio in the Desert

According to reports, wireless is playing a big part in the Libyan Desert campaign. Every tank has its own set, and small portable sets are carried by infantrymen in the front line. Many armoured vehicles also have wireless sets, and thus, with the heavier sets at divisional and corps headquarters, there is a complete wireless chain linking up the various army units.

Radio Men from Canada

The arrival of a number of airman radio mechanics in this country from Canada recently is a feather in the cap of the Royal Canadian Air Force, and is incidentally a tribute to the usefulness of the Empire Air Training scheme.

The rate of expansion of the R.A.F. frequently gives rise to sudden calls for specialists of one sort or another. When radio mechanics were wanted, Canada was asked to supply them, found them at very short notice, and trained them under the Empire Air Training scheme. This scheme is primarily for the training of air crews, and it is, therefore, all the more satisfactory that it should have yielded this number of men for ground duties.

Civilian Training in Wireless

For some time men trained at certain civilian wireless schools have been accepted for the Royal Air Force as wireless operators.

This scheme is now to be extended. Civil wireless schools administered by the General Post Office and municipal technical colleges are to give courses in wireless to boys who intend to enlist.

Boys so trained will be accepted for the Royal Air Force as wireless operators from the age of 17½ if suitable. In such cases a return of tuition fees can be claimed up to £25.

Wireless Operator Gets the O.B.E.

Mr. G. W. Backston, wireless operator and former exhibition officer of the B.B.C., has been awarded the O.B.E. in recognition of his devotion to duty when his ship was attacked by an armed raider. He sent out the vessel, and remained at his post in the wireless room throughout the attack, until it was set on fire.

Alteration in French Station Names

It is reported from the U.L.R. that as a result of the reorganisation of the French broadcasting system, the names of the stations have been altered. The name of the French service in future be suffixed by "National" instead of "P.T.T.", etc., i.e., Lyon-National, Toulouse-National, etc., instead of Lyon P.T.T. and Toulouse-Pyrénées.

B.I.R.E. Forms New N.W. Section

Work has commenced with a view to forming a N.W. section of the British Institution of Radio Engineers, according to G. R. Leech, general secretary of the Institution. A provisional committee has been elected, with A. G. Eggington, S3, Washway Road, Sale, Manchester, as chairman, and A. V. Simpson, 10 Fullman Street, Deepshill, Rochdale, as honorary local secretary.

Some time in March an inaugural meeting will be called, when, with the exception of the two officials named the provisional committee will offer themselves for formal re-election by all members residing in the N.W. area.

B.B.C. Programmes for Northerners

Northerners exiled in many parts of the world are to be specially catered for by the B.B.C., which will keep them in touch with what is going on in their home towns.

For many months, performances by bands which are household names in the North have been heard in Empire programmes. The response already received to Northern programmes which have been broadcast to the Empire in recent months shows how much these are appreciated by Northerners exiled in the far corners of the world. One of the most successful broadcasts has been that of D. G. Brecken's play, "Aaron's Field," which has a Northern setting. Among bands which have been heard throughout the Empire are Foden's and Baxendale's. One of the biggest successes has been Victor Smythe's "Works Wonders" programmes. These concerts by munitions workers for munitions workers have been broadcast live at 2.30 a.m. from a number of factories in the North.

American Amateur Radio Committee

We learn that seven members of the American Amateur Radio Relay League have been appointed to the Amateur Radio Committee of the U.S. Defense Communications Board. The committee is to consider all questions relating to amateur radio, and its place in the national defence programme.

Timber for Radio Sets

According to a recent announcement by Major A. I. Harris, Timber Controller, limited quantities of timber and plywood are being released for the manufacture of radio cabinets of the cheaper type.

"Wireless for the Blind" Fund's £10,000

Mr. Ernest Bevin, who broadcast on Christmas Day for the British "Wireless for the Blind" Fund, has handed over a cheque for the first £10,000 received in response to his appeal. He handed the cheque to the "Unknown Blind Man," who has personally made the annual appeal on two occasions, and had been chosen to receive the money on behalf of the 70,000 sightless people in this country.
F. J. CAMM'S ALL-DRY

A Compact Self-contained I Satisfy Readers' Re

The finished set housed in the well-designed and sturdy cabinet.

The compact chassis arrangement will be noted.

The assembled receiver compared with the M.c speaker gives an indication of its compactness.

This view will prove helpful when assembling an positions of these parts and adjustment because the necessary padding condensers are incorporated in its construction.

The condenser to the primary of the transformer, Bulgin Type 75, thus allowing the secondary to pass the signal to the second valve which is an H.F. variable-mu pentode Cosson 1.N.5.0, operating as a

of the two-gang condenser. The oscillator grid and anode have their circuits completed through the oscillator coil, Bulgin Type C72, which is designed for 405 kc's operation. This particular component calls for special mention, as it simplifies wiring

Theoretical Details

The circuit is shown in Fig. 1. Regular readers will recognise that it is practically identical with the All-Dry 4 Valve Superhet which was first mentioned in our issue for October, 1910. The reason for this is the fact that the circuit has been well tried and not found wanting, with the same specification, there are no worthwhile modifications which could be made. In addition to this, constructors who have made the above set can, if they so desire, convert it to the portable model about to be described with the minimum of trouble and outlay. For those who would like a brief description of the circuit, here are the chief details:

The first valve—a Cosson 1A.7.V.C.—is a pentagrid, having variable-mu characteristics, and operates in a perfectly normal frequency-changing stage. The signal grid receives its bias via the frame aerial windings which are tuned by one section

too complicated. We appreciated their views, and endeavoured to combine efficiency with simplicity. In this direction, we were helped by the power radiated by the transmitting stations in pre-war days, which was such that it was not really essential to use an elaborate circuit specification to achieve satisfactory results. Conditions now, however, are somewhat different; the modified broadcasting arrangements, the poor reception due to receivers being used underground or in metal A.R. shelters, and the necessity of dispensing with accumulators, have introduced requirements which now outweigh peace-time consider-

many designs of portable receivers have emanated from our laboratories in the past: each one was outstanding in its class and represented a distinct and tangible improvement on previous designs. Progress was maintained, until the time arrived when we had to restrict our desire to offer our readers a receiver comparable with commercial design and efficiency, because of the constructional and wiring work involved, and the fact that many constructors did not want anything

In keeping with our usual policy of providing designs which are in step with the latest developments, we have produced the All-Dry Superhet Portable, a compact, self-contained, four-valve superhet receiver, comparable in construction and efficiency with commercial products, using the latest 1.4 volt valves and incorporating A.V.C., a high-grade P.M. moving-coil loudspeaker, single-knob tuning, automatic grid-bias and a single dry battery to supply both H.T. and L.T.

The assembled receiver compared with the M.c speaker gives an indication of its compactness.
SUPERHET PORTABLE

All-dry Superhet Receiver Specifically Designed to Meet Special Requirements and Existing Reception Conditions

Pure H.P. amplifier under A.V.C. conditions. The third valve is a diode-triode—L.C.5.G. and serves as a detector, source of V.C. and as an L.F. amplifier. The particular section of the circuit has been kept as simple as possible, consistent with the resistance connected between H.T. and L.T. negatives, therefore it is essential to adhere to the value specified.

Constructional Details

With a set of this type, the constructional work is bound to be slightly more difficult than that required for a less ambitious circuit. It is not possible, when compactness is a consideration, to adopt hazardous methods for the location or wiring of the components, therefore it has to be admitted that the constructor who wishes to build a satisfactory model of this set must be prepared to expend a reasonable amount of skill and patience: otherwise the whole design will be ruined. It will also be noted that soldering is used for all connections, and as many of them involve more than one wire, care must also be taken to see that neat and efficient joints are made. Avoid excessive flux and solder at all costs. See that the iron is clean and kept at the right working temperature, and that the smaller components are not overheated when applying the solder.

All dimensions are given on the plan drawings, and as space is a vital consideration, these must be adhered to when marking off. In the interests of economy, the chassis does not take the usual form. A single piece of 18-gauge aluminum, 7½ in. by 5½ in., is used for the top, half an inch along the front edge being turned down at right-angles, thus leaving an overall dimension of 5½ in. by 5 in. Five small odd pieces of metal are required, two for the front component mounting brackets, which also serve as legs or location pieces; these are 2½ in. by 1½-16 in. These are fitted inside the bent-over edge of the chassis, therefore, as they are intended to keep the assembly 2 in. high, allowance must be made for the thickness of the metal. In the above measurements we have allowed 1½ in., but if metal of a different gauge is used, this must be adjusted accordingly. Two smaller pieces must also be cut to act as anchoring supports for the back of the assembly. They can be ½ in. in width, and of sufficient length to keep the chassis at 2 in. above the wooden shelf fitted inside the cabinet. If ½ in. is bent over at right-angles at one end of each strip, this will allow them to be bolted to the chassis, whilst the other ends can be screwed to the shelf, once the set is in position.

The fifth piece is required for the fixing of the L.F. transformer, which is located under the chassis. This should be 1¾ in. by 1¼ in., of which is turned at right-angles to form a base, thus leaving a surface of 1½ in. by 1¼ in. for the seating and fixing of the L.F. transformer. A hole 1 in. in diameter has then to be drilled to allow the connecting wires to be brought through, but this is not drilled dead centre of the brackets' height. It is approximately 1½ in. off centre, i.e., raised that amount off the underside of the chassis, to provide clearance for wiring which passes between screening can and chassis.

It is best to undertake all drilling before fixing any of the brackets or components. When this has been done, the valve holders can be bolted in position, taking care to see that they are placed with the key slots—between contacts number 1 and 8—in the same positions as those indicated on the plan.

Failure to observe this small but important point will possibly result in incorrect connections being made to the valve holders. Proceed with as much wiring as possible before bolting on any other parts, but when the time comes to do this, we suggest the following order: L.F. transformer on top of chassis; oscillator coil; wave-change switch and bracket; two-gang condenser; L.F. transformer underneath chassis and then potentiometer and bracket. The above
should be fitted as and when required, as the wiring work can be made easier by the freedom gained by keeping components of the assembly until they are actually required. Special attention is called to the early planning of the use of metallic sleeving. Note, for example, that the frame and moving vane of the ganged condenser are electrically connected to the chassis by a short length of metallic sleeving. Likewise, a direct connection is made between the L.T. negative side of the filaments and the chassis, whilst all lengths of metallic sleeving are also definitely connected to the common negatives.

A word of warning is here given - keep all resistances and H.T. conductors well clear of metal work, and don't take any risks by skipping the insulating sleeving. Four flexible wires are required for the battery supplies, and these should terminate at the four-pin plug which is used to make contact with the four-point socket fitted to the specified H.T.-L.T. battery.

Dial
The specified two-gang variable condenser incorporates a neat slow-motion drive in its spindle which enables the pointer to traverse a 180-degree dial. No dial escutcheon plate is provided, as it is intended to make use of a simple dial marked off on, and cut out of, stiff Bristol board, an item which each constructor himself could undertake. The advantage of this method, apart from reducing cost, is that the dial can be calibrated according to the stations most in demand. Complete details of the construction and fitting of the dial will be given in our next issue.

Cabinet and Frame Aerial
The cabinet illustrated has been especially produced for this receiver by Messrs. Lockwood, and its design, construction and finish make the completed assembly comparable with many commercial receivers. The battery fits into the bottom of the cabinet, whilst the chassis and M.C. speaker are fitted at opposite ends of the front panel, thus securing a very even distribution of weight for carrying purposes. A neat leather handle is fitted to the top of the case, but it is so inconspicuous that it does not detract from the pleasing lines.

The frame aerial is wound on supports which are mounted on the flat, removable back, and although it has directional properties, they are not sharp enough to prevent the cabinet being placed at the most satisfactory angle for listening. The switching of the two sections of the frame is provided for by one series of contacts on the rotary switch. These connections are not shown in the illustrations in this issue, but they will be clearly indicated in the final article.

For the benefit of those who are able to complete the chassis assembly before our next issue, when all details connected with the frame aerial, testing and fitting the set into the cabinet will be given, we would mention that a preliminary test could be carried out by substituting a modern type of dual-range coil for the frame. This will aid, unless particular attention is paid to the trimming, give maximum results, but it will allow one to discover if all wiring has been carried out in the correct manner. Remember to locate all components and wiring, as indicated on the wiring plan, and see that all connections are sound and electrically perfect.

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**LIST OF COMPONENTS**

- One Bulgin coil, type 72.
- Two Bulgin L.F. transformers, type 73.
- One 2-gang tuning condenser, J.B., 0.005 mfd., Type 4301.
- One wavexchanger switch, Bulgin type, S.204.
- Four octal valveholders (Celestion-Amphenol).
- Fixed condensers (Dahilier):
  - Two .1 mfd., type No. 460/35: three .04 mfd., type 4601S: two .001 mfd., type 4601S: one .005 mfd., type 4601S; one 0.01 mfd., type 5016.
- Cabinet (Lockwood).

- Resistances (Erie), 3-watt type:
  - Two 1 megohm: two 50,000 ohms: one 18,000 ohms: one 8,000 ohms: one 29 megohms: one 2 megohms: one 1,000 ohms: one potentiometer with 3-point switch, one megohm.
- One four-pin plug. Bulgin. P.104.
- Three top cap connectors, Bulgin, type P.96.
- One H.T. and L.T. dry battery, type H. 1157 (Exide).
- One W.B. speaker, Junior.
Planning Your Receiving Station

Station Efficiency and Smooth Working can be Seriously Impaired by Lack of Consideration for the Layout of the Equipment

By L. O. SPARKS

Station planning and efficiency are intimately related; a shack filled with a mass of hook-up and make-shift arrangements is not usually productive of first-class results or a high degree of reliability. Apart from results, the layout of a station is indicative of the mind of the operator, and reveals whether the work is treated in a slip-shod manner or carried out with due respect for the apparatus in use, and as a key of a reasonably methodical system. There are, of course, exceptions; a neat, well-laid-out station owned by an operator who thinks more about stations planning factors than its shape and size. An area occupier is very likely to be short, whilst the front of the top shelf can carry a neat tool rack. Small parts, such as nuts, bolts, drills and tape, screws, etc., should have their individual boxes, and a piece of metal or other fire-proof material should be fastened to the right-hand side of the top of the bench, to form a base for the soldering-iron holder. The actual size of the bench will depend on available space, but a handy size is 3ft, by 18ins., the height being 3ft.

Space

Space is usually one of the governing factors so far as amount of equipment and its shape and size are able to be ignored, so one of the first steps in station planning is to prepare a list of the minimum apparatus likely to be required for the particular work the owner has in mind. The accumulation and harboring of unnecessary gear, the duplication of apparatus and the construction or purchasing of testing equipment which is not likely to frequently be used, are points which must be avoided. Compactness and the use of multi-range and/or application units should be provided for to avoid high lights of the equipment, and before any additional piece of apparatus is added, careful thought should be given to determine if it is going to be really useful and, if so, where can it be located.

Rack construction, to which too little consideration is given by the average amateur, can do a lot towards freeing space, as the ground area occupied is very small, whilst the height of racks and the number of sections they can carry can be adjusted to individual requirements. Although this form of housing equipment is so closely connected with transmitters, there is no reason why it should not be used, with great advantage, in listening station design; in fact, it is the one solution of the space problem for the amateur who has a shack of very limited area. Suitable designs and constructional details have been given in past issues.

The Bench

As normal radio constructional work is not of a heavy nature, it is not necessary to make the bench a massive affair. A satisfactory worktable can be under-taken with the minimum of trouble. The operating or receiving table need not be large; it is not intended to carry all the station equipment, therefore its size can be governed by the receiver in use, plus allowances for, say, a frequency meter, log books and elbow room sufficient for writing purposes. It is a great mistake to place every available piece of apparatus on it, at its sole purpose is to enable the owner to operate his receiver efficiently and make such records as may be necessary.

Bench and Operating Table

Wherever possible, a bench—even if of small dimensions—should be provided in addition to the operating table. It is very difficult, and usually most unsatisfactory, to try to make do with a table for both purposes. The bench is essential for all constructional work; it allows all tools and materials to be kept together and provides a satisfactory surface on which all constructional work can be undertaken.

Fig. 1.—The two shelves enable the work table to be kept clear and for the same reason it is advisable to place the vice and soldering iron on opposite sides.

The Operation Table

Equipment

The complete equipment of no two work benches is the same; much depends on the individual, but there are certain minimum essentials. The following tools are advisable: Square and round tapered gauges; small or large cutting pliers; screwdrivers—1in. to 1½in. (long and short shanks); small and large twist-drill, together with a wide range of twist drills; taps and dies (B.A. range); hack saw and blades; soldering iron; light hammer; files; small vice; steel rule; scriber; snips; square-edge; bradawl and one or two woodworking implements. It is advisable to include a block of hard wood, say, 2 to 3in. thick by 6in. by 6in., on which all drilling should be done, thus protecting the top surface of the bench. A more complete range of tools should be acquired by adding to one's kit as the need arises, and funds permit. Good tools are a valuable asset, therefore, they should only be used for the purpose they are intended, and always looked after with care.

The Operating Table

Here again, a plain deal table is the best, bearing in mind that it may be necessary to fix it various fittings, etc., which one would be loath to do to a more valuable piece of furniture. The top can be finished off with fine sandpaper and stained if so desired, but the writer favours covering it with a piece of plain infield linoleum, neatly cut to size and held in position by suitable tacks. No attempt should be made to cover the edges; it is best to stain them.

The table top should not be overcrowded;
New Varley Products

SINCE we had the opportunity of subjecting one of the first Varley Dry Accumulators to some most intensive and rigorous tests, several new types have now been released. Technically, the Varley Dry Accumulator is similar in basic principles to the standard free-acid type of accumulator, but its construction is such that it contains no free acid. This important fact, combined with special features in design and assembly of the elements, allows the cell to maintain constant operation without disintegration under concussion or rough treatment.

Dry Accumulators
The model shown on the left of the second illustration is ideal for cycle lamps, which normally use a two-cell dry battery. Its voltage output is 2 volts and its ampere-hour capacity, at the 20-hour rate, is eight, thus providing a most satisfactory period of service on each charge.

The other model is even a more recent addition. It is known as the V.P.T.1, and delivers the same voltage as the above, but its capacity, under the same conditions, is 41 hours. We understand that this particular cell can be supplied in blocks or units to any required voltage. Other models are the "V" type, having a capacity from 10-40 ampere-hours; the "T" type from 23-8 hours; the T.U.B. type, which are ideal for Deaf Aids, from 24-4 hours; and the P.V.20, which is invaluable when a continuous power supply for a long period is required.

Home Charger
The above illustration shows the compact charger which is produced by Varley, to enable the various types of their dry accumulators to be charged at home by those users who have A.C. mains supply in their homes. It is housed in a neat, strong bakelite case, thus rendering it perfectly safe to handle and place in any convenient spot. A generous length of twin-flex, fitted with a standard lamp-adaptor connector, forms part of the assembly and, although the leads for the accumulator are terminated with special connectors for the dry accumulators, the charger is equally suitable for use with an ordinary 2-volt cell, such as is used for radio work. Two charging rates are provided, namely, 1/8 ampere and 1/3 ampere.

Batteries and Mains Units
There are several reasons why these items should not be located alongside the sets on the table top, but from the point of view of space alone, it is advisable to make other arrangements for them. The simplest and most efficient storage place can be formed by fixing a shelf under the table. It should be high enough off the floor to allow free movement of the feet of the operator, but not so high that it becomes difficult to get at, or make adjustments to, the batteries, etc. For connecting leads, use slightly heavier flexible wire, especially for L.T. supplies, to prevent any possibility of voltage-drop. If a permanent installation is being erected, and any mains-operated equipment (such as a trickle-charger, eliminator, or receiver), is to be used, it is advisable to carry out the wiring-from wall socket to switch to apparatus-with twin lead-covered wire, the metal covering of which can then be connected to earth for safety. Very neat wiring can be produced by using a little care, a few clips for holding the wire in position, and a little forethought to determine the best way to run the wiring. When mains supplies are used, one cannot be too careful in the way the work is handled, and the selection of the materials used.
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DYNAMO BARGAIN. 110-VOLTS .8 AMP., D.C. BALL BEARING, SEMI-ENCLOSED, 1.850 G.R.V., 15 Ib. 6 in. x 5 in., cheap, 10/6.

Motor Driven. mono 1/4 in. Silent Whistle, new, 20 in. long, with sliding switch, ideal for chair or bench. 6/-.

Motor Driven. mono 1/4 in. Silent Whistle, new, 20 in. long, with sliding switch, ideal for chair or bench. 6/-.

Gear Drive Gear Boxes for Cine. or Boat. £1. 5/-.

Drill Stands, Massively machined steel drill stand. Short type, with non-slip feet, 60 lbs. weight, height 60 in. weight 60 lbs. Sale price 10/-.

Electric Governors, Centrifugal control, 1,050 r.p.m., 32 oz. weight, for each speed, 7/6.

D.C. GENERATORS, 120 watt, 13/4 volt 30 amp. With see pull, 40/6. 1/2 in. weight, 6½ lbs. Sale price 25/-.

W.R.G. GENERATORS, totally enclosed, built as new. Starting at 800 r.p.m. 6½ in. 12½ lbs. 9/6.

D.C. MAINS MOTOR GENERATORS. D.C. 200 watt, 30 volt 10 amp. Mains Motor Generator. 5½ in. 10 lbs. 10/-.

EDISON'S dictum that genius is two per cent inspiration and ninety-eight per cent perspiration is wiser than it appears at first sight. The inspiration that gives birth to a great work of art, as compared to the months of work that are necessary for its fashioning and completion, would be as a baby is to a mature adult could they be measured side by side. But in art the mere toil expended on a creation counts for nothing; and even the knowledge displayed throughout its composition—something which took years to acquire and cultivate—means very little. Hardly a thank you is handed out to the publisher, he rushed a letter down...

- of repeated.

Thoven was a composer who probably attached to it of incredible adventures as the musician is someone magically propelled through life by some unseen forces, who, so-called hard work is required, which of itself is the absolute truth of Edison's observation. Every tiny variation of tone and its sobriquet of composition that might well have been written "on the spur of the moment." Something of this sort of composition that might well have been written "on the spur of the moment," very beautiful, but too bound up in the manner that inspired it and consequently lacking in character. Religion has inspired some very great music, whereas patriotism, I'm afraid, little or none. The tenderness, passion, also, has not been the motive of much outside opera and some master song writers like Schubert.

The greatest music is very much like architecture—massive edifices built up of many materials, and to a definite plan or design. Hence its extreme practicability, and its sobriquet "highbrow." A thousand pities that such a marvellous sphere of human activity should so frequently be greatly misunderstood.

E

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Impressions on the Wax

A REVIEW OF THE LATEST

H.M.V., Parlophone, and Columbia

RICHARD TAUBER has chosen Eric "The Millionaire". His latest recording on Parlophone R 209492, whilst on the reverse side he sings "All the Things You Are." He sings both solos in "Your Memory," for the orchestra. His recording is supplied by the Orchestra Mascotte, who play-Johann Strauss' "Tales from the Vienna Woods," coupled with "Ever More," and "Donna Clara." Jan 974.

Anne Ziegler and Webster Booth, who have sung many duets together on the radio, have recorded a medley of duets on H.M.V. B 9129. The songs they have chosen will be familiar to most readers and include "Until," "Love's Old Sweet Song," "I Hear You Calling Me," "Two Little Words," "Deep In My Heart, Dear," "I'll Walk Beside You," "Give My Heart," and "I'll See You Again."

Uncle Mac, who is a firm favourite with children in the "Children's Hour" broadcast, has produced three records under the title of "Uncle Mac's Nursery Rhymes." The records are sold in an attractive folder. The numbers of the records, which can be obtained separately are H.M.V. BD 886-8.

John McCormack, the famous Irish tenor, has made two lovely recordings this month. The songs he has chosen are "See Amid the Windsor and "All thro' the Night"-H.M.V. DA 1758.

Those two cads, the Western Brothers, give a very amusing rendering of "It Was Bound to Happen," and "You Can't Take the Breed from the British" on Columbia DB 1969, whilst if you like dancing then you cannot do better than dance to "Lincle in the Balloon" and "Anelide in the Ballroom," played by Victor Silvester and his Ballroom Orchestra on Columbia DB 2537. Stringed instruments are heard to advantage in "Autumn Serenade," Things which were played by the Albert Sandler Trio on Columbia DB 1978.

Nelson Eddy, the popular film star, sings in_FREMANTLE for his latest recordings. The songs, "Vision Fugitive," from the opera "Elektra," and "Chanson de Tomor" (Toreador Song), from "Carmen," suit his baritone voice admirably.

Dance Music

CARROLL GIBBONS and The Savoy Hotel Orchestra have made two records recently of popular hit tunes. They are "I'll Never Smile Again" and "Merry-Go-Round." They have chosen Eric "The Millionaire" for the orchestra. His recording is supplied by the Orchestra Mascotte, who play-Johann Strauss' "Tales from the Vienna Woods," coupled with "Ever More," and "Donna Clara." Jan 974.

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Open to Discussion

"The Fleet S.W. Two"

SIR—I feel I must write to you to let you know how pleased I am with results obtained from the "Fleet S.W. Two" receiver, which I have recently constructed. All my listening has been on loudspeaker, and among the stations I hear at good speaker strength, and quite regularly, are TAP Ankara, WGE0Q Schenectady, CS2WA Lisbon and WCBX Wayne, N.J. I have been very surprised at the results, bearing in mind the fact that only two valves are utilised. In conclusion, I should like to thank you for the help you gave me, while building the set.—R. G. STEPHENS (Taunton).

Automatic All-clear Detector

SIR—I read with interest your article entitled "An Automatic All-Clear Detector," but think that the calculation of the dimensions of the resonator tube is open to slight criticism. The resonator tube of the open-tubed variety and its fundamental response must be such that there are anti-nodes at both free ends whilst there is, of course, a nodal point in the centre. In practice, however, the anti-nodes fall just outside the ends, and a correction must be applied to allow for this. The formula then becomes:

$$L = \frac{1090}{2k} - 2k$$

where k = 3 times the diameter of the open ends. Also, perhaps to split a hair, the total length of the resonator, including adjustment tube, thus becomes:

$$L = \frac{1090}{276} - 0.050$$

which becomes 9.81 in., approx.

As the two ends of the tube are of different diameters, it is possible that the brackets will be understood as each end-correction must be evaluated separately. It will thus be seen that the main tube is best made about 8 in. long plus the 3 in. adjustment tube. All this is, of course, based on a frequency of 576 c.p.s., but the siren may or may not be of this pitch. The general principle, however, holds.—Eric JONSSON (Highams Park).

Some Suggestions: Using a S.G. Valve and Detector

SIR—I have noticed several times in your columns an invitation to readers to write you concerning their requirements, and I would like to mention that, as your theoretical circuits are very interesting they should be printed larger, so that study becomes easier. Also, I think that prices of components should be stated.

The monthly issue has definite advantages over a weekly one; articles can be kept together for reference and theoretical and wiring diagrams could be published in the same issue.

With reference to the article on "Re-versed Valves," I used a S.G. valve as diode detector and amplifier for a short period in a superhet. The valve worked quite well, but I fancy the high notes were accentuated a trifle. The idea is not original, but I enclose the circuit, which may be of interest to other readers.—G. DAVIES (Cardiff).

Changes at the B.B.C.

SIR—May one make a few inquiries concerning the changes which are promised in the R.R.C. with the object, so it is said, to improve national propaganda and bigger and more powerful stations for its transmission: which would be all to the good, but where is the cost of all this to come from? Will it be covered by a Government grant, derived from general taxation, or merely pinch of our licence fees? Since such propaganda is in the interests of the whole community, it would be most unfair if the cost of it was inflicted on radio fans alone. Motorists have for long endured this sort of thing in that the money extracted from them in the form of their licence fees, which were originated for road making and upkeep, has been raided to the tune of many millions to pay for, and bolster up, all sorts of objects quite apart from any motoring interest or advantage. We don't want this somewhat dishonest paperhanger up B.B.C. revenue which otherwise could be used for the engagement of well-known artists as a change from the old dug-in staff veterans. We should resist the same plan being put into operation a second time for propaganda work in the interests of the community as a whole. In common honesty the right course will be for the Government to make any B.B.C. special grant for this new departure. The names of certain well-known men have been put forward to take charge of it, all of them of high standing and repute, but with one possible exception. I would like to have the least experience of the programmes side of the B.B.C. work, and, if they are given control over both propaganda and programmes, the latter will certainly become even more awful than they already are. Eliminate the schools broadcasts and the never-ending talks, postscripts, commentaries, etc., and there is if they wish, by giving same to the organisation for use in the scheme. Full details about the scheme will be made public at a later date; little can be done until all volunteers have been consulted.—R. LAWTON (Secretary, North Manchester Radio and Television Society, 10, Dalton Avenue, Thatto Heath Lane, Whitefield, Near Manchester).

"Making Simple Superhets"—Correction

SIR.—After reading the article on "Making Simple Superhets" (pp. 150-1), should like to point out that the .001 mfd. condenser, which should be in series with the long-wave winding of the oscillator coil, is shown wrongly connected in the circuit diagram. As shown it would be out of circuit on long-waves and shunting the long-wave winding when switched for medium-waves.

Also, in column 5, 10th line, you have put 290 to 400 degrees instead of metres.—R. V. Gooe (York).

Correspondents Wanted

SIR.—I shall be pleased to hear from any owner of a battery-operated receiver, situated in the North Manchester area, who has a little knowledge of radio, and who is not afraid to speak over a microphone.

Volunteers will not be called on to put in a lot of time in the scheme, which will be concerned with the dissemination of news announcements, but they will, if they offer their help, be assisting a service which will be valuable and useful to this country. Any persons with old battery receivers which they may not now want, can also help

Very little else to listen to, and we have the alternatives of listening to all sorts of previously unheard of nomenclature giving us their views on everything from Dan to Beershba, or switching off our sets. It has been said that people get the sort of Governments they deserve, and the same thing would seem to apply to their radio programmes and their cost. From a purely entertainment point of view what we now get might well be considered very costly at 2s. 6d. per annum.—"Anti-Jawing" (Birkendale).

New Voluntary Radio Group

SIR.—I was pleased to hear from an owner of a battery-operated receiver, situated in the North Manchester area, who has a little knowledge of radio, and who is not afraid to speak over a microphone.

Volunteers will not be called on to put in a lot of time in the scheme, which will be concerned with the dissemination of news announcements, but they will, if they offer their help, be assisting a service which will be valuable and useful to this country. Any persons with old battery receivers which they may not now want, can also help

Very little else to listen to, and we have the alternatives of listening to all sorts of previously unheard of nomenclature giving us their views on everything from Dan to Beershba, or switching off our sets. It has been said that people get the sort of Governments they deserve, and the same thing would seem to apply to their radio programmes and their cost. From a purely entertainment point of view what we now get might well be considered very costly at 2s. 6d. per annum.—"Anti-Jawing" (Birkendale).

Government grant, derived from general taxation, or merely pinch of our licence fees? Since such propaganda is in the interests of the whole community, it would be most unfair if the cost of it was inflicted on radio fans alone. Motorists have for long endured this sort of thing in that the money extracted from them in the form of their licence fees, which were originated for road making and upkeep, has been raided to the tune of many millions to pay for, and bolster up, all sorts of objects quite apart from any motoring interest or advantage. We don't want this somewhat dishonest paperhanger up B.B.C. revenue which otherwise could be used for the engagement of well-known artists as a change from the old dug-in staff veterans. We should resist the same plan being put into operation a second time for propaganda work in the interests of the community as a whole. In common honesty the right course will be for the Government to make any B.B.C. special grant for this new departure. The names of certain well-known men have been put forward to take charge of it, all of them of high standing and repute, but with one possible exception. I would like to have the least experience of the programmes side of the B.B.C. work, and, if they are given control over both propaganda and programmes, the latter will certainly become even more awful than they already are. Eliminate the schools broadcasts and the never-ending talks, postscripts, commentaries, etc., and there is if they wish, by giving same to the organisation for use in the scheme. Full details about the scheme will be made public at a later date; little can be done until all volunteers have been consulted.—R. LAWTON (Secretary, North Manchester Radio and Television Society, 10, Dalton Avenue, Thatto Heath Lane, Whitefield, Near Manchester).

"Making Simple Superhets"—Correction

SIR.—After reading the article on "Making Simple Superhets" (pp. 150-1), should like to point out that the .001 mfd. condenser, which should be in series with the long-wave winding of the oscillator coil, is shown wrongly connected in the circuit diagram. As shown it would be out of circuit on long-waves and shunting the long-wave winding when switched for medium-waves.

Also, in column 5, 10th line, you have put 290 to 400 degrees instead of metres.—R. V. GOODE (York).
in brief off-duty periods, snatch sleep in stage boxes, dress circle, stalls and orchestra pit—a sight which would have astonished the theatregoers who, in another war, 25 years ago, thronged into the theatre to see its longest run.

21,500 Sets for the Forces

ACCORDING to the latest figures available, the Forces’ requirements in radio sets are helping to keep the wheels of the wireless industry going. Judging from the following figures the troops are keen listeners.

Latest order........ 10,000 sets.
Recently bought...... 4,000 sets.
Previously bought... 7,500 sets.

The last mentioned were mainly supplied through the Nuffield Trust. The latest 10,000 order was recently announced by Mr. Eden.

PERSONAL PARAGRAPHS

Alfred Duncan Gay has succeeded to the Presidency of the Radio Society of Great Britain after serving as a Council member since 1930. During this period Mr. Gay has acted as Honorary Treasurer (1937) and as Executive Vice-President (1938-40).

Leading Telegraphist D. S. Thomson, of the Decca Record Co., Ltd., has been awarded the D.S.M. “for determination in a successful attack on an escorted enemy supply ship.”

Admiral H. W. Grant, C.B., has been appointed chairman and managing director of the Marconi International Marine Communication Co., Ltd.

M. W. Richardson has been appointed Private Secretary to the Assistant Postmaster-General, in place of Mr. R. E. German, who has been promoted.

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Experimental Equipment

In the early days of radio, no two experimenters appeared to have the same idea regarding the layout or design of their equipment. No two shacks presented the same appearance, and one of the big interests about visiting trips was the appreciation (or otherwise) of the ideas embodied in the design, construction and layout of the other man’s shack. But, now that we have no set or stereotyped arrangements; each amateur showed a certain amount of originality, and many happy hours were used to be passed discussing their shacks and claims of the equipment in use, and listening to your host expounding his theories on the relative merits of his apparatus compared with your own or that used by the rest of the local circle of amateurs.

It can be imagined that those visits used to prove most interesting, informative, and a most pleasant way of strengthening the bond between fellow experimenters. No longer are social distinctions allowed to interfere with the round of calls. A great deal of good work could be done now, if only those members living in the same districts would arrange to visit each other in turn, and there is no reason why, at a later date, some form of inter-district visits should not be arranged. A little closer contact and co-operation between all members is all that is necessary. We at this end will do all we can to further the above idea. To give you a better idea of this, we would like to quote a few lines from an article in the November issue of Radio.

‘A few short years ago amateurs who engaged in u.h.f. experiments will tell you,’

Do You Realise?

We have replied to the member concerned by post, but for your benefit we are reproducing his sketch on this page.

Do You Realise?

When we have won this war, and conditions are back to normal, there is going to be a great deal of activity on the 5 metres, 21 metres and, believe it or not, the 14 metre bands. Our American friends are already doing some very useful work on these bands, although they are more concerned with the last two than the first, as 56 m.c.s. transmission and reception seem to have lost their kick, so far as they are concerned. To give you a better idea of this, we would like to quote a few lines from an article in the November issue of Radio.

‘A few short years ago amateurs who engaged in the experimental work of receivers, of a voltage-doubling rectifier type of receivers, of a voltage-doubling rectifier...’

Voltage-doubling Rectifier

This extract precedes a description of a super-regenerative 224 m.c.s. receiver, whilst on the next page the construction of the transmitter to cover the same band is given. This only goes to prove our remarks above, and it is high time that we amateurs started to become more acquainted with the higher frequencies, as it will, without doubt, form an important link in the communication system of the future.

Voltage-doubling Rectifier

Many have asked for details of the circuit used in some of the A.C./D.C. types of receivers, of a voltage-doubling rectifier making use of a valve. As we think that the subject might be of general interest, we give on this page the theory of a circuit employing a 2240 valve. It will be appreciated, from the name given to the arrangement, that its sole object is to provide an output (D.C.) voltage of approximately twice the input (A.C.) voltage, the current output being that for which the valve is rated. With the type mentioned above, this is in the region of 85 m.c.s. The arrangement has, perhaps, a greater appeal in America, where the mains supply voltage is around 100 to 125 volts, when it becomes necessary—with A.C./D.C. sets not using a mains transformer—to raise the rectified or D.C. values to values higher than the mains. When a 2240 is used on a supply having a voltage higher than that mentioned above, it is essential to include in each anode circuit a resistance of, say, 100 ohms. The output voltage is thus increased to a great extent by the capacity of the condensers, and we would suggest 6 mfd. as being satisfactory for British supply voltages.

Morse Transmissions

Make a note of the following times and wavelengths if you wish to have some familiar names on the air; GBR, GAY, GI and GJ at 00.20 hrs, GBR, GAD, GIA and GJ at 13.00 hrs, and 17.02 hrs; GBR, GAY, GI and GJ at 20.48 hrs. All times being B.S.T. The transmissions consist of British news bulletins from the Post Office stations operating under the calls given above. It should be noted that GIA has a directional aerial on S. America. The wavelength at 00.30 is GAY, 15.27 m.; GAD, 16.03 m.; GBR, 23.13 m.; GAY, 33.67 m.; GI and GJ, 42.05 m.; and GBI, 18.75 m.

Contacts

Member 6,868, a newcomer to our ranks, would like to make contact by correspondence with members in his area or overseas. His address is 21, Racecourse Avenue, Monkmoor, Shrewsbury, Shropshire. Member 6,575, of 22, Drummond Drive, Stanmore, Middlesex, would also like to get in touch with members in his district, to see if some arrangements could be made for a local club or the means of holding frequent meetings for general discussions on S.W. work.

Calling Leigh, Lancs

Members in or around Leigh will, we hope, be interested in the following letter we received last month from Member 6,310, of 49, Twist Lane, Leigh, Lancashire. He says: ‘For your suggestion about the equipment and interest which could be obtained if members could contact each other in surrounding districts, and, say, meet once or twice weekly in a fellow-member’s shack, I am almost sure members would take to this suggestion at once, and thus keep the ball rolling until peace and better conditions are with us again. Might I add that I would be only too pleased if any member, or S.W.L.s who could become members, would call at my shack any night of the week to discuss matters. I already have a very good visitor, member No. 6,598, who lives in Leigh, so I hope that many more will come along.’ Judging by the photo of his den, for which we thank No. 8,310, he is evidently a keen enthusiast. Therefore, we hope that his letter will induce several members to get together to form a local section.
### PORTABLE RADIO RECEIVERS

The following list covers those sets for which Verley Dry Accumulators are suitable:

<table>
<thead>
<tr>
<th>Make of Receiver</th>
<th>Type No.</th>
<th>Voltage (V.D.A.)</th>
<th>Suitable Notes</th>
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</thead>
<tbody>
<tr>
<td>Alpha</td>
<td>2 553</td>
<td>0.9, 2.5</td>
<td>1.5 V. 20</td>
</tr>
<tr>
<td>Beechwood</td>
<td>3 41</td>
<td>0.9, 2.5</td>
<td>1.5 V. 20</td>
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<tr>
<td>Burghie</td>
<td>3 50</td>
<td>0.9, 2.5</td>
<td>1.5 V. 20</td>
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<td>Burmanto</td>
<td>3 58</td>
<td>0.9, 2.5</td>
<td>1.5 V. 20</td>
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<tr>
<td>Bush</td>
<td>3 57</td>
<td>0.9, 2.5</td>
<td>1.5 V. 20</td>
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<tr>
<td>Cossor</td>
<td>3 52</td>
<td>0.9, 2.5</td>
<td>1.5 V. 20</td>
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<tr>
<td>Defant (C.W.S.)</td>
<td>3 52</td>
<td>0.9, 2.5</td>
<td>1.5 V. 20</td>
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<tr>
<td>Elco</td>
<td>3 52</td>
<td>0.9, 2.5</td>
<td>1.5 V. 20</td>
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<td>H.M.Y.</td>
<td>3 52</td>
<td>0.9, 2.5</td>
<td>1.5 V. 20</td>
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<tr>
<td>Invicta</td>
<td>3 52</td>
<td>0.9, 2.5</td>
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<td>Keelor Brocas</td>
<td>3 52</td>
<td>0.9, 2.5</td>
<td>1.5 V. 20</td>
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<td>Lotus</td>
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<td>1.5 V. 20</td>
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<td>Marconi</td>
<td>3 52</td>
<td>0.9, 2.5</td>
<td>1.5 V. 20</td>
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<td>Mc Michael</td>
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<td>0.9, 2.5</td>
<td>1.5 V. 20</td>
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<td>Mullard</td>
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<td>1.5 V. 20</td>
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<tr>
<td>Murphy</td>
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<td>Ormond</td>
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<td>Phillips</td>
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<td>Portadynne</td>
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<tr>
<td>Powerfone</td>
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<td>1.5 V. 20</td>
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<td>Prince</td>
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<td>1.5 V. 20</td>
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<tr>
<td>Pyle</td>
<td>3 52</td>
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<td>1.5 V. 20</td>
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<tr>
<td>Ross</td>
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<td>0.9, 2.5</td>
<td>1.5 V. 20</td>
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<tr>
<td>Regentone</td>
<td>3 52</td>
<td>0.9, 2.5</td>
<td>1.5 V. 20</td>
</tr>
<tr>
<td>Roberts Radio</td>
<td>3 52</td>
<td>0.9, 2.5</td>
<td>1.5 V. 20</td>
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<tr>
<td>Rolls Gaydon</td>
<td>3 52</td>
<td>0.9, 2.5</td>
<td>1.5 V. 20</td>
</tr>
<tr>
<td>Spencer Cameo</td>
<td>3 52</td>
<td>0.9, 2.5</td>
<td>1.5 V. 20</td>
</tr>
<tr>
<td>Trophonic</td>
<td>3 52</td>
<td>0.9, 2.5</td>
<td>1.5 V. 20</td>
</tr>
<tr>
<td>Ultra</td>
<td>3 52</td>
<td>0.9, 2.5</td>
<td>1.5 V. 20</td>
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This winter has introduced a rapidly increasing number of listeners to a new radio pleasure: "music where they want it!" Free from the restrictions of one-room radio, they are enjoying their favourite programmes in the shelter, whilst working in the kitchen, or wherever it is convenient to listen; and all by the simple connection of a Stentorian Extension speaker to their existing radio. What's more, these handsome, but moderately priced speakers offer an appreciable improvement in reproduction over most built-in speakers. Why not make full use of your radio NOW by installing a Stentorian?

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P. 13.
A "Class B" Degenerative Feed-back Amplifier

Details of an Interesting Circuit Incorporating a Pentode Driver Stage

In an effort to obtain as large an undistorted output as possible from a battery-operated receiver, J. M. Riddle, junior, of the Radio Corporation of America, has been experimenting with "Class B" amplifiers employing degenerative feedback and a pentode driver, and has produced the three-stage amplifier shown in the circuit diagram (Fig. 1). In this circuit the inverse feedback loop is provided through the three amplifier stages, thereby correcting distortion and other undesirable frequency characteristics of the pentode driver stage, permitting the full power output therefrom to be made available for driving the "Class B" stage, and permitting a relatively high gain through the amplifier by reason of the high gain of the pentode stage over the reduction in gain introduced by the high degree of inverse feedback.

Referring to Fig. 1, the audio-frequency amplifier includes a high-impedance triode-voltage amplifier provided by a valve 5 as a first stage having a control grid 6 connected to the volume control contact 7 of a volume-control potentiometer 8, to which incoming audio-frequency signals are applied through an input lead 9 and a ground or chassis connection 10. The high-impedance first-stage amplifier valve is included in the same envelope with diode detector anodes indicated at 11, having a common cathode 12 connected to ground or chassis 13 through a low resistance bias resistor 14. The bias potential from the resistor 14 is applied to the control grid 6 through a grid resistor 15 connected to chassis as indicated at 16.

Output Stage

The amplifier output stage consists of a pair of "Class B" amplifier triodes 20 and 21 having a balanced output circuit comprising the secondary 22 of a step-down transformer 23 providing a low-resistance input circuit connected at its terminals to the control grids 24 and having a centre tap 25 connected to earth 26, and to the cathodes 27, as indicated, for zero-bias "Class B" operation. The output anodes 28 are connected in balanced relation to the primary 29 of the "Class B" output transformer 30, the secondary 31 of which is connected with the loudspeaker load represented by the speech coil 32.

One side of the secondary circuit is earthed to chassis as indicated at 34. The opposite high potential side of the secondary is provided with a terminal connection 35 for an inverse-feedback lead 36 having a value for a given feedback and an input connection to the cathode terminal 38 of the cathode resistor 14 in the first stage, in order to provide inverse feedback to the first audio-frequency stage under control of the resistor 37.

Fig. 1.—Circuit diagram of a 3-stage amplifier incorporating a pentode driver stage.

Driver Stage

The amplifier utilizes a pentode valve 40 as the second-stage amplifier or driver stage for the output stage. The use of a pentode valve for a driver stage ordinarily results in severe distortion, and an unsatisfactory fidelity characteristic. However, the pentode amplifier has the advantage of a higher power output is obtainable therefrom because of the better plate efficiency of the pentode valve. The feedback provides an adequate power source for driving an output stage of the "Class B" or "Class AB" type and, at the same time, takes less output voltage from the first audio-frequency amplifier stage 5.

The advantage of the high signal gain and power of the pentode is retained by employing a relatively high degree of inverse feedback which is sufficient to correct the high-distortion characteristic of the pentode driver stage, while a portion of the relatively high gain is maintained through the amplifier substantially higher than available with a usual triode driver.

The pentode driver stage is connected between the first-stage amplifier 5 and the "Class B" stage 20-21 by connecting the output anode 41 of the pentode to a high-impedance primary 42 of an interstage coupling transformer 23, and the input signal grid 44 is coupled to the high-impedance output circuit 45 of the first-stage amplifier through the usual capacity coupling means 46, provided with a high impedance grid leak 47.

Lack of Phase Shift

The pentode is provided with an unby-passed cathode resistor 48 from which bias for the control grid 44 is derived, and a predetermined degree of degeneration which further aids in preventing distortion. Furthermore, the unby-passed resistor does not introduce any phase shift. The cathode circuit is earthed as indicated at 50. The suppressor grid 51 is connected to earth, and the screen grid 52, is connected to the positive supply lead indicated at 53, which also supplies the anode 41. The primary 42 is shunted by a condenser 54 which cuts off the amplifier response above the audio-frequency range to prevent oscillation at a high frequency such as 35 kc., where the low leakage reactance rating of the screen reduces the overall characteristic of the amplifier.

With an RCA 6G7 valve for the first-stage amplifier, an RCA 6J7 pentode as the valve 40, and the valves 20 and 21 provided by a single RCA 6N7, "Class B" twin output valve, highly stable amplifier operation has been obtained in a low-power battery amplifier with a resistor of substantially .5 megohms at 43 and 47, a coupling capacitor of .5 mmf. at 46, and a grid leak of one megohm at 15. The self-bias resistor 48 without by-pass is approximately .5 ohm.

The resistor 14 in the cathode circuit of the first-stage amplifier 5 is preferably of a low value, and is of the order of .680 ohms to prevent degeneration in the first stage. For this reason, bleeder current is provided from a suitable source controlled by a series resistor indicated at 63. The by-pass condenser 30 is of a value sufficiently small to prevent introducing any frequency characteristic into the feedback circuit.

It has been found that, with a resistance of 1,500 ohms at 37 a feedback of the order of 32 db is provided, and that the resistance may be increased to 2,200 ohms with a feedback of substantially 36 db with stable operation, for the reason that the pentode driver stage is included in the feedback loop between the amplifier input circuit and the output stage for an inverse feedback of the order of 15 db has been considered normal.

Characteristic Curves

For a given wattage output, the three-stage amplifier shown has an over-all characteristic as indicated by the curve 66 in Fig. 2, whereas, with an equivalent drive in place of the pentode 40, the distortion is indicated by the curve 60. The distortion of a standard "Class B" amplifier with triode driver and no feedback is indicated by the curve 67.

It has been found that the undistorted power output of an amplifier, as shown in Fig. 2, may be of the order of 40 to 50 cent. higher than that obtained with a conventional "Class B" feedback amplifier, provided with a triode driver stage, and first-stage amplifier.

Fig. 2.—Curves indicating the over-all characteristics of the amplifier.
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FUSES

and

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NATIONAL EFFORT

In these times, in many directions, needless to say, we are directing our research and planning towards the requirements of the Government services. However, some supplies of components are still available for Radio Servicing, but should delays occur we know our friends will appreciate the difficulties which at present arise from day to day.

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A Service Engineer's Log

A Further Selection of Notes Which Will be Found of Practical Aid by Both Service Men and Constructor-experimenters

RECEIVER, that I was called out to see recently, was a high-class set with triode-type valve in the frequency-changer and one stage of pre-F.C. high-frequency amplification. Normally, it had an extremely good range and plenty of output, but a fault had developed suddenly which resulted in an almost complete cessation of signals except from the Home Service; these were so weak as to be hardly audible.

Since the set was well screened, I first tried the effect of removing the aerial lead and connecting a length of flex in its place. That was to make sure that there was not a break in the aerial lead close to the aerial terminal. But it did not make any difference, so it was evident that the fault was within the set. When a pick-up was connected, reproduction of records was quite satisfactory, which showed that the fault was prior to the L.F. stages. A rough check was made of the voltages to the preceding valves, which were in order.

The next step was to connect the aerial lead, through a small fixed condenser, to the control grid of the first detector; the receiver then behaved well, so it was evident that the fault lay in the H.F. stage.

Broken Choke Connection

The H.F. valve was temporarily replaced as a check, but that did not make any difference. It was then realised that in making a test of H.T. voltages the meter had been connected to the H.T. side of the H.F. choke in the anode circuit of the first valve, so another test was made by connecting the meter between earth and the anode terminal. Since the meter needle remained at zero it was clear that there was no circuit through the choke.

Close inspection of this component revealed a fault—primary winding was at fault, and the primary-terminal connections were not made, the meter plug was inserted; the meter plug opens the anode circuit of each valve. The next step was to connect the aerial lead, through a small fixed condenser, to the control grid of the first detector; the receiver then behaved well, so it was evident that the fault lay in the H.F. stage.

Simplified Circuit Testing

Incidentally, it is worthy of mention here that in building a multi-valve receiver of fairly pretentious type—such as a high-class commercial receiver—it is an excellent plan to include small jacks in the anode circuit of each valve. The jacks should be of the closed-circuit type, so that their contacts are closed when the plug is inserted; the meter plug opens the contacts and connects the meter between the two terminals of the jack, as shown in Fig. 1. It will be obvious that the meter should be on the H.T. side of the anode-coupling components, and that the meter should be shunted by a non-inductive fixed condenser of about 1 mfd. capacity.

Meter Shunts

This arrangement is followed in the case of many commercial-station receivers and is elaborated slightly, the elaboration consisting of wiring suitable shunt resistors across the various jacks so that the amplified meter can be used for reading the anode current of each valve and also the total current consumed by the set. Thus, if the anode current is found to be 2 mA, can be taken by shunting the jack by a resistor equal in value to the resistance of the meter; 3 mA can be read by using a shunt resistor equal to one-quarter the resistance of the meter, and so on. It may be helpful to mark the jacks with figures to indicate the multiplication factor. One slight difficulty which cannot easily be avoided is that the ordinary resistors on the market are not accurate to within about 10 per cent., and therefore, readings are not precise. This is seldom important, since the main requirement is that any change in readings should be easily seen.

Just one point to remember: see that the polarity of the jack and plug is correct for the meter and that the jack is well insulated from the metal panel, if such is used.

A Misleading Fault

What at first appeared to be a very simple matter caused a certain amount of confusion when testing a three-valve "straight-through" receiver. It will be obvious that the L.F.-transformer primary winding was at fault, and the decoupling resistance was checked to verify this.

Rather as an afterthought it was decided...
to test the transformer and to make sure that the fault was not in the leads from the windings to the terminals. This was done by connecting a milliammeter, series resistors, and G.B. battery between the primary terminals. But the test indicated that the transformer was sound. It was then found that the lead from the H.F. choke was attached to the transformer through a "dry" soldered joint, the joint having a resistance in the region of 100 ohms at the time of the test. Consequently, it was necessary to clean up the break, clean away, clean the wire and the soldering tag and re-solder to stop the cracklings.

Erratic Working of Amplifier

A five-watt A.C. amplifier was in for test, the trouble being that it sometimes failed to work at all and sometimes worked normally for a short time and then began to produce all sorts of weird noises. When we first put it on test it refused to function, so we quickly proceeded to make various voltage and current tests with a uni-meter. By the time we had measured the rectified output from the H.T. section, however, the amplifier started to work, although there was a certain amount of "clicking" in the speaker. When this happened it was noticed that the rectified H.T. voltage rose suddenly.

That was a fairly clear sign that the valves were not passing their full share of anode current when the "clicking" occurred, and therefore that there was probably a bad connection in the H.T. line. The wiring seemed to be sound, done in the scope of these notes, but the hint may be of interest to other service men. We had a particular commercial American-made receiver of very compact type which was frequently giving trouble due to resistors going o/p. There was no circuit diagram available, and it was always difficult to find the resistors associated with the particular circuit which was found to be open. After spending a good deal of time, on two separate occasions, in tracing resistors, we simplified any future work on the set by drawing a rough skeleton circuit including most of the resistors. We then numbered both the circuit and the components R.1, R.2, etc. It is now a very simple matter to trace through the set in case of trouble, although now that we have replaced several of the 4-watt ones with 100-watt, it is unlikely that there will be much further trouble in this direction.

The hint may be useful to constructors who build elaborate receivers in a compact form, although in their case resistors with an ample "margin" will generally have been specified.

Potentiometer Tests and Repairs

Volume-control potentiometers are apt to be troublesome after they have been in use for some time. The reason is, generally, that the fine wire winding becomes worn through at one point due to constant rubbing of the contact arm. This fault appeared to have arisen in a set which we had on test recently, since output was "jumpy" as the volume-control knob was turned from minimum to maximum; probably a bad connection in the H.T. line. The wiring seemed to be sound enough, and the thermal-delay switch came under suspicion; incidentally, this had, no doubt, been included because a directly-heated rectifier was used in conjunction with two indirectly-heated pentodes in push-pull. As a test of this switch, we wired a Q.M.B. switch in parallel with the input and output H.T. terminals and turned this on after waiting about 30 seconds for the heaters to reach working temperature. With this switch in circuit the amplifier behaved correctly, so there was no doubt that the T.D. switch was defective and a new one was obtained. As available, we made an examination of the old switch and found that the bi-metal arm was strained, so that there was insufficient pressure on it. By carefully bending the arm and cleaning the contacts, the switch was made serviceable again. Before putting it into use, however, a few tests were necessary only to pull the wire to ensure that the contacts did not close for between 30 and 40 seconds after the mains had been switched on.

To Simplify Component Tracing

The following is rather outside the normal scope of these notes, but the hint may be of interest to other service men. We had...
The Bombing of Broadcasting House

It was recently revealed that Broadcasting House has been twice hit and seriously damaged during air raids. A number of the B.B.C. staff were killed and others wounded, most of the casualties being among members of the monitoring staff. During both raids separate programmes were being simultaneously transmitted to the home country, to Europe, and to the world. On both nights all programmes went on without a break. Both the Home Service and the Forces programmes have since been regularly maintained. The accompanying illustrations give a good idea of the extent of the damage done during the second raid. We think that great tribute is due to the B.B.C. and its staff for maintaining its service under "front-line" conditions.

Wireless Operator Saves a Bomber

The crew of a heavy bomber must be a carefully-chosen team if the best results are to be obtained and the aircraft brought comfortably back to base. Some of the men may seem to have more spectacular jobs than others. The bomb-aimer times his release to do the utmost damage to the enemy; the pilot takes turns at the controls; and the tail gunner in his little glass house keeps a watchful eye open for attacking aircraft.

Perched at his instruments amidships, in the dark interior of the bomber, sits the wireless operator, who would seem to have only routine stuff to do; but sometimes it all depends on him. The other night, our wireless operator managed to get into communication with the B.B.C. staff during air raids. A number of the monitoring staff were being simultaneously salvaged and accommodated, or if this application will be

PUBLIC APPOINTMENTS

WIRELESS TECHNICAL INSTRUCTORS REQUIRED IN ARMY UNITS

Emoluments.—Pay, 8s. od. per day (7 days a week). Clothing, rations and accommodation, or if this cannot be provided, allowances at authorised rates. If married and otherwise eligible family allowances payable in respect of wife and children, subject to allotment from pay.

Candidates should preferably be under 25 and over 24 and—

(a) Hold one of the following qualifications:

- Graduation of the Institution of Electrical Engineers.
- Final (Grade II) Certificate of City and Guilds of London Institute Examination in Radio Communication.
- Certificate of City and Guilds of London Institute in Radiolocation Work.
- OR

(b) Be able to pass an examination on the following syllabus:

- Simple algebra, including quadratic equations; simple trigonometrical ratios and identities; vectors.
- Properties of electrical currents; heating of conductors; magnetic fields; unit of current; Ohm's Law; resistance in series and parallel; potentiometer.
- Magnetic effects of current; fields due to parallel wires; field due to a solenoid; electro-magnets. Meters. Induction; effect of rotating a coil in a magnetic field.
- Mutual and self induction and inductance; effect of inductance on growth and delay of current. Capacity; charging storage and discharge of condensers; current, resistance and inductance.
- Alternating currents; vector diagrams; effect of resistance variation; effects of L and C in A.C. circuit; phase difference of currents; resonant in a series circuit; parallel circuit of L and C; etc.
- Elementary knowledge of valves; simple theory of amplifiers; oscillators and detectors; general principles of radio practice.

Suitable candidates will be interviewed at local offices, and if successful, will be mailed and appointed as Acting Sergeant Engineers. For those who are on the Staff of the Institution of Electrical Engineers, special arrangements will be made to enable them to be examined. In the event of any applicant found to be unsatisfactory, selection will be made for relaxation of the Schedule. No guarantee can be given that this application will be successful.

Application Forms, obtainable by post card from the Under Secretary of State, The War Office (A.G.60), "Pools," London, S.W.1, to be lodged by Friday, February 14th, 1941.
Methods of Detection

"I am building a receiver to give me goodquality reproduction, and I cannot make up my mind whether to use anode-bend detector. I understand that the former method is likely to introduce distortion. Is this so in actual practice; if it is, do you think the latter method will be noticeable by an average listener? I rather wanted to be able to receive one or two of the more distant stations, if possible." - F. H. (Sheffield).

If you wish our answer to be in the practical sense, we would suggest that you use the leaky-grid method, as it is more sensitive and has a very low input. The amount of distortion it is likely to introduce would not be apparent to the average listener. Make some provision in the pre-detector circuit for adding the signal, after reaching the grid of the detector, thus eliminating the possibility of the valve being overloaded.

R.C. versus Transformer

"Having noted that you have been good enough to act as arbitrator on past occasions, when readers have held different views about matters connected with radio, I wonder if you will settle a little debate I have been having with two other constructors. I would mention that we are all readers of PRACTICAL WIRELESS. The point in question is, can an L.F. transformer give as good response, when used as an inter-valve coupling, as the resistance-capacity method? - T. D. (Etham).

A transformer must be of good design and make. The circuit, valves and operating conditions must conform with the makers' specification. The valve should not be high. R.C. coupling is now widely used because of the high gain obtainable from modern valves, but unless reasonable care is taken with the selection of component values, distortion can be introduced and the performance may be worse than with the original grid-bias. The receivers become less efficient; the listeners are served less well than they are with the original grid-bias. The receivers become less efficient; the listeners are served less well than they are with the original grid-bias.

Mains Dropping Resistance

"I have come up against a snag—being a comparative novice to radio—when trying to build an A.C./D.C. type of receiver. It is in connection with the voltage and current ratings of the valves, and the value of the resistance required to reduce the mains voltage. Is the total heater current the same as that required by one valve, i.e., in my case 2 amp., and must all the valves have the same heater current rating? - P. D. (Chester).

All valves must have the same heater current rating, and this also applies to any dials lights which are connected in series with the heaters. If each valve requires, say, 2 amp., for its heater, then that value will represent the total current flowing in the circuit. (It should be remembered that the heaters are wired in series and not parallel as with ordinary A.C. valves.) The total voltage required can be determined by adding the heater voltage rating of each valve, plus dial lights if they are intended for use, and the mains supply voltage is 200 volts, then to find the value of the resistance required apply the following. From the mains voltage deduct the value required for the valves, i.e., 200 minus 80, which equals 120 volts. This represents the voltage which has to be dropped across the mains resistor, the value of which can now be found from R equals \(\frac{E}{I}\) when R is the resistance, E the voltage to be dropped and I the current flowing. Therefore, R equals \(\frac{120}{.2}\) which equals 600 ohms.

L.S. Extension Losses

"I have just finished wiring an additional point for an extension speaker, and I am very dissatisfied with the results. The reproduction seems to be on the weak side, and the heaters are wired in series to the main power. I am wondering if this, together with the fact that I used tin twin bell-wire, is responsible? - B. H. (Newbury).

You do not use any idea of the impedance of the speaker you are using for the extension, but from the details of your trouble we imagine that it is of the low impedance type, possibly in the region of five to ten ohms. If this is the case, then the extension leads you are using would be responsible for the trouble, as their resistance, compared with that of the speech-coil of the speaker, would be unsatisfactorily high and would cause an unreasonable percentage of the power to be lost or absorbed in the leads. We would suggest that you try and reduce the length and use larger gauge wire. Twin lighting flex would be better or, if you wish, you might make a firstrate heavy male known as "workshop" or power flex, would prove most satisfactory.

Voltage and Power Amplifiers

"I sometimes see the terms 'voltage' amplifier and 'power' amplifier and, so far, I have not yet been able to find a clear explanation of what they mean. When diagrams have been given, they appear to me to be fundamentally the same; another thing which has helped to confuse me is the fact that the terms seem only to apply to L.F. stages. Could you help me to get a better understanding?" - L. K. (Birmingham).

I will help you if you think of an ordinary amplifier circuit as consisting of two parts or sections. The first, which includes the valves preceding the output stage, being used for amplification of the signal voltage applied to the input. These valves act as voltage amplifiers, i.e., they are not concerned with providing power in the audio-frequency range. These stages of the right valves are selected, enable them to give high amplification (voltage) at comparatively low anode currents. The output valve(s) in reverse has totally different characteristics. It is able to handle a large voltage input on its grid, with a correspondingly much larger anode current swing, depending on its amplification factor, therefore, it can deliver a large power output and consequently it is rated as a power amplifier. The term holds good for audio-frequency amplification, and is used in connection with the voltage and current ratings of the valves preceeding a transmitter, and for L.F. work involving the normal amplifier circuits. It is possible for a power amplifier stage to be used elsewhere in the system for example, where those arrangements where the output valve(s) demands an appreciable power to produce full loading.

REPLIES IN BRIEF

D. L. (Canterbury). The L.F. section is built-in the large advertising box, and as it is a 1000 volt grid-bias, the receivers become in effect a single valve affair containing the grid-bias.

G. E. (Plymouth). It is no longer possible to get copies of the blueprint in question. The diagrams given in the issue are quite clear, and you should be able to wire the circuit from them as there are no complicated symbols or diagrams, and no possibility of confusion.

J. L. (Birmingham). The detector anode by-pass condenser has a capacity too high for the type of circuit in question. As the grid-leads are fixed to the chassis, the condenser shunts the grid circuit, and causes the valve to work in a way similar to the by-pass circuit, the delay condenser is another condenser, and it is quite possible to obtain a better treble response.

E. T. (Newmarket). The circuit is satisfactory, but we do not like the layout. We would advise the beginner being new to radio to employ the old grid-bias, receiver with the grid-leads. The receiver will work as long as the grid-lead are fixed to the chassis, then it is quite possible to get the full frequency range of the radio, but we would advise the beginner to use a 500 volt grid-bias变压器.

J. E. (Wineham). We can only suggest that you get in touch with the makers. A simple scratch filter for the pick-up can be made by connecting a 25,000 ohm variable resistance in series with a .002 ft. condenser, across the P.I. leads.

G. P. (Bosslb-on-Sea). We have not published a design of a one-valve S.W. A.C.-operated receiver; therefore, we can only suggest you modify the published designs which have appeared in past issues of PRACTICAL WIRELESS, and build your own.

J. K. (Bromley). The valve base mentioned is evidently of the octal type. Valveholders can be obtained from most of our component advertisers.

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