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ROUND THE WORLD OF WIRELESS

An Ambitious Programme

We have already received congratulations on the new appearance of the paper, and many suggestions have been made as to the programme of receivers which should be described. Unfortunately, it is impossible to design a receiver which will suit everybody. In last week's issue we described a model which has a very wide appeal, and in this issue we continue the details of construction of these receivers, but there are still many readers who prefer the simple one-valve or crystal set as well as those who need a receiver which is even more comprehensive than the Air-Hawk. We shall, of course, continue to describe receivers at each end of the scale and although it is not possible to lay down any definite programme, we shall endeavour during the coming season to describe receivers of every class so that every constructor will find some models of interest in his particular case. In this issue we describe some of the more important features of the exhibits at Radiolympia for the benefit of those who are unable to visit the show, and also give illustrations of the various points of interest.

A Licence Problem

In a case recently brought by the authorities against a listener who was using a receiver without a licence, the defence put forward was that the receiver was only used for the reception of foreign stations. The defence was not accepted.

New Radiotelephone Service

There will shortly be opened between Chungking and Hong Kong a new radio-telephone service, the distance covered being approximately 700 miles.

French Licence Increase

It is announced that next year there will be an increase in the cost of the ordinary receiver licence. The new figure is 70 francs, compared with the existing 50 francs. Television receivers are to be licensed separately, the figure being given as 10s. for private viewers and 32s. 6d. for demonstration sets.

French Television Station

It is announced that the Spir of Lyons, which is a local traders' and manufacturers' association, is trying out an experimental television receiver in conjunction with the French wireless ministry. If results prove satisfactory a permanent transmitter may be installed there.

The Next Olympic Games

The next Olympic Games are to be held at Helsinki in Finland, and it is known that the German Government were anxious to secure the rights for televising the events. It is now learned that the Reich postal department has had its offer to carry out the work accepted, and steps are being taken to arrange for technicians to carry out the installation work. Mobile camera and transmitting units will be on duty at the various track and other events, and the radiated pictures are to be received at special public booths so that members of the public unable to be present in the Games arena can still participate in the excitement of the races. At least twenty cinemas and theatres are to be equipped with big-screen apparatus, and this will provide a picture about 8ft. by 6ft. for an average audience of 500. Bearing in mind that German television equipment is being used in the Italian service, and has been displayed successfully by a touring unit in South America, it becomes still more necessary for the British Government to take every possible step to see that its television lead is not assailed by any foreign country.

Miss Patik Kench, who was chosen from eleven competitors to be Miss Radiolympia, 1939, in spite of the fact that she could not croon! You may see her in her "Boudoir" at Radiolympia
More European High-power Stations

It is reported that the German Reich intends to increase the power of its existing stations in the near future; many of them will go to 120 kilowatts. Prag and Mohnik will also be overhauled and reconstructed in order to attain this power. At Hensesberget and Namme, Norway is also erecting 100-kilowatt transmitters; with this addition the country will possess seventeen stations of a total power of some 300 kilowatts. During the coming autumn Sweden hopes to bring into operation the 100-kilowatt transmitter now under construction at Stora Tuna in Dalecarlia.

Radio Andorra

On August 7th the small transmitter installed near Escalps (Republic of Andorra) was officially inaugurated by an eminent French official. Broadcasts will shortly be made daily in French, Spanish and Catalan on 410.4 m. (731 kc/s). The Republic of Andorra situated on the extreme southern end of France on the Spanish border consists merely of six parishes in the Pyrenees, and is under the sovereignty of France; its total area is only 191 sq. miles.

Spring Cleaning?

Until September 6th, Lyon P.T.T. will not be on the air on weekdays from B.S.T. 08.40 to noon, and again from 13.30-18.00, to permit a complete overhaul of the broadcasting plant.

WLW Broadcast Art Series

A NEW programme launched in recognition of the rapidly growing interest in art in the United States, and devoted to news of art events in the art world, is now being broadcast by WLW from NBC on Wednesdays at 5 p.m., E.S.T. The series, entitled "Art in the News," is conducted by Dr. Bernard Meyers, widely-known art critic and teacher at New York University. It is presented in cooporation with the National Art Society.

Bristol Radio Show

The ninth Bristol Radio Exhibition will be opened at the Coliseum on Wednesday, September 6th, by Reginald Poort, the popular broadcast and stage organist.

King's Cup Air Race

On September 1st, the evening before the King's Cup Air Race, William Courtenay will give, for Midland listeners, a ten-minute talk about the organisation of the race and about the airport at Elmdon.

Radio Organist's Library of Music

A RTHUR CHANDLER, Jr., popular WLW (Cincinnati) organist whose music forms an essential part of Paul Allison's poetry broadcasts, has a library of classical and popular music so large that if he presented five selections a day on the air, every day of the year, he could play for seven years without repeating a tune. Chandler recently recatalogued his library and found that he had more than 12,000 numbers on file. This makes his one of the largest private collections in America. He is heard with Allison, Monday to Friday, from WLW at 9.15 a.m., E.S.T.

The New Aeolian Players

THIS popular quartette — Joseph Sister (flute), Samuel Kutcher (violin), Raymond Jeremey (viola) and Marie Korchinska (harp) — will be heard in an interesting programme on September 9th (National), which will include works by Scarlatti, Max Reger, Albert Roussel, and Bach.

A Puzzling Transmission

IMMEDIATELY above P.T.T. Strasbourg, daily at B.S.T. 23.30, you may pick up a broadcast in the French language preceded by the popular melody, Marche Louvrins. Do not be misled in thinking that it emanates from a French station; it is from EA1H01, Radio Saragosse (Spain), on 352.9 m. (850 kc/s), and is destined to North Africa.

Radio Bizerta

OCCASIONALLY one may hear transmissions from French Morocco on 209 m. (1,435 kc/s), in which the studio gives the above call. Although the transmitter is only rated at 100 watts, on favourable evenings the signals are well received. Radio Bizerta is on the other daily at B.S.T. 12.30, 14.30 and 21.30, usually closing down with the Marseilleaise towards B.S.T. 23.30.

Northern Radio Show

The sixteenth of the series of North National Radio Exhibitions, organised by the Manchester Evening Chronicle, will be opened on September 26th by Sir Stephen Tallents, the B.B.C. Controller of Public Relations. The Exhibition, which will remain open until October 7th, will again be held in the City Hall, Manchester.

Television the Zoo by Night

TELEVISION cameras are for the first time to visit the Regent's Park Zoo by night. Specially augmented lighting will be used for these two programmes, which will be radiated to home viewers as well as visitors to the Radiolympia Exhibition.

On the evening of August 30th the transmission will be from the Mappin Terraces, and polar bears will be selected by Philip Dorté as being the most photogenic artists. Their yellowish-white coats should be ideally suited to the television medium.

Penguins and flamingoes in the small pool below the Terraces will be seen on the next evening, and it is also hoped that Ring, the giant panda, may be persuaded to take his evening bath in front of the cameras.

Lawrence Wright, the composer, discusses future plans with Mr. H. Hall at Blackpool.
The 1940 All-wave Three

Constructional and Operating Details are Given of the Receiver which has Already Attracted so much Attention at Radiolympia

Although this receiver has many distinct features as regards price, specification and performance, there is one item in particular which has created the most keen interest from those who have been able to examine it on Stand No. 9 at Radiolympia. We refer to the very novel and attractive chassis made and supplied by Messrs. Catalin, Ltd., which, while possessing ideal qualities so far as constructional work is concerned, is perfectly transparent, and allows all wiring and components to be seen at a glance. The resultant effect is most pleasing, and if all the wiring is carried out in the manner indicated by the plan drawings, it presents a most distinctive appearance which will make the owner exceptionally proud of his work.

Construction

There are two components which call for particular attention as regards mounting and wiring. They are the coil unit and the special wave-change switch.

All connections to the coil unit are made to contact tags which project through the mounting base and, as these have to be brought through the chassis, it is advisable to solder suitable lengths of stranded copper wire to them before fixing it in position.

The drilling of the fixing and connecting tag holes must be carried out with due care to see that they all line up with the component. A simple template can be made to indicate tag positions by placing a thin postcard on the ends of the tags and exerting sufficient pressure to allow the tags to mark the card.

No preparatory work can be done on the switch, either before giving it a thorough examination to become familiar with its thought and care is all that is required to do this part of the work in a business-like manner and thus help to make a first-class job of the assembly.

The drilling positions of the holes for the aerial and earth and loudspeaker connecting strips should be checked against the actual parts before drilling. See that the holes allow sufficient clearance for the metal sockets.

For the valveholders, three thin holes are required. Before drilling these, turn one of the four-pin valveholders upside down and, with its centre hole over the marking point, mark off the positions of the four fixing holes. This makes quite sure that the sockets will come in the centre of the holes and not one-sided as so many are often mounted.

The holes for the variable condenser bracket, the aerial series condenser, and the three components on the front runner can now be drilled and all components mounted in position.

Wiring

It will be noted that the wiring of this receiver has been carried out in instrument wiring fashion, as this allows a much cleaner and clearer assembly to be obtained, but to obtain its full benefit it is essential to bend the wires to the correct shape before fixing them in position. A little skill with the soldering iron will make quite sure that all connections and joints are perfectly sound electrically and mechanically.

If heavier gauge tinned copper wire is used than is usual with such circuits, the new wiring will be rigid and self-supporting and the danger of interconnection between circuits will be reduced. On the model shown, 16 S.W.G. wire was employed; with wire of this thickness, however, it is necessary to remove all bends and kinks by stretching it well before wiring.

With all wire end components, such as the resistances and condensers specified, it is always advisable to clean the ends by lightly rubbing them with fine sandpaper before attempting to apply the flux and solder, otherwise a poor joint might be formed which would directly affect the efficiency of the circuit.

Operation

Only one H.T. positive connecting lead is provided, and this should receive 120 volts. (L.T. negative 1) will require 11 volts and G.B. negative 2.4 volts, while the L.T. supply will, of course, have to be 2 volts for the valves concerned.

With everything connected, the initial test should be made on the local station, and for this purpose the aerial can be plugged into A.2, which will give the

<table>
<thead>
<tr>
<th>LIST OF COMPONENTS FOR THE 1940 ALL-WAVE THREE</th>
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<tr>
<td>One variable condenser...0.005 mfd. J.B. ... 6</td>
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<td>One five-pin valveholder. Clix Type No. L.111 ... 6</td>
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<tr>
<td>One A.1, A.2, and E socket strip. Clix No. X.182 ... 6</td>
</tr>
<tr>
<td>One L.S. socket strip. Clix No. X.380 ... 5</td>
</tr>
<tr>
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<td>One 0.04 mfd. Type No. 100 (ls.) ... 4</td>
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<td>One 2 mfd. Type No. F.T. ... 3</td>
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<tr>
<td>Resistances. All 3 watt type: One 20,000 ohm. (ld.) ... 3</td>
</tr>
<tr>
<td>Two 50,000 ohm. (ld. each) ... 2</td>
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<tr>
<td>Two 25,000 ohm. (ld. each) ... 1</td>
</tr>
<tr>
<td>One 1 megohm. (ld.) ... 1</td>
</tr>
<tr>
<td>One 25 megohm. (ld.) ... 1</td>
</tr>
<tr>
<td>One 0.5 megohm p.e.m. with switch...40</td>
</tr>
<tr>
<td>One wave-change switch. Type No. S.203 ... 6</td>
</tr>
<tr>
<td>One 0.1 mfd. Type No. 100 (ls.) ... 2</td>
</tr>
<tr>
<td>One 2M H.F. one 210 H.L. and one 220 H.F. values (Kozarn)...4</td>
</tr>
<tr>
<td>Chassis, 12 x 9 x 3 inches (Mears, Catalin)...3</td>
</tr>
<tr>
<td>Battery-case...9 volt G.B. and one 120 volt H.T. (Dryden)...1</td>
</tr>
<tr>
<td>Speaker. P.M. moving-coil (W.E.). ... 1</td>
</tr>
</tbody>
</table>
THE 1940 ALL-WAVE THREE
(Continued from previous page)

The greatest signal strength with the minimum of selectivity, that is, comparing A.2 with A.1.

Reaction should be at minimum and the volume control at, say, halfway. These settings will give ample strength on the local station, depending, of course, on its distance from the receiving aerial, but if greater output is required, the volume control can be turned to maximum.

With the reaction advanced sufficiently to produce a steady rushing sound, the tuning control should be manipulated and the whole waveband explored and this procedure should bring in other transmissions. If it is found that too much interference is experienced from the local station, then the wavebands should be transferred to A.1 and the aerial series condenser adjusted until the tuning is sharp enough to eliminate all trace of the unwanted signal. Careful use of this control, and the reaction condenser, will render the circuit very selective for a receiver of this type.

As bearing in mind that only one tuned circuit is employed, it must not be expected to be as sharp as, say, a receiver incorporating a stage of H.F. amplification.

When the operator has become familiar with the adjustments, then the other wavebands can be explored, remembering that on the long waves the maximum signal strength will be obtained with the aerial in A.2, while on the two S.W. bands it will, no doubt, be necessary to use A.1 all the time to get smooth and even reaction over the whole dial.

If one is not familiar with S.W. operation, it should be observed that the tuning of transmissions on the short wave lengths calls for more accurate adjustments than the normal broadcasting bands, so, if no stations are logged at the first attempt, don't condemn the circuit. A little practice will soon enable one to get the hang of such tuning, and, after a short while, it will be possible to receive many commercial stations apart from those operated by the amateur transmitters.

HOLLYWOOD and TELEVISION

The question of television's effect on the film industry brought from the production and exhibition point of view, was dealt with quite effectively recently by one of the leading Hollywood executives. While agreeing that there had been some conjecture as to the future of films in relation to the potentialities of television, it was pointed out that this emanated largely from those who lacked full acquaintance with the long history and strong traditions of what has come to be known as the show business. While agreeing that television will eventually become a potent force in everyday life, it is known that material changes cannot take place overnight. Not many years ago there was a great hue and cry to the effect that radio would ruin all other forms of democratic entertainment, but attendance figures at cinemas in the United States showed that over 30 million more people visited cinemas in 1937 than in 1927. Furthermore, the most popular artists in the radio programmes of that country were the screen personalities, so that this was yet another case of downplaying or cooperation between the new industry and the old. Just as many years ago there were people in the show business capable of taking over the flickering films which then existed and developing them to present-day perfection, so there will be these same progressive people who will be ready for any transition brought about by increased developments in television on the big screen, or even home reception side. As soon as television shows that it is ready to become an integral part of entertainment life, then those within that field will be ready to carry on in the new and highly intriguing field.
Radio as a Career

A Brief Outline of the Possibilities in Radio Engineering and of the Requirements of the Successful Professional Engineer. Scope and Limitations are Explained

By FRANK PRESTON

It has been said by sceptics that any article on this subject should have as its sub-title "—Or the Road to the Poor House"; don't believe it.

During the past few years there have been many suggestions to the effect that radio engineering is an overcrowded profession. That is only a half-truth; overcrowding there has been, but by the wrong class of men. For the enthusiastic amateur who is prepared to work hard and study intensively there is tremendous scope in the industry and science of radio. If you are inclined to disagree, think of any of the "big names" in the business and then take the trouble to find out how they made a start in radio. In the majority of instances you will find that the present "big names" was once an amateur experimenter.

It would be difficult to provide any convincing argument that there was more scope and greater opportunity in past years than there is now, for the increased production and still-increasing number of receivers in use mean that more and more well-qualified men are required. If you propose to argue that the general mass production of receivers has lessened the need for skilled men of high intelligence—and that is not true—you should remember that television has still a very long way to go.

There are so many branches of modern radio that it might become desirable to specialise in one of them sooner or later, but there is probably no better method of entering the profession than by tackling seriously the work of the service engineer. The rates of pay for this work are, admitted very low in many instances, but they must continue to improve as the work becomes more specialised. What is more, the first-class service man can command a far higher wage than is earned by many of the self-styled engineers who have never even studied the fundamental principles of the subject and who work by nothing better than rule-of-thumb methods.

A Stepping-stone

But the ambitious man will often consider his initial radio work as service engineer as a means to an end—stepping-stone to the responsible work of designer, laboratory chief or works manager. There is no harm in aiming high if your aim is true; if the full extent of your ambition is never realised you will, at least, be fairly sure of steady and interesting work for many years to come. And what is to prevent your making valuable discoveries and taking out patents which can be sold or exploited to produce a suitable reward for your endeavours? Many of the most valuable radio inventions have been produced by amateurs and "near-amateurs" who have gradually transferred their activities from the amateur to the professional field.

Free-lance

Quite apart from the question of becoming a service engineer in the employ of a firm of manufacturers or dealers there is scope, in many parts of the country, for free-lance engineers who may or not, as they prefer, take a shop and act as retailers. There are many small dealers who would not find it economical to employ a full-time engineer, and who would be glad to pass on all repair and service work they receive to a local engineer who could prove his worth. The free-lance engineer might also find that public-address work would provide a suitable sideline and a means of gaining a valuable local reputation. Many such men have also discovered that, after extensive experience, they could act as very efficient consultants. Of course, a "name" is important if a success is to be made in this side of the business, but other men have made such a name, so why not you?

Making a Start

After reading the foregoing paragraphs you will probably ask: "But how can I start to make radio my career?" The answer is a long one and depends to a large degree upon individual circumstances. Here, however, I am thinking more of the keen amateur constructor who is amateur than of the youth who has just left school, without having any knowledge of radio, and who is simply looking for a job. It is assumed that you have taken an active interest in radio for a few years, have gained at least a little experience in wireless-set construction and have mastered the elementary processes of fault-tracing. You are probably already at work in a field other than radio and wish to improve your position and to take up radio more seriously.

As an amateur radio engineer you would probably be looked upon with disapproval by full-time service men, who may think that you were attempting to "steal" their work. That would be a deterrent to many, and might not be entirely to your own advantage unless you were thoroughly competent and confident of your ability. A bad reputation can easily be made by passing out a single unsatisfactory job, so risks must not be taken. In other words, you should first obtain a thorough mastery of fundamental wireless theory and as much experience as possible of service methods and procedure. Here there seems to be a snag: if you do not commit yourself to undertake service work, the necessary experience cannot be gained; if you do, chances might be spoiled.

Gaining Experience

There is a way out, though. Constant experiments in your own "den," plus the experience gained by servicing the receivers of close personal friends, will help considerably. But the job must be taken seriously. It is impossible to become a service engineer by studying books, but study combined with experimental work will take you a long way. Regular readers of Practical Wireless are sure to find their helpful articles in every issue. This reading can be augmented by perusal of the many wireless books by the Editor of this journal, among which are "The Wireless Constructor's Encyclopedia," and "Television and Short-wave Handbook." (To be Continued)
Another Camera Suggestion

In a recent paragraph attention was drawn to one or two disadvantages associated with the secondary emission of electrons from the camera mosaic when subjected to the impact of a high velocity scanning beam of electrons. A little further thought will bring to light other defects that can be attributable to the same source. First of all, the presence of these released secondary electrons brings about a negative field in the immediate locality of the mosaic face and this space charge must naturally tend to prevent the emission of further electrons from the signal plate due to the photographic image. Obviously, this reduces very materially the photo-electric current, and in consequence the output of the camera and overall sensitivity has shown that the output is only about one-third of that which would occur under conditions of saturation. Added to this, it must be remembered that these secondary electrons which do return to the mosaic face have the effect of partially neutralising the electrical charge stored on the signal plate, and this gives a further reduction factor of about the same order. The efficiency of the device, therefore, seldom exceeds 10 per cent., and this figure is borne out by measurement. Many schemes have been proposed to offset these defects, and in one of these the scanning beam of electrons is periodically cut off, while at the same time the anode voltage is increased. During the suppression period the increased voltage helps to disperse the electron space charge in the neighbourhood of the plate, and in addition to improving camera sensitivity reduces the possibility of spurious shadow signals.

Improving Picture Definition

It has long been realised that the limit of picture definition in the vertical direction is the restriction of the televised picture to a total dissection of 405 lines, and a percentage of these is allocated to synchronising pulses which of course reduces the active picture lines. Any increase in the number of lines, provided the receiving circuit is altered to take cognisance of the additional band width of the picture frequency, will produce a more detailed picture, and this is particularly useful in the case of large-sized pictures. Any change of this nature, however, really constitutes a radical alteration in existing picture standards and in consequence may not materialise for some time to come.

Bearing this in mind, it is very interesting to examine some of the "subfluors" (if such a word can aptly describe the schemes) which have been proposed, and tried in order to give improved picture definition without actually bringing about an alteration in the total number of picture lines. One very promising suggestion is first of all to reduce the size of the scanning spot to less than that occupied by the depth of a normal scanning spot. Now, instead of the spot moving horizontally from left to right it is made to follow an oscillatory path

within the boundary limits of the original line. Depending on the frequency of its up and down movement in relation to the horizontal trace, so the very small spot area can be made to cover almost the whole picture area. The resolving power of the spot is materially increased and greater detailed definition is apparent. Naturally, the receiving equipment must be designed to follow the exact spot motion to secure the increased definition benefit, but the advantage of the suggestion is that standard forms of receiving sets will still operate on the new signal but naturally will show no benefit in the reproduced picture. If a scheme of this character can be fully developed to its logical conclusion it may provide one solution to the limits now imposed by a 405-line picture.

Television at Olympia

The first time that any real attempt was made to show high-definition television to the public visiting Olympia was in 1936. It was rather half-hearted, however, for no names of sets were allowed to be displayed, and visitors were moved past the anonymous pictures on the cathode-ray tube faces at too rapid a rate for quality to be studied. The following year the right side booths decorated externally in sombre black enabled individual manufacturers to give demonstrations of fifteen minutes' duration to ticket holders, and there was always a shortage of tickets except at the morning sessions. In 1938, however, due to a marked change in many of the R.M.A., a determined effort was made to present television in a really effective manner. The receivers were demonstrated on manufacturers' stands, and packed galleries and stand floor space gave ample evidence of real public interest, if such was required. For the present show, however, the organisation has gone a stage further. To prevent congestion in the galleries, sets can only be shown with the C.R. tubes facing inwards, and in this way no one walking round the exhibition can see the television pictures without actually walking on to the stand floor space. As a form of overflow, however, and to enable anyone to judge the performance of individual sets working side by side under identical conditions of reception, a special "Television Avenue" is built on the gallery, and as many as 60 sets can be seen in this section alone.

Signal Distribution

A last year, the arrangements for both television and broadcast sound distribution were vested in a small committee of technical experts, and benefiting from past experience the television scheme finally adopted is of a very interesting character. On a flat section of Olympia's roof a well-stayed 45th mast carries the half-wave aerial, and an impedance matched high-quality feeder cable carries the signals to the main distribution amplifier located in a part replica of one of the Alexandra Palace towers. After amplification the combined vision and sound signals are fed out at a high level on their proper carrier frequencies of 45 and 41.5 megacycles, respectively. On each stand featuring television one or four-way distribution boxes are fixed to the roof, and a separate馈er cable links each of these pad boxes to the multiple output circuit of the main amplifier. One, two, three, or four television receivers are joined to these boxes, according to manufacturers' requirements, and in this way an approximate level of 3 millivolts is provided for each set, so that it could operate under conditions simulating those of a good reception point inside the Alexandra Palace area. The scheme is made clear by a reference to the accompanying illustration, which shows the distribution in simple schematic form. In the case of the "Television Avenue," to which reference was made earlier, two main feeder cables are linked to two small pad boxes, and from here two cables join a pair of thirty-way distribution boxes. Each outlet from a box is connected to the aerial terminals of a receiver, so that the two lines of thirty sets have the signal level stepped down to the normal working voltage.
ON YOUR WAVELENGTH

Have You or Are You?

At the moment of writing this I have been able to make only a preliminary examination of the Exhibition, and figures are not available for the attendance. Judging from previous years, however, I should not expect the attendance figures to be as high as in previous years. Many readers have already visited the Exhibition, and all visitors with whom I have conversed express delight at the clean, artistic yet businesslike arrangement, the case in which they may examine the various exhibits, and their surprise at the strides which television has made.

It is quite the best exhibition of the whole series. Have you been, and if not are you going? You must go to keep abreast of developments. Any advice you want regarding the Exhibition or the location of exhibits will be cheerfully given if you call at Stand No. 9, Ground Floor.

Any Old Plays?

I was listening to a broadcast play a few weeks ago—I will not say from which station—and was surprised to recognize a piece which had been hawked round the London publishers many years ago. This is not necessarily a sign that the play is bad, but it does mean that it could not have been good, when all publishers have passed it by with a rejection slip. I have recognized a number of other occasions plays, stories, and songs, which have been consistently rejected by publishers, but which have been accepted by broadcasting authorities. It is amusing to read the critics' reviews of this rejected matter, which is finally accepted for broadcast. They usually hail it as a great success. The best the author has ever written, and so on. It seems to me that to be a successful author or song-writer you must plug away for years, knowing that your work will be returned. When finally you get one accepted which is successful, you then dig out all your rejected manuscripts, which will then be worth a considerable sum of money. In other words, you merely have to write one successful book, play, or song. From that moment you retire and live on the proceeds from your worthlessness, rejected but now valuable work.

This probably accounts for the fact that most authors only write one good book, and the rest are pot-boilers.

As far as is possible, I suggest that the B.B.C. should not broadcast authors' first efforts, or alternatively if they do because of its intrinsic merits, they should ask for an undertaking when considering future manuscripts from the same authors that it is new work which has not been submitted elsewhere, and is not work which publishers have rejected. In this way the B.B.C. will safeguard itself from the charge that it will accept rejected work, and it will prevent unsuccessful authors from having a chortle at the expense of the B.B.C. Some of the plays which have been elevated to the importance of broadcasting have been the merest trash. The authors everywhere exhibit their apprentice hand. This seems such a pity, when there is such a wealth of excellent material available.

If it is necessary to have plays specially written for broadcasting, I suggest that well-known and experienced play-writers should be used. It is nonsense to think that an individual who has never written a play before can write one suitable for broadcasting. Anyone wishing to write plays should commence by writing short sketches and entertainers before being permitted to take advantage of the considerable publicity which a broadcast play affords to the author. To put green authors on the air is grossly unfair to experienced writers. The B.B.C. must use some sense of proportion in these things. Many of those who have been given opportunities by the B.B.C. have merely used the B.B.C. until they were able to gain more highly paid engagements outside of that organisation.

Radio versus Television

This year I have observed less opposition from manufacturers interested only in radio sets to the introduction of television. Radio is undoubtedly the present almost uncharted seas of combined sound and vision programmes. The success of television in the home counties has been most encouraging to all concerned. There are those who have complained that the sales of receiving sets in 1938 were much below the figures for previous years. In my view this is a most excellent thing. It cannot be denied that the radio manufacturers were over-producing, and they were suffering from all the maladies of over-production. Last year, it is stated, over-production bore a reasonable relationship to sales. That is the correct basis of all production. Once you produce more than the market can absorb you must unload receivers at knock-out prices. The inevitable corollary is that the following year the public will wait until the receivers have been similarly marked down.

It is also wise for the industry to limit the number of dealers to those known to adopt correct trading methods. I do not believe in the price-cutters and the discount-dodgers.

Our Transparent Chassis

Many of the early visitors to the Radio Exhibition have expressed their delight at our latest idea for constructors—the transparent chassis which enables you to see every wire and every connection without having to invert the set. Many readers thought that this chassis was made of glass, but as a fact, it is composed of a new synthetic glass known as "Catalin." This has almost exactly similar characteristics to glass, but with the important advantages that it may be drilled and filed. If you have not visited the Show make a point of inspecting our new receiver on its transparent chassis. I am certain you will want to build one. The same material could, moreover, be used to make a complete chassis and cabinet.

It was this journal, of course, which standardised the chassis system for constructors. Before this journal appeared most sets were designed for
baseboard erection, and the so-called advantages advanced were that you could see every wire at once, and that it was simpler. Another parrot cry which went up from some of the so-called experts was that amateurs could not solder and therefore preferred terminals. We have most effectively laid those bogeys. I do not believe in the baseboard system of construction, for it makes an unwieldy set, long leads where long leads ought not to exist, particularly on the H.F. side, and gives the whole affair an amateurish appearance. I am not in the least surprised that these so-called "designers" and "experts" and "radio technicians," with their "radio laboratories" (usually the corner of the kitchen table—equipment consisting of a red-hot poker for boring holes, and a half-crown voltmeter) should advance false reasons in order to cover up their own ineptitude. Unfortunately, it has been my lot to know a few of these so-called experts. They were amateurs, and presumed that none of their readers could advance beyond their own level of ability. They have gone, fortunately, to the obscurity from which they ought never to have emerged. I tremble to think of the bad language they must have caused constructors who were sufficiently misguided to build their receivers. In many cases such receivers would not work, and they were not backed by a guarantee as are Practical Wireless receivers. Perhaps that is one reason why this journal survives.

Whiskers and Tripe!

PROPOS my recent remarks concerning bewhiskered youths, and the use of the word tripe, our old friend "Torch" pens the following:

WHISKEROFFSKI TRIPOVICHT.

A FOLK SONG OF THE HUNYANS FROM THE SIBERIAN STEPPE.

Solo Part:
Whiskers and tripe! Whiskers and tripe!
We, the Hunyans, shall never a-fight! Others may faint at the horrible sight,
We'll never show terror at whiskers and tripe!
Brothers, Tavars! No whiskers and tripe!
Whiskers and tripe! Whiskers and tripe!
Over the ocean and far out of sight,
Are others defiant of whiskers and tripe,
Curfew, Tavars! We know they are right.
To hurl their defiance at whiskers and tripe.

Whiskers and tripe! Whiskers and tripe!
Maneuzian tummies may fill with delight
When they sniff at the onions served up with the tripe,
And mousy-faced stripplings grow beards out of spite.

But true men and great men hate whiskers and tripe!

Notes from the Test Bench

Adjusting Inductances

WHEN some home-made receivers of the modern sweatered type have been in use for some time, difficulty arises owing to mis-matching of circuits. This is found to be due to the fact that the coils are placed too close to a valve—some of the modern mains valves running very hot. The result is that the component used to retain the coil windings in position becomes softened and the turns move slightly. Therefore, in making such a receiver, care should be taken to place the values as far as possible from such components as coils, H.F. chokes, etc. In the event of a coil becoming mis-matched, it may be re-adjusted by moving the end into or three turns slightly, testing and readjusting with screening case in position. Do not overlook the last point, as the coils have different inductance values when screened. When the correct position of the turns has been found, Chatterton's Compound or some similar medium should be lightly smeared over the winding.

Position of Decoupling Components

WHEN decoupling has to be introduced the usual arrangement is a resistor and condenser. The resistor is to prevent the passage of H.F. currents, and the condenser is to by-pass them to earth. Therefore, there is a right and wrong way of placing these parts in the circuit. The two components should first be joined together, with a minimum of wire between them, and the junction point then attached to the actual value leg or other point which is being decoupled. This way stray H.F. currents are prevented from being radiated by the wiring, and are conducted direct to earth by the shortest possible route.

Earth Connection

ALTHOUGH the earth lead has to be buried in the ground or joined to some subject which itself is buried, it is desirable to use an insulated lead so that the actual earth connection is only made at the ground point. If a bare wire is used and it touched various earthed objects, such as walls, etc., on its way to earth, it may affect results by providing alternative paths or separate closed circuits which may resonate and lead to various peculiar tuning effects, apart from the risk of introducing instability. The buried connection should, of course, be moist, and where the ground is of a rapidly drying composition some aid to the retention of moisture should be included.

W.L.W Announcer Travels 100 Miles Nightly

AN interesting report has just reached me concerning Bill Edmonds, W.L.W remote announcer, who hasn't a much heavier round-the-town schedule than the normal announcer heard with dance bands in the evenings. He reaches near the century mark in mileage to fill a night's schedule of remote broadcasts, and here is a typical schedule of his night's work:

Edmonds drove from the W.L.W studios in Cincinnati to Beverly Hills, 12 miles; then to Coney Island, 25 miles away. After a half-hour at Coney, he drove to a broadcast at the Hotel Netherland Plaza, and then went from downtown Cincinnati to Castle Farm for another broadcast. That added 30 miles to the 37 already travelled. From Castle Farm he took a long jump to Lookout House, across the Ohio River in Kentucky for an additional 17 miles. As he broadcast from there he had driven 84 miles.

But he had one more show—from Barney Rapp's, 13 miles away—and then added five more to report back to the studios before he closed his books for the night. His total mileage was 192. And he had made only six broadcasts, for a total of two and a quarter hours on the air.

Miss Radiolympia

I WAS present in the Bowl Theatre at Radiolympia when the judging took place to select from eleven entrants Miss Radiolympia, 1939. There were to have been twelve, but one refused to appear in public in a bathing costume. Each of the finalists was asked to sing a chorus of the theme song "Let's All Go to the Radio Show." They were also asked to parade in front of the distinguished panel of judges. It is a most surprising thing that Miss Patsey Kench, who was finally selected, was the only one who refused to sing. The remaining ten exhibited crooning voices. Thus, I take it that the judges agree with me that crooning is not an advantage! I felt somewhat sorry for these really charming and beautiful girls, however, in having to parade round the platform after the manner of prize livestock at an agricultural show. As a distraction I judged the entries myself, and awarded the honour to Miss Margaret Ann. This just shows how amateurish I am in matters of this sort. I do not, of course, disagree with the judges' decision any more than I do the Editor's—it's final!
Ribbon Microphone Mechanism

The following description of a ribbon mechanism I have devised may be of interest to my fellow amateur enthusiasts. The circuit particulars comprise a straight transformer coupling (140:1 transformer) working into a MH4 type valve-grid/filament circuit across the secondary winding—employing 1.5 volt grid-bias. The transformer and valve should be situated as near to the microphone as possible, and connected to it by means of a screened two-core cable (screen to be earthed).

Referring to the diagram, it is apparent that all details are designed to suit the type of permanent magnets obtainable. Overall sizes of those employed are quoted upon the assembly views, and were incidentally a pair of old instrument magnets. The magnets were brazed together (like poles adjacent) by means of L-shaped iron pole-pieces, so that jin. gap remained between the butts of the magnets. The extremities are rigidly held in brass框架, upon which two units are sweated to facilitate fixing inside the microphone head: two drillings fitted with rubber grommets take the leads through at points close to the terminals. To ensure that the maximum field exists between the pole-pieces, this gapping between the magnet poles is very desirable, and also allows a little latitude in assembly.

The pole-pieces are made from jin. x jin. x jin. angle iron, cut away to jin. upon their upper flange, so as to leave a jin. gap between them to accommodate a jin. copper ribbon. Copper foil (0.001m.) was used; very carefully crinkled between a pair of gear wheels so that its rigidity, and effective (inductive) length was increased. Elongate plates, supported across the ends of the pole-pieces, clamp the ribbon element between sets of serrated jin. wide rubber pads so that it lies central between, and is insulated from, the pole-pieces. Two

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THAT HINT OF YOURS!

Every Reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best hint submitted, and for every other item published on this page we will pay half-guinees. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL WIRELESS," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Practical Hints." DO NOT enclose Queries with Hints.

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SPECIAL NOTICE

All hints must be accompanied by the coupon copy from page 624.

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Constructional details of the mechanism for a ribbon microphone.

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A Sensitive Relay

WHILE experimenting some time ago with remote-control apparatus, I wished to use a micro-relay, due to the small current available. I therefore improvised one from an old wrist-watch, a headphone bobbin and a few odds and ends.

I just removed the escapement from the drum attached to the mirror (A) thus leaving the wheel free to revolve within the limits set by the hair-spring. Next, a 3in. length of 24-gauge iron wire was fastened to the upper portion of the wheel by means of shellac and cotton. The whole assembly was then mounted on a wooden base about 4in.x 3in. The headphone bobbin was mounted near one end of the wire, and two contacts mounted on a short piece of wood at the other end. Next a contact of 24-gauge enamelled copper wire was fastened to this end of the wire, and a lead of 36-gauge enamelled wire jammed to it. The two contacts and the moving contact, together with the leads to the headphone bobbin, were brought out to terminals on the baseboard.

In operation, the lower contact is adjusted to keep the other end of the iron wire close to the headphone bobbin, and the regulating lever of the watch adjusted to the setting of easiest operation. I found that this relay would work on a current of less than one milliamp, and that there were no cases of "freezing," the spring pulling back the contacts in sufficient time for slow Morse of ten words per minute to be sent.

In order to shield it from draughts, the relay should be enclosed in a wooden case.

S. H. WATTS (Cheltenham).

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Adjustable Extension Control

I RECENTLY made a receiver in which a condenser was mounted on a bracket to be operated from an extension control. When I came to fit the control I found that it was too short, so I purchased another, but this was too long. This set me thinking, and in overcoming my difficulty, I think I have hit upon an idea which would be of use to many other constructors, as it is a form of adjustable extension control, and has been applied to the Bulgin component. As may be seen from the accompanying illustration, the smaller type of control is cut in half and a length of rod is inserted. Locking-screws are added, and if desired a "V" groove may be tooled in the rod to prevent slipping when a tight component is being operated. The one-hole bush is mounted on the panel, and the screws loosened whilst the end is slipped out and over the component spindle. This is then located in the bush and the two remaining screws locked up.

T. K. VERNON (Stoke).

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For constructing this sensitive relay the works of an old wrist-watch were utilized.
A casual glance at the receivers on show this year bear an appearance very little different from those which have been seen at previous shows. A more critical examination will, however, reveal several interesting features which appear for the first time, and which mark a step forward in the design of modern radio apparatus. In general the styles of cabinet remain unchanged, but the earlier types of cabinet design have given way to more severe lines and styles, more in keeping with modern furnishing schemes. Moulded bakelite cabinets are not now so common, but in this connection it is interesting to note that Philips have utilized the idea of a moulding in one or two cabinets, and have produced some models in which both wood and bakelite are employed. The front portion of the cabinet is moulded, and the chassis is attached to this. Thus, by a simple movement the whole front of the cabinet may be pulled forward revealing the entire receiver chassis and loudspeaker fully accessible for test and servicing purposes.

This is a K.B. model.

Here is one of the modern cabinet designs referred to in this page. This is a K.B. model.

Push-buttons
A further outward development seen this year is the remarkable array of designs in push-button controls. From the original small bell-push types, these have been modified until now there are all shapes, some sunk flush, some projecting, some requiring to be pushed in, and others which have to be depressed. Various fancy names have been given, such as organ key, piano key, press-button, push-button, etc. In all cases, of course, the idea is the same, namely, the changing of a station merely by operating a button carrying the name of the desired station. In some receivers the buttons are subdivided into medium and long-wave stations, whilst in others a wave-change switch has to be operated separately. In view of the fact that the stations which may be pre-tuned will vary in different parts of the country, various attempts have been made to facilitate the change in setting provided for the buttons. In the early days the cabinet had to be opened and various tricky adjustments made.

In some of the modern receivers small panels are attached above the buttons and by removing the panel the stations may be changed. A most ingenious and effective scheme is seen in the new Philips receivers, however, a small key being provided and retained in a clip at the rear of the cabinet. When it is desired to change a station the button required is depressed. The key is then inserted in a slot beneath the button which is down and the key turned until the desired station is heard. The key is removed and henceforth that station will be heard until changed by the key. The three left-hand buttons on these receivers may also be adjusted for long or medium waves. To change the waveband the button is not depressed, but the key is inserted and turned until the maximum travel is obtained in either direction (according to the change which is desired) and then the button is depressed and the station tuned in as already mentioned. It is thus a very simple matter and may be carried out

In the early days we had elaborately fretted fronts reminiscent of the early pianos, and gradually the woodwork has been removed until to-day the majority of cabinets have merely a rectangular opening backed by fancy silk or similar material. This is certainly a step in the right direction, but why must the opening be so prominent? This point in design has obviously been tackled by several firms and we were pleased to note that this year the G.E.C. have found at least one effective way of overcoming the trouble. They have made use of neat louvres in certain designs, and this has, in some of the cabinets, made a marked improvement in appearance and will no doubt appeal to many listeners on aesthetic grounds.

Speaker Frets
A further point in exterior design concerns the loudspeaker fret or opening.

This Elco receiver has the push-buttons above the dial for ease of operation.
by the most inexperienced person.

Motor-driven push-button operated sets are, of course, now fairly common, but when the manual control is operated the usual trouble is that of high gearing, resulting in a tiring operation when searching through the full scale for a station which is giving a programme suitable for the mood of the moment. On some receivers this is a real wrist-aching procedure. Marconi-phonograph and H.M.V. this year have introduced "crusher" tuning, which may be seen in addition to the Micro device on somewhat similar lines. The idea is that the motor used for mechanical tuning is brought into circuit to rotate the condenser to avoid the normal manual process, and it may be stopped as soon as a desired station is reached.

Components for the Constructor

This year there appears to be only Belgie, Varley, Polar and Warrite who are exhibiting constructor components, although one or two other firms have accessories which are of use to the amateur set builder. The Belgie range of components needs, of course, no introduction. It would be impossible to deal with all the items shown, and in fairness to all it is better to refrain from any particular mention, but the odd lines are all of the greatest value to the set builder. Varley are showing coils, transformers and one or two other lines, many of which are already well known, whilst the Polar range of condensers has been augmented by one or two special lines for transmitting or ultra-high-frequency reception. Warrite are showing on Stand 207 the range of "P" coils, transformers and switches, as well as standard Service test equipment. Messrs. Ferranti are showing a wide range of their meters which, of course, every worth-while constructor finds of value in real experimental work. On the Westinghouse stand there are metal rectifiers for various purposes, and Pix on Stand 64 are showing their range of aerials. Various types of aerial may also be seen on the Aerialite stand, whilst one or two firms, in particular Antiference, are showing specially developed aerials for television or noise-free reception.

One type of receiver which is apparently alone in its class may be seen on Stand 42. This is the Pilot Twin-Miracle. It is a mains or battery indoor or outdoor set. There is one unit battery in it, and it is a five-valve superhet receiver. The new batteries are generally of an all-in type inco

valves. The new batteries are generally of an all-in type incoc

orating both the H.T. and L.T. sections and these are to be seen on several stands. Various plug-in or clip connections are used for the L.T. circuit.

Economy Valves

A new line to be seen this year is the economy valve, which has resulted in the introduction of special portables and batteries. This particular type of valve, which may be seen on Stand No. 62, has a 1.4 volt filament and thus may be operated from a dry battery instead of a standard 2 volt accumulator. This means that the portable receiver may be made more compact and lighter in weight, as a small dry cell only is required for the filament. An example of the new portable may be seen on Stand No. 51 (Videx), whilst Ferranti on Stand No. 41 are also showing a superhet battery (table model) using these new

A table model in the G.E.C. range, with the new speaker opening idea.

A.C./D.C. superhet. If, for instance, it is plugged into the mains and the mains supply fails, or the mains lead becomes pulled out of the socket by accident, the set does not stop working. Automatically, the batteries are switched into circuit and the receiver goes on playing without interruption. It is entirely self-contained, and requires no aerial or earth. An ideal A.R.P. receiver.

Car-radio and Television

There remains only car-radio and television apparatus to be dealt with. In the former class Cossor are newcomers, and have produced a neat two-piece receiver with readily changed station setters. Whilst motoring it is possible to pass out of the range of one station and into the range of another, and it is a simple matter in this particular receiver to make a change on the push-button mechanism whilst driving, without taking your eyes from the road. Ferranti are also showing a car-radio receiver, whilst the Philips is also to be seen on their stand. Special aerials for cars are also being developed and may be seen on several stands.

The most remarkable point about many of the new television receivers in the cutting out of the black around round the picture opening. Cinema screens are, of
course, provided with a black surround to throw the picture in relief, but on several new receivers the picture opening is in light wood and this has apparently in no

way detracted from picture brilliancy. It does, of course, improve the general set appearance, and the modern C.R. tube is so good that in many cases it is not necessary to make any modification to the normal room lighting, and perfect pictures may be seen. The add-on unit is increasing in numbers, due to the fact that many listeners have a really good broadcast receiver and do not wish to change it for a new receiver. The only point is, of course, that the ultra-high frequencies used for television enable better sound reproduction to be obtained, and it is thus desirable to use a special set if the maximum performance is to be obtained on the television sound wavelength. Other types of unit television receiver are merely sound and

vision in a small cabinet, the existing broadcast receiver being used for normal broadcasts. This is naturally higher in price than the simple add-on vision unit in which the L.F. section of the broadcast receiver acts as the reproducing medium. Several firms are showing these units and small television receivers, and the most interesting development from a general point of view is the reduction in cabinet size. The modern tube is smaller than last year’s model, but the cabinets have been brought into line with standard broadcast apparatus by permitting the end of the tube to stick out at the back of the cabinet a matter of 3ins. or so. As the cabinets are not generally placed flat up against a wall this is not a very important point, and the result is that a neater-looking cabinet has been produced with some saving in cost.

The Add-on Television Units, as they are called, are proving extremely popular, and in order to increase the popularity, especially among non-technical listeners, a simple form of plug connection to a radio receiver has been adopted. In the Ekco range, for

instance, the receivers are now provided with a pair of sockets marked “Add-on Television,” and thus all that is necessary when a unit of this type is purchased is to plug it into the receiver and television is added to the normal broadcast entertainment. One of the new season’s add-on television units in the Ekco range is to be sold at 22 guineas, and includes an 18-valve television chassis.

Elsewhere in this issue we describe the ingenious system which has been adopted at Olympia for the re-distribution of the television programmes to the stands and to Television Avenue, and on the upper gallery crowds may be seen viewing the television engineers at the controls of the re-distribution panels. Here there are the small monitoring tubes which enable the output to be checked and the panel is a replica of that used at the Alexandrine Palace, a reproduction of this building surrounding the “studio.” Walking along the Avenue, one can see the various models of the different firms all working together and can compare the various tones used for reproduction. The semi-darkened appear-

ance of this Avenue should not, however, mislead you into thinking that it is necessary to reduce the normal room lighting in order to see the pictures. On those stands where a television receiver is working you can compare the brilliancy in surroundings which are very similar to those which will be found in the normal home, and as already mentioned in connection with the light surround now employed for the tube in the majority of receivers, the picture is sufficiently bright to enable viewing almost in full daylight. Some idea of the detail and the high degree of efficiency which has been reached in the television camera may be gained when we point out that during the preliminary tests at Olympia the Test Match was being televised. It was easily possible to follow the cricket ball as it ran along the ground after being hit, and this was a “long shot” by the camera. Furthermore, although all the players were in the usual cricketing whites, the shades formed by creases in the shirt or trousers were perfectly clearly marked, and the figures did not represent a white

This is one of the “National Band” concertograms and it is on view on Stand T. 4.

For good wiring an electric soldering iron is indispensable. This is a Cossor product, “cut-out” as in some of the earlier broadcast scenes which some of us remember. However, a visit to Television Avenue will soon convince you that television pictures are now perfect home entertainment, and the receivers are as simple to operate as a one-valve.

Adopting the inserted electrolytic mounting, the Dubliner can now supply condensers of this type.
The Factory

The special section devoted to the factory will, we hope, reawaken constructor interest, and the many interesting processes which are being carried on there, although in the main showing commercial work being undertaken, will give you some idea of the best way of setting about set construction. The methodical stage-by-stage wiring or assembly of parts bears no comparison to the haphazard method adopted by inexperienced constructors, and furthermore, the simplicity of soldering is fully demonstrated by the operatives. Just watch how quickly a joint is made when really good soldering iron is employed, and the work is clean. The "hidden secrets" of some components are also revealed here and should remove the temptation which sometimes exists for screws or containing cases to be removed to see what is inside. Many components are so assembled that if the cover is removed, the component may be damaged, or in the act of replacing or removing a metal can the leads may be damaged. On no account, therefore, should such dismantling be attempted, and you can see at the Radio Factory all that you require to know in regard to these enclosed components.

Many listeners fail to realise how complete receivers are tested by the manufacturers, and the process of trimming and adjusting a modern multi-valve superhet appears to be a complicated process, when undertaken without suitable test apparatus. The method adopted by the makers is demonstrated here and you will see how quickly a multi-valve may be set up so that it is corrected and aligned for correct tuning over either the short or normal broadcast bands—and there are no hit or miss methods. Speaker response, too, is tested, and the receivers all have to pass a response test before they are passed to the packing department ready for sale.

This is the Pye Baby "Q". It measures 11ins. high by 12½ins. wide by 8in. deep. Price is 8s. 6d.

A feature of this H.M.V. console, which is to be released on September 3rd, is the effective 3-valve push-button circuit. The price is 14s. 6d.

The Ecko "Pick-me-up" portable—an 8-valve superhet. It measures 11½ins. by 11½ins. by 7½ins.

This 4-valve portable by Cossor is a battery receiver with single-knob tuning and auto grid bias. Size is 12½ins. by 10½ins. by 7½ins.

Cossor Exhibit

In the factory there is a special section showing some of the machines used in the Cossor works at Highbury, including a wire-joining machine, a grid-winding machine, and other winders. The wire joiner is a remarkable piece of apparatus which automatically selects and joins together three wires of differing thicknesses, length and material such as are found in the modern valve. The electrode support wire cannot be taken through the glass "pinch" because nickel has not the same co-efficient of expansion as glass. Thus a short length of borated copper wire (which has the correct rate of expansion, thereby ensuring an airtight seal) has to be joined to the end of the nickel support. Ordinary copper wire is then used for the final leading out wire. The machine which you can see in the model factory welds these three wires together as the copper wire is fed from one end, the nickel support from the other, and the small length of borated copper is cut off and carried by a pair of electrically-operated tweezers which centre it between its fellows a split second before controlled flames make two perfectly welded joints.
Television receivers may be seen on the stands of the manufacturers, or all makes may be compared in the Television Avenue, situated on the Balcony behind "Broadcasting House."

This Ferranti Table Model No. T10 provides a picture 7 in. by 6 in. The controls are synch., volume/on-off switch, and brightness. The price is 30 gns.

The simplest complete television receiver. This is H.M.V. Model 1800 with a picture 8½ in. by 6½ in. The price is 31 gns. Controls are "brilliance" and "volume."

Baird Model T25 is a combined all-wave radio and television, giving a picture 10 in. by 8 in. Only one television control (external), providing contrast. The price is 47 gns.

Baird Model T26 has a 10 in. by 8 in. picture and two controls giving contrast and volume. The price is 40 gns.

RGD Model 391, giving a picture 7½ in. by 6 in. Sound louvres are provided at the speaker opening. The price is 45 gns. and the four controls are focus, brilliance, contrast, and volume. The chassis is a 22-valve superhet, and an H.F. stage for vision and sound is provided. The same chassis is available as a radiogram, a 6-valve radio chassis being added.
You can be televised free during the morning sessions. Application must be made during the afternoon to Harold Cox, Reception Room, National Hall, between 2.30 and 5.30.

A handsome table model in the Philips range. Picture size is 7\(\text{\text{in.}}\) by 5\(\text{\text{in.}}\), and the price 32\(\text{\text{gns.}}\). The controls are on-off and brightness (combined), focus, volume and contrast.

Decca Model 46 is a combined all-wave radio and television. Picture size is 10\(\text{\text{in.}}\) by 8\(\text{\text{in.}}\), and the price 40\(\text{\text{gns.}}\). Television, sound and vision are pre-tuned.

G.E.C. Model 0091 has a picture measuring 7\(\text{\text{in.}}\) by 6\(\text{\text{in.}}\). The three push buttons switch on the set, provide sound only and switch off. The controls are for brilliance and contrast and sound volume and tone quality. A 16-valve superhet circuit is employed, and the mains loading is 235\(\text{\text{watts}}\) or 115\(\text{\text{watts}}\) when used for sound only. The depth of this cabinet is 15\(\text{\text{in.}}\). The price is 32\(\text{\text{gns.}}\).

A radiogram version of the RGD 391 chassis. The controls are focus, brilliance, contrast, volume, frames hold and line hold.

A console model in the H.M.V. range. At 44\(\text{\text{gns.}}\) this gives a picture 11\(\text{\text{in.}}\) by 9\(\text{\text{\frac{1}{2}}}}\text{\text{in.}}\). Note the inclined front for easy viewing.
LISTENING TO THE PRAMS.

The Attractive Bill of Fare at Queen's Hall This Week is Discussed by our Music Critic, Maurice Reeve.

This week's programmes are indeed rich in material for the connoisseur and the genuine lover of the best music. It would be difficult to imagine a wider survey packed into six programmes than this week's fare has succeeded in accomplishing. These are the chief events: Monday, Wagner; Tuesday, Tchaikovsky; Wednesday, Brahms; Thursday, Sibelius; Friday, Beethoven, with some Handel; and Saturday, Russian night including Tchaikovsky!!

The Monday Wagner programme contains Siegfried's Funeral March—one of the most sumptuous pieces of music ever written, and a piece which seems to outstrip even the title of just one hero—the Flying Dutchman outstrips even Wagner's own composition. Written by a great composer, it is one of the most popular of all the Dutchman's compositions. The Ride of the Valkyries, The second half of the programme includes "Mercury," "The Sun and Jupiter" from Holst's suite, The Planets.

Tchaikovsky evening should be the most popular one of the week the Fifth Symphony in E minor, which most people must know almost by heart now, so often has it been played in recent years. Sir Henry Wood is particularly famous for his rendition of Russian music, and Tchaikovsky in particular, and the Fifth is one of his tours de force. With a motto theme that recurs in each of its movements—its last appearance being as a kind of hymn of triumph that reminds one very much of 1812, this work would seem to symbolise the dark and brooding but strong and passionate soul of the mighty country in whose hands the destiny of mankind may be, at this minute, resting.

In contrast to the wide fame of this work, Moseritsch is going to play the second concerto, which, I, at any rate, have never heard before. I don't think many have ever heard it. It is the first, in B flat minor, which Moseritsch himself has done more than anyone to make such a household favourite. There is a long history of this concerto, and the swinging, fascinating lift of the Polonaise from his other opera, "Égénie Daring".

Brahms Night

Wednesday is another Brahms night. After opening with the "Tragic" Overture, there are two mighty works. The second piano concerto is the longest, most difficult, and most complex of all existing concertos. Let me say at the outset that it is a magnificent work, packed with everything that the musician and audience expect, and an abundance of those delightful Hungarian dance and folk tunes which I never tire of hearing. Beneath the previous reviews of Brahms. Two features call for mention. Unlike most, if not all, concertos which are written for solo instrument with an orchestral accompaniment, Brahms treats the piano in his concerto almost as a member of the orchestra. This not only has the effect of emphasising the symphonic character of the work and of adding to the heaviness of the texture as compared with Mozart's or Beethoven's concertos, but it multiplies the difficulties of the solo part enormously and greatly adds to his responsibility. The second point is that the work was finished in three movements, the first, third and fourth. As these were all in the same, tonic, key of B flat, and therefore apt to rob the work of sufficient key contrast, Brahms added a fourth, the second, in D minor. In my judgment it is the finest in the whole work, as it also is my favourite. The other work in this Brahms banquet is the fourth symphony. I like this one at least as much as any of Brahms's four symphonies, and probably more. Written in the "bright, melancholy" key of E minor, it charms all the way through. When the first movement was heard, there was an unusual silence, then bursting into applause, which is a set of variations on a grand basis. I hope you will all make a note of this very fine programme.

STUDIO ORCHESTRAL CONCERTS

CONSTANT LAMBERT will conduct the BBC Orchestra on September 3rd (National) in a programme consisting of the Ballet Suite, "Céphale et Procris," by Grétry (Pott's orchestration), Honegger's "Pastorale d'amour," and the "Petite Suite" by Borodin, orchestrated by Glazunov. The Orchestra will again be heard on September 8th (Regional), under the direction of Béla Bartók. This experienced conductor, who was born in Budapest, was appointed conductor of the Hungarian Municipal Orchestra in 1922, and has been director of the Hungarian Municipal Orchestra in 1922, and, after seven years, he combined that task with the direction of the Harrogate Municipal Orchestra. He called for America in 1930, directed the San Francisco Orchestra, and became regular conductor of the Seattle Symphony Orchestra in 1922. He was made Hon. Mus. Doc. of Whitman College, Washington, for services to music in the United States. He returned to his country last year, and has been appointed director of the Hull Philharmonic Orchestra in succession to Sir Henry Wood. His programme on September 8th will include "The Overture to "Euryanthe," "Variations on a Theme of Tchaikovsky" for strings, by Arensky, and Stravinsky's "La Ballade du Prince de Carles," a ballet which he has subtitled a Ballet in Three Deals. Its first performance in England took place at Covent Garden, London, October 19, 1926, under the composer's direction, and has since been given with great success at Sadler's Wells Theatre.

Russian Music

I am looking forward to Saturday's concert very much. I have always had a great liking for Russian music and, while it is tremendously colourful and its powerful and persistent rhythms fairly sweep one along, there is also a sense of tragedy in the melody. Every Russian music is indebted to its folk tunes and national dance rhythms, and the Russian people are particularly wealthy in these traditions, their home territories containing such wild peoples as Tartars, Cossacks, Kurds, Ukrainians, etc., with their exotic antecedents and their wild, nomadic life. At the same time, there is always that strain of haunting fear and superstition through all their music which is not to be wondered at of a people that can scarcely ever have heard of such a thing as stability, and who venerate the ikon.

The 1940 "Air-Hawk" 9
Chassis and Screen Construction Data for this New Communications Receiver.

By W. J. DELANEY

Last week the main details of this new receiver were given, but one small point was not mentioned. It will be noted that the input circuit has now been so arranged that either a straightforward or a dipole aerial may be used, a flexible lead being connected to the earth socket and two sockets used for connection to the ends of the primary winding of the aerial coil. Thus, by plugging the earth plug into socket A1, a single lead may be connected to A2, but by removing the plug and allowing it to hang loose, two leads such as would be employed with a dipole or similar aerial may be connected to each end of the primary winding.

The chassis may be cut from sheet aluminium of 16 S.W.G., or obtained ready-made. The necessary drilling holes will be given next week; and if the chassis is homemade half an inch may be left at each of the side runners for bolting to the end runners when the chassis is formed, or alternatively, short lengths of angle brass may be used to hold the chassis together with greater rigidity. The screws should be cut from the same material, and full details of these are given in Figs. 3 to 10. In all cases it should be noted that the turn-over for fixing purposes is 11n. The only difficulty likely to be experienced in this part of the work is the lining-up of the various fixing holes. To overcome this difficulty one plan is to drill only the two long centre strips and from these, when in position on the chassis, mark the holes for the remaining screens which are bolted to them, and in turn to mark the remaining strips.

Chassis Assembly

Unfortunately, this will mean that all screens have to be bolted in their correct position and then dismantled for the complete receiver assembly, as some of the components must be mounted on the screens before they are placed in position. If you already have the original receiver, the screens will have to be cut down to enable the receiver to be placed in the T-8 cabinet which is illustrated in last week's issue, but this can be carried out without dismantling the receiver, provided that shakeproof washers were originally employed. A hacksaw may be used in a horizontal position and all screens sawn off in situ. The panel should be drilled

The screens are in the correct position when mounting these condensers.

Extension Controls

Mount all valveholders first, then the two L.F. transformers, and attach the two

Fig. 1.—This view of the underside of the chassis shows the network of wiring and the screened tuning sections.

Fig. 2.—Panel layout and drilling dimensions.

long central screens in position. Next place the rear screen carrying the band-spreader condenser in position and bolt this to the chassis, at the same time attaching the lower screen beneath it. The upper screen may then be locked to the L.F. dividing screen. Attach a flexible coupler to the top condenser and put the second screen in position, engaging the spindle end in the coupler. Again bolt this partition down with the under-one in its correct position. Attach a coupler to the condenser on the remaining lower partition, and with a similar coupler on the top condenser place the remaining two partitions on the chassis and lock up. One of the extension controls must now be cut down so that it will couple the two band-set condensers on the underside all drive cleanly through the maximum movement from the front of the panel, and in the event of any stiffness the holes should be opened slightly so that the condensers may be locked in such a position that perfect freedom of movement takes place. Failing
this, the slow-motion drives will stick or slip, and settings of the condensers will not be capable of duplication, or you may find that when tuning the drives will move without the condensers and time will be wasted searching for a fault in the receiver.

Mounting the Remaining Components

The component bracket should be mounted next, and the volume-control panel placed on it. The mains transformer follows, and the electrolytic condensers, after which the chassis will stand rigidly in any position and the remainder of the constructional work may be proceeded with. On the other side of the chassis the B.F.O. coil should be bolted in position, the .001 mfd. condenser soldered to the two tags provided and two lengths of connecting wire attached to the lugs of the condenser and left standing vertically for subsequent connection to the B.F.O. tuning condenser. The B.F.O. screen may then be bolted in position to complete assembly. It is preferable to carry out as much of the wiring as possible before the panel is placed on to avoid marking this, and in one or two points it will be found impossible to complete assembly until wiring has been done.

The coi1 holders in the front and rear section must be raised so that they clear the moving vanes of the condensers mounted beneath them. The simplest way of obtaining the necessary height is to run a nut on the bolt after the bolts have been placed through the holder, and then to attach them to the chassis in the ordinary way. Make quite certain that the coil sockets then clear the condenser and allow a slight distance for any thickness the wiring may be raised by soldering.

Attach the short length of flex to the earth socket before mounting the A.E. strip, and drill a small hole to enable the flex to pass through so that the plug is on the outside of the strip. Cut off the flex to such a length that the plug may be inserted into the socket marked A.2. The components which are locked to chassis and panel must, of course, be placed into position after the panel has been drilled and care should be taken to see that the holes in both register accurately. The mains transformer should, of course, be left until last to enable the chassis to be turned about easily, and the meter should be left off the panel until the end to avoid any risk of damage to it.

In the original model the corners of the lower screens shown in Figs. 9 and 10 were bent out so that the screened lead used to connect the first valve to the H.F. gain-control could be led along the side of the chassis. An alternative scheme is to cut out the corners. The exact position of the screened lead will be shown in the Wiring Diagram to be published next week, and it may be seen on the left of the illustrative Fig. 1. Owing to pressure on our space, the chassis drilling has had to be held over this week, but for those who wish to commence the constructional work the screens may be made up and drilled. The chassis is, incidentally, cut from a sheet of metal measuring 22in. by 16in.

Chassis Drilling Details and Wiring Diagram will be given in next week's issue.
A NORTH SEA DIARY 1914-18

By Commander Stephen King-Hall

Everybody who has heard King-Hall's broadcasts, and the thousands of readers of his candid articles, will be specially interested in this intimate and intensely human day-to-day diary of his life in the war years, as an officer aboard H.M.S. Southampton of the Grand Fleet. With typical sincerity he tells what it was like to live in a light-cruiser in the North Sea from 1914-1918. A cruiser, moreover, which had the unique distinction of participating in all the Fleet actions and which, at Jutland, engaged four German ships at a range of 800 yards.

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Leaves from a Short-wave Log

Esclaps S.-W. Station

A small short-wave transmitter to work 45.85 mc. (1.835 kw.) has been officially inaugurated near Esclaps (Republic of Andorra); it will broadcast daily in French, Spanish and Catalan. Programmes are S.B. on the medium-wave station.

Altered Call Signs

In future, well-known calls as W2XAF and W2XAD from the General Electric Company's transmitters at Schenectady (N.J.), will no longer be heard, as they have now been changed to WGED and WGEA respectively. Other alterations in U.S.A. short-wave stations are WPII (WIXX), East Pittsburgh; WCAI (WIXX), Philadelphia and WBOS (WWIX), Boston (Mass.).

Broadcasts from Costa Rica

With the exception of TBINR, installed at Heredia, all Honduran transmissions are officially suspended from the capital, San José. The principal stations are as follows: TRIP, The Voice of the Prophecy, 31.21 m. (0.96 mc.); TAVI, 45.85 m. (6.35 mc.) operated by the local Catholic Association; TGP, Alma Pico, 31.55 m. (5.83 mc.); TIGN, The Voice of the Republic, 25.17 m. (11.9 mc.); TIEH, The Soul of America, 29.87 m. (10.04 mc.); TILS, Radio Honduras, 30.8 m. (5.9 mc.). TBI NR, Heredia, is now said to be broadcasting on 31.02 m. (0.67 mc.).

And from Honduras

The main short-wave stations in the capital city, Tegucigalpa are HRN (The Voice of Honduras) on 51.06 m. (5.87 mc.) At La Ceiba, HDR2 (La Voz de la Atlántida) on 48.12 m. (6.33 mc.) provides the programmes for distant listeners. In addition, at San Pedro Sula the Echo of Honduras (HRPI), broadcasts with a power of 100 watts on 47.24 m. (6.33 mc.).

Managua in the Log

On a recent date a transmission from Nicaragua detailing in the English language the proceedings of a Central American Congress was picked up from YNII (The Voice of Nicaragua) in the capital city, Managua, and working on 31.06 m. (9.66 mc.), also through the Government station YNMA, on 31.35 m. (9.52 mc.). Other Nicaraguan transmitters which are regularly heard in the British Isles are YNGU, 32.26 m. (9.53 mc.); YNUG, 28.39 m. (6.61 mc.); YNIGG, The Voice of the Voice of Nicaragua, 45.33 m. (6.33 mc.); YNOD, The Latin Wave, 41.63 m. (7.5 mc.), and YNPR, on 34.92 m. (5.89 mc.) all situated at Managua.

Erase From Your Lists

The following Mexico City stations have suspended their broadcasts: KEKK, 49.46 m. (6.065 mc.); KEKN, 48.39 m. (6.2 mc.); and KGEX, 49.1 m. (6.11 mc.).

TELEVISION FROM RADIOLYMPIA

Television is much to the fore at the Radiolympia Exhibition, where more than fifty transmitters are in continuous action in the Television Avenue throughout the day, taking either the B.B.C. studio programmes from Alexandra Palace, relays from the Radiolympia theatre, or closed circuit relays which are not radiated to home-viewers.

The Radiolympia theatre is a reproduction of the famous " Hollywood Bowl," and has been specially designed so that every member of the audience gets an uninterrupted view of the great television stage. It is unique in that it is the first theatre ever to be built solely for sound and television broadcasting.

A daily morning feature of the Exhibition, Jasmine Bligh and Elizabeth Cowell, the two television announcers, are "at home" at Radiolympia during the mornings from 11 a.m. to 12 noon to welcome in front of the television cameras members of the public who would like to meet them personally. Visitors will be encouraged to chat informally to Miss Bligh or Miss Cowell on any subject which may appeal to them in their job, for instance, their holidays, or their hobbies. Amateur singers, impresarios, dancers and pianists are always invited to demonstrate their skill.

These interviews are broadcast to home viewers from the B.B.C. transmitter at Alexandra Palace, and are a daily morning feature during the entire run of Radiolympia. The interviews are informal, visitors being introduced by a parlour-maid just as though they were dropping in to a friend's "announcers" own homes.

Home viewers and visitors to the Exhibition will be able to form a whole galaxy of famous stars who will twinkle in the Olympia firmament.

Bobby Howell and his Band will play throughout the Exhibition. The Kentucky Minstrels, with Harry S. Pepper and Doris Arnold, will be an almost daily feature, with a banjo accompaniment by Troise and his Mandoliers.

Other popular television stars taking part will be the Gordon Radiolympia Girls, C. Denier Warren, Adelaide Hall, J. Murray and Mooney, Ike Hatch, Scott and Whaley, Nosmo King and Hubert, and C. H. Middleton, just to mention a few.

Joan Miller and her staff are seen on the stage in "Picture Pages," one of television's most popular items, and visitors to the Exhibition will be able to watch interesting personalities interviewed before the television cameras.

Production of the stage shows is in the hands of Jack Swinburne, while Harry Fringle is in charge of the television presentations, assisted by Eric Bolesey and Arthur Osmond.

Radio Macentra

It is reported that the French Colonial authorities have opened short-wave transmitters at Konakri (French Guiana-West Africa). The call-signs and channels allotted are: TXCO, 61 m. (5.887 mc.); TXO6, 49.5 m. (7.407 mc.) and TXIC, 54.3 m. (8.694 mc.) in the traffic band.

Curacao Changes Wavelength

Radio CURON, the 150-watt station at Willemstad, Curacao (Netherlands West Indies), has changed its channel from 31.67 mc. (9.473 mc.) to 32.35 mc. (9.106 mc.). The broadcasts now take place on weekdays between G.M.T. 1136-1306, and on Sundays from 1336-1726, the odd minutes being accounted for by the fact that standard time is four hours and twenty-four minutes behind Central European time. Chances may be heard as interval signal and the studio closes down with the end of the Curacao national anthems. Willemstad is roughly distant from London by 4,400 miles.

PERSONAL PARAGRAPHS

Mr. R. F. Campbell has been appointed sub-editor in the B.B.C. overseas department. Mr. Campbell is at present Routes chief correspondent in Poland. He joined Routes in 1896 and went to the Berlin office in 1915.

H. T. Stott, chief technician on the staff of A. F. Bulgin and Co., Ltd., has been elected to the board of this Company. Mr. Stott has been on the executive staff of the firm for the past eight years, and is well known in the radio industry.

C. D. Weton has been appointed to the Board of the Radio Graphophone Development Co., Ltd., in connection with the management of that Company.

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By F. J. CAMM.

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All obtainable from or through Newsagents or from Geo. Fawcett, Ltd., Tower House, Southamptoa St., Strand, W.C.1.
THE TRIO-PEN THREE
Further Constructional Details of This Simple All-wave Three

For the chassis a sheet of aluminium should be obtained, and first of all the bending lines scribed and scored sufficiently to facilitate bending without over-weakening each section. This can be accomplished quite simply with a good penknife blade and a steel straight edge. If metal cutting shears are to hand, it will be found a matter of a few moments to cut out the V pieces as indicated; failing this the cutting lines should be indicated and a suitable saw used.

As frequently pointed out in past issues when fashioning the chassis, the surface should be protected with a soft cloth, and the underside of the chassis used for scribing and drillings, etc. It will be found quite simple to bend the flanges and runners if lengths of wood or a suitable vice is used methodically pressing over the various sections by hand. It should be pointed out that the flanges must be bent over before the runners, adjusting the final alignment when necessary by filing the V section to obtain a snug fit.

A quick method for making the large diameter holes in the front panel and chassis is to make first of all a small drilling to take the point of a woodworkers' brace bit of as near the diameter required as possible. Then, after packing the chassis under the drilling with suitable pieces of wood, the holes can be cut first one side of the chassis then the other, until the bit practically cuts through; the centre-piece can then be tapped out cleanly with a cold chisel, finishing off with half-round file.

Mounting Components
Now with regard to the components. It is essential that shaker-proof washers of the type quoted in the component list be used under both bolt head and nuts.

The condensers C4 and C6 should be mounted on the aluminium bracket complete with the epicyclic drive and the flexible coupling, then on mounting the front panel, the volume-control and key-switch, and two end fixing bolts, this condenser mount can be accurately centred prior to clamping down.

The 'phone jack, reaction condenser, and broadcast condenser should then be fitted, making sure in the case of the broadcast condenser that the dial, neatly and as closely as possible, fits flush with the vernier indicator.

In the case of the bandset condenser C1, this similarly applies with regard to the hair-line indicator, and as this particular indicator is exactly the same as that used in the original Trio-Pen Short-Wave Two detailed in the November 12th, 1938 issue, readers are referred to the diagrams in Fig. 2 of that issue.

Slow-motion Drive
For the slow-motion reaction drive and dial, an Eddystone type 1027 dial plate required modifying by simply enlarging the fixing hole in the centre to 1 in. in diameter. The drive is soldered to the two fixing nuts of the bolts securing this dial plate to the front panel, and in order that the flange of the epicyclic drive may provide sufficiently through the panel drilling for fitment of the pointer, which is supplied with the drive, the dial fixing bolts and nuts, which are 6BA Oak., require filing down, otherwise the pointer may foul the dial plate in its movement.

The fitment of the remainder of the components is quite straightforward and the wiring will be dealt with next week.
News from Members and Headquarters.

Awards and a Special Appeal to Those Members.

It is only fitting that the progress of the period, which sponsors the B.L.D.L.C., should be registered by some progress in the activities of this movement: therefore, with the second issue of the new Practical Wireless, we are able to announce certain items which we feel will meet with the approval of all members. To commence with, we are going to have a membership campaign. The membership list becomes larger and larger each week, but with the very definite and alarming increase in circulation figures, which, incidentally, is going to be accelerated considerably by the new Practical Wireless, it is obvious that quite a number of readers are missing the real thrill of long-distance listening by not signing up with the B.L.D.L.C.

Those readers who are members naturally want to see the movement get stronger and stronger and offer more facilities, contact and encouragement to the real enthusiasts. Do you realise what you can do towards bringing these desires into actual being? How about those friends of yours who are interested in S.W. or medium-wave DX work; transmitting or construction? Couldn’t you show them this issue and get them sufficiently interested to join you on the membership list?

As you see later, the more members in any one area, the greater will be the enjoyment and activities of that section.

To those who are not already members, we can only say, if you are really interested in your hobby of radio, send up at once for a membership certificate, there is no entrance fee to pay, and join in the programmes of activities specially arranged for B.L.D.L.C. members.

The A.E.L. and A.C.R.

In the past, we have given an acknowledgement to our members who have sent in QSL cards from stations they have received which have been situated in the five continents, that is, one from each continent. In this issue we acknowledge those who are known as the A.E.L., or in full, All-Empire Listening. The fact is that a member obtained QSLs from each continent shows that he must be a keen and efficient S.W. listener, therefore, to make our appreciation of his interest and skill more fitting, we have decided to award to award in future a real certificate, of most suitably designed, which will be worthy of display in any radio den. This award will be known as the A.C.R., which stands for All Continents Received.

So that present holders of the A.E.L. will not have to compete afresh for this, we are arranging to replace their existing A.E.L. acknowledgments with the certificate mentioned above. All members wishing to take advantage of this must send in their A.E.L. acknowledgment, together with three-halfpence in stamps, before September 9th, 1939. Envelopes must be marked B.L.D.L.C.

Money for Members

In the business world, it is not unknown for a husband and “sleeping partners,” or, in other words, those who do not take an

Preliminary Details of New Features and Changes in B.L.D.L.C.

active part in directing or furthering the business of the firm. In an amateur non-commercial movement such as the B.L.D.L.C., we do not want members who are “sleeping members.” The whole life of the movement, it is to offer facilities, instruction and render possible the exchange of views and ideas, depends on the active support of all its members. While adhering to the written matter, this incentive will start from September 2nd, so get busy.

And Another Award

The question of inaugurating listening periods for our members has been stressed in a great deal lately by many members. The suggestion below we give but one typical reply to “J.W., of Purley” whose suggestion was recently published, for No. 9, 2800, of Oxford, who says: “I agree wholeheartedly with J.W. and hope many other members have also written in agreement to the suggestion. I would like to write half a page of interesting DX news as it is a very good one indeed, and I hope you will take note of it. I also think that if you held listening periods, say two a week at different times to suit all members, it would give to the Club a very keen interest and would soon increase the number of members.

Well, the idea is quite sound, provided QSL cards are sent in to prove reception. Without these, the whole suggestion would be useless, so for the present, and to indicate that we do value suggestions, we have decided on the following simple arrangement.

Every fortnight, that is from the date of publication of this issue, we will give one book free to the member who sends in the best five QSL cards, provided these have been received by him within one month. The points which will count will be: distance, time of reception, and type of receiver used.

All cards submitted for this award must include a stamped-addressed envelope for their return.

Space prevents further explanation, if such is needed, in this issue, so if you want to swell your library with a good text-book, start sending in those QSL cards, but don’t forget to also send a Reply Coupon with your report to the stations concerned.

Members in London, Kent, Essex and Middlesex

As mentioned above, we want active members, so we have arranged to check our records in the following manner and find out if all are still interested in their hobby. Will all members in the London postal area and the above counties kindly send us a postcard giving their present address and the letters “S.W.” if they are chiefly interested in S.W. reception; “G.C.” if medium or long waves, and “F.C.” if transmitting is their strong point. Will you please undertake to do this as quickly as you can, and let it prove that you are at least active in the interests of the movement.

By the way, these details are also going to enable us to arrange matters so that the B.L.D.L.C. will soon be in a position to offer you real attractions and facilities.

AIMS OF THE B.L.D.L.C.

THE purpose of the club is solely to bring together all those listeners who specialise in the reception of stations situated in distant parts of the world. It is intended to form a community of kindred minds, and in its aims are encompassed the reception of foreign DX stations, mutual help and cooperation.

The B.L.D.L.C. has no commercial aims. Memberships are free. Members can, therefore, still belong to all other similar clubs with similar aims without further incurring any additional financial responsibility through their membership of the B.L.D.L.C.

In order to give members the opportunities of exchanging ideas, the services of the entire technical staff of Practical Wireless are made available to every member.

PRACTICAL WIRELESS, furthermore, will set aside a special section in which reports of reception, constructive articles, information, etc., and the internal affairs of the club will be discussed.

ADVANTAGES OF MEMBERSHIP

1. No enrollment or membership fees.
2. Organization centre in Great Britain.
3. Standardized log-books and verification sheets are obtainable for members at reasonable prices.
4. Regular reports in PRACTICAL WIRELESS.
5. Interchange of ideas with fellow members.
6. Members in same district placed in touch with one another when required.
7. Special meetings and visits to be arranged.
8. Regular problem sheet for members.
9. Members' competitions and numerous other advantages:
10. Members are expected to show an active support of the Club by communicating with Headquarters, and by taking an active part therein.

Tolstoy is a sine qua non in the serious listener's den, as exemplified in the station layout illustrated above and operated by Mr. H. Simpson, of Bradford.
PETO-SCOTT NEW PROGRAMME

Details of the New Receivers and Accessories
Now Being Marketed by Messrs. Peto-Scott

ALTHOUGH not exhibiting at Radiolympia, Messrs. Peto-Scott are still actively producing receivers and aids for the keen constructor, and on this page we show three of the lines which are of prime interest. Communication receivers are available in several types, from a simple three to an eight-valve A.C. model. The latter, known as the Trophy 8, is shown below and this incorporates one of the EPS low-noise H.F. pentodes, followed by an intermetallic metal valve. It comprises a B.P.O. stage, separate H.F. oscillator, A.V.C. and 'phone jack. The price is £12 12s. cash, or £14 14s. 1d. with matched speaker. At the top of this page is the Trophy 6, the major communication model for A.C. operation, with a separate dial electrical bandspread, as distinct from the mechanical bandspread device of the Trophy 8. The Trophy 6 also has a B.P.O., but the input is a triode-pentode. A headphone jack is also provided, and as in the "8" this is in the output circuit. The controls fitted to the Trophy 8 are, in addition to tuning and bandspread, A.V.C. on off, B.P.O. on off, band selector, A.F. gain and pitch-control, whilst the usual send receive switch is also fitted.

An important aid with some of the standard types of receiver is a pre-selector, and there are not many pre-selector units available in this country—other than those of American manufacture. On the right is a two-stage preselector for mains operation also produced by Peto-Scott. This embodies two H.F. stages and a complete mains section, the valves used being the "E" series low-noise H.F. pentodes and a standard full-wave rectifier. Mechanical bandspread is included, and the unit comprises tuning, combined gain and off, wave-range selector, and send-receive switch. Provision is made for a single lead or a double-lead-in. The pre-selector may be used with any straight or superhet/dyne receiver, and all that has to be done is to transfer the serial and earth leads from the receiver to the pre-selector and two further leads are then joined from the pre-selector to the receiver (parallel and earth sockets). The price is £10 10s.

All of the Peto-Scott products are available on easy payment plans, and the range of Trophy receivers, with prices, are as follows:

**Trophy 8**—Cash price £12 12s. Deposit £4 14s. 1d. and 18 monthly payments of £6 6d.

**Trophy 6**—Cash price £9 18s. 9d. Deposit £4 14s. 1d. and 18 monthly payments of £6 6d.

**Trophy 5**—Cash price £6 13s. 6d. Deposit £3 15s. 6d. and 18 monthly payments of £4 10s.

**Trophy 3**—Cash price £3 15s. 6d. Deposit £1 15s. 6d. and 18 monthly payments of £2 10s.

**Trophy 2**—Cash price £2 5s. 6d. Deposit £1 10s. and 18 monthly payments of £1 5s.

**Trophy 1**—Cash price £1 10s. Deposit £1 10s. and 18 monthly payments of £1 5s.

This is the Trophy 6—An A.C. communication receiver with electrical bandspread.

**GOODMANS' LOUDSPEAKERS**

The A.T. Attachment of an Ideal" is a very suitable title for lines by Messrs. Goodmans to their twenty-page booklet which describes their latest loudspeakers. The first eight pages of the brochure deal with the specifications which have been kept in mind in the "Search for Quality" to become commercially possible and this, incidentally, forms very interesting reading. The next two pages deal with the manufacturing, including the materials, tests and examinations which have to be satisfied before the product is passed as being up to the high standard associated with this firm's reputation.

The remaining pages of the booklet give complete specifications of the various models, together with prices.

**G.E.C. TELEVISION RECEIVERS**

This interest in television should most certainly make a point of being included in a copy of the latest catalogue of television receivers produced by the G.E.C.

The letters G.E.C. have been associated with the development of all matters connected with electricity for over 105 years, and the firm has been officially named the standard of G.E.C. It is only natural that their television receivers should be included in the list of such apparatus.

The catalogue, which contains complete details of four models, shows how it is possible for the modest £22 6s. to secure an efficient broadcast receiver, with Lloyd's guarantee, and with the high standard associated with this firm's reputation.

**DUBLINER CONDENSERS**

O Nly catalogue which should be in the possession of every constructor is that issued by Messrs. Dubliner. It is formed by fourteen pages of most interesting details concerning the numerous products for which this firm is famous.

All condensers of all sizes and ratings, fixed and variable resistances, capacitors for use on electrically balanced internal condensation engines, such as those used for commercial or medium-sized or small electric lighting power supplies, power condensers and filters, are given some space in the list of items catalogued in the catalogue.

This name which will prove most useful to the constructor is that which gives a calibrator by means of which one can determine, almost to a fraction, any device related to this firm's output. When you are at Radiolympia, be sure you copy this most useful booklet.

**PREMIER RADIO**

THE catalogue for this season received from Premier Radio Consoles is most comprehensive than their previous issue and that in itself is saying a great deal.

One hundred and eleven pages are devoted to describing and illustrating in the most pictorial manner components, receivers, amplifiers and all equipment associated with radio work, whether reception, transmission or power amplification.

Calculating valves—complete with full data—cathode-ray, communication receivers, complete transmitters, and small units down to wires and units and bolts, cover but the extremes of the wide range of products which are detailed in the numerous pages which form this most useful catalogue and reference book.

When one examines it in detail one has to appreciate that no amateur's library would be complete without a copy of this work, which can be obtained from Premier's for the very nominal fee of sixpence.

**JACKSON BROS. CONDENSERS**

Messrs. Jackson Bros. is well known for its capacitor condensers. Some are housed in their latest list, and and as covers all types suitable for amateur and low-power transmitting, whether short or short waves, it will prove very handy when one comes to select an information of this data. Several types of slow-motion dials are also illustrated, and while prices are not recommended, the quality of the finished article is up to the high standard associated with this firm.
**ELECTRAX**

**LATEST PATENT NEWS**

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

Abstracts Published.

**TELEVISION RECEIVERS.**—White, E. L. C. No. 509764.

Line and sound synchronizing signals, distinguished by duration, are isolated by a valve (Fig. 1) and applied to an inductance 11, the current in which grows to a value dependent upon the duration of a signal. At the end of the signal, the inductance 11 and shunt capacitance 7 oscillate to give a pulse at 13 whose amplitude depends on the duration of the synchronizing signal.

The larger amplitude pulses correspond to frame synchronizing signals and are isolated by an amplitude filter or the whole train may be applied to a frame deflecting oscillator to produce the larger pulse only. The oscillator may be of the type described in Specification 462929.

In order to balance out interference from a synchronizer, etc., the aerial downlead 2 (Fig. 2) and a underground downlead 3 are connected to the ends of the primary 5 of an input transformer 6 which is connected to the receiver.

The transformer has a high permeability core. For accurate balancing, a resistance 10 or 11 and condenser 4 are connected in the primary circuit. Specifications 376670 and 481806 are referred to.


A receiving aerial 1 (Fig. 3) is connected through the primary 2 of a transformer and lead 3, to earth, the secondary 8 being connected through an unscreened feeder to a further transformer, whose primary has an earthed centre tapping 11 and is electrostatically shielded by a screen 13 from the secondary 5, which is connected to the receiver.

Reference has been directed by the Controller to Specification 482786.

**WIRELESS RECEIVING SYSTEMS.**—Kino, R. I. No. 509663.

In order to balance out interference from a synchronizer, etc., the aerial downlead 2 (Fig. 2) and a underground downlead 3 are connected to the ends of the primary 5 of an input transformer 6 which is connected to the receiver.

The transformer has a high permeability core. For accurate balancing, a resistance 10 or 11 and condenser 4 are connected in the primary circuit. Specifications 376670 and 481806 are referred to.

Reference has been directed by the Controller to Specification 482786.

**NEW PATENTS**

Three particulars of New Patents of interest to readers have been obtained from the Office and are published by permission of the Controller of H.M. Stationery Office. The Official Journal of Patents can be obtained from the Controller of H.M. Stationery Office, 25, Southampton Buildings, London, W.C.2, price 7d. weekly (annual subscription £1 1s. 6d.)

**LATEST PATENT APPLICATIONS.**

25543.—Baird Television, Ltd., and Baird, J. L.—Television systems. August 3.

22680.—Barndt Ltd., and Richardson, R. P.—Electric batteries. August 4.

22746.—Belling, C. H.—System for the reception of television, etc., signals. August 3.

22531.—Slophony, Ltd., and Okolossy, P.—Television receivers. August 3.


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

Specifications Published.

510522.—Oelsner, W. (trading as Oelsner & Co., W.).—Acoustical arrangements for studios and concert halls.

510523.—Groves, W. I. (J. G. Farbenindustrie Akt.-Ges.).—Production of submersive multi-colour photographic pictures.


510532.—Baird Television, Ltd., and Medard, L. R.—Synchronisation of oscillation generators.

510888.—Golvinz, V. S.—Radio frequency induce current coils and the like.

510486.—Naamvloow Vennootschap Philips Gloeilampenfabrieken. Protection envelopes for high-tension discharge tubes.

NOW READY!

**WORKSHOP CALCULATIONS, TABLES AND FORMULAE**

By F. J. CAMM

Radiolympia Conventions

THE following arrangements have been made for the Conventions which are to be held this week at Radiolympia. Two of these are open to dealers only, while the remaining four are open to both dealers and members of the general public.

Admission to the Popular Technical Conventions is open to any visitor to Radiolympia and no special tickets are required. To the Dealers' Television Convention admission is by special ticket, while to the other Dealers' Convention admission is open to those holding a dealer's season ticket for admission to Radiolympia or a trade card.

Dealers' Convention—1

Wednesday, August 30th, 1939, 6.30 p.m.

Subject: Short Waves.

Chairman: Mr. E. M. Lee, B.Sc., Associate I.E.E. (Chairman of the R.M.A. Technical Advisory Committee).

Speakers: Dr. R. C. G. Williams, A.C.G.I., D.I.C., Ph.D. (Eng.); Mr. F. E. Henderson, A.M.I.E.E.

Others on Platform: Members of the R.M.A. Technical Advisory Committee; Mr. N. R. Bligh; Mr. L. A. Moon; Mr. R. A. Watson Watt.

Popular Technical Convention—4

Thursday, August 31st, 1939, 6 p.m.

Subject: Television.


Speakers: Mr. R. G. Clark, Mr. J. H. Owen Harries, A.M.I.E.E.; Mr. T. C. Mascnamara.

Others on Platform: Members of the R.M.A. Technical Advisory Committee; Mr. J. L. Baird.
Proposed S.W. Club for Coal Aston

Sir,—I would like to get in touch with all short-wave enthusiasts in my district with a view to starting a short-wave club. Will anyone interested please write or call at my Q.R.A.—C. Winton (GDX).

(Oak View, Eckington Road, Coal Aston, nr. Sheffield).

Correspondents Wanted

Sir,—I have just moved into the minds and I am quite anxious to contact any S.W. enthusiasts or any radio society in the locality. My A.A. licence has just been granted, and I am now using my R.R.A. at Backy, 62a, Park Way, Ruislip, Middlesex.

Sir,—I would like to exchange CWL cards, postcards, stamps or correspondence with S.W. licence in any part of the world. I QSL one hundred per cent.—Don Burv, 618, N. June Street, Hollywood, California, U.S.A.

Sir,—I am a regular reader of Practical Wireless and shall be glad to get in touch with another wireless enthusiast residing in England. I am fifteen years of age, and have built a few simple receivers with.—O. P. Alexander, 107, Hamilton Road, Tollcross, Glasgow, E2.

A 14 Mc/s Log from Golders Green

Sir,—I subbit a log obtained on 14 mc/s (phone and C.W.) by myself and a friend between the hours of 22.30 on August 19th, to 07.00 Sunday, August 29th, hoping that it will be of interest to other readers living in this district.

W1 (22), W2 (19), W3 (7), W4 (16), W7FW, W8 (9), W9 (8), K4 (20), K6 (21), CO (6), PY (3), VPNS, L2DMY, YV (2), VE (4), ZL4BN, SYRKA, YR3F. Near Europeans were not logged.

The receiver was an ov-c2, aerial a 20-metre doublet. According to amateurs on the air at the time conditions were not too good. According to the new Practical Wireless the very best of luck.—T. G. Dickinson (Golders Green).

Battery Communications Receiver

Sir,—As a reader of your excellent journal since No. 1, may I add my plea for a battery communications receiver. My ideal set would be something like this: triode-pentode frequency changer, two I.F. stages with some form of variable selectivity, a.c., d.c., and 1st audio, pentode output; controls to include A.V.C. switch, bandspread, and variable selectivity control. I have omitted a R.F. stage as it can always be incorporated later for those who want it. —G. Brooks (Plymouth).

PRACTICAL WIRELESS

September 2nd, 1939

Problem No. 363

JACKSON had a simple one-valve detector battery set in which a home-made coil was used for short-wave reception. He decided that it would be desirable to replace the homemade coil by a standard component and accordingly purchased a standard 6-pin plug-in short-wave coil. He wound the coil holder on the earthed bar and made the necessary connections, but when tested the receiver failed to function. So far as he could see all connections were in order, and nothing had been damaged or altered in the receiver. What was the cause of trouble? The best manner for the first three correct solutions opened.

Entries should be addressed to PRACTICAL WIRELESS, Ltd., Tower Press, London, W.2.

Solution to Problem No. 362

As Peters had a metal panel, and used a standard 6-pin plug, it was evident to his former neighbour's receiver was wired N.C. at the back of them. W. J. Perry, 169, Wotton Lane, Liverpool 4; W. J. Hubbard "Novelt," 29, Mary Avenue, Shildon, Iossy; J. Diamond, 14, Denbridge Street, Greenock.

TELEVISION AND THE BALLOON BARRAGE

The recent tests with the balloon barrage round London has brought to light certain peculiarities in some television sets. There have been distinct ghost images observed, while at times the whole scene is gone alternately light and dark. The latter effect is always noticed when one or more aeroplanes are flying within reasonable distance of the receiving aerial, and is due to reflections from the machine body causing a rapid change in signal strength at the output of the aerial or is banking. The deflection of balloon surface and mooring cable brings about similar results as the large gas envelope sways to and fro in the wind. A steady ghost image is due to the television signal being reflected to the receiving set, and arriving a very small fraction of a second later than the direct ray. This causes a second but reduced modulation signal to be applied to the set, and the ghost image, therefore, appears slightly to the right of the main picture outlines.

PATENTS AND TRADE MARKS

Any of our readers requiring information and advice on Patents, Trade Marks or Designs, should apply to Messrs. Rayner & Co., Patent Agents, 19, Bank Chambers, 29, Southampton Buildings, London, W.C.2, who will give free advice to readers mentioning this paper.
Vibrators

"I have been experimenting with vibrators for H.T. work and followed the article in your July 22nd issue. I have all the parts except the rectifier. I asked my local radio dealer about one, and the most reasonable model he could offer was 12s. 6d. As I thought this too expensive when I see you used one costing 1s. 6d., I thought I might save expense by asking where you got yours. Could you give me the address of the firm, please?"—R. G. P. Ballycost, Co. Antrim.

The rectifier referred to by the author of the article in question was obtained from Messrs. Galpins, Langle High Road, S.E.13.

Frequency Meter

"I am going to take up transmitting, and feel that a good frequency meter would be a valuable asset. Unfortunately I have looked through all your back numbers, but have been unable to find a design and should therefore be glad if you could give me some indication as to whether you intend to publish one, and if not could help me to make one up."—R. F. (N.W.9).

The simple frequency meter which will be published in the near future. This is a simple valve oscillator with a home-made coil, and is designed to operate fundamentally on the 100-kilometre band. By the use of the harmonics this little meter may be used right down to 56 kec. Alternatively a crystal bar (100 kec) may be used in a meter to give harmonics at every 100 kec through the band. The only trouble with frequency meters is obtaining the preliminary calibration.

Transformer Limitations

"In several of your articles on home-made chokes and transformers you refer to No. 860 stampings. I wonder if you could tell me whose these are and the size of the particular limbs and winding area, as I have a number of stamped sections and should like to use them if possible."—S. L. (S.E.4).

The stampings referred to are standard Stalloy components, and the No. 4 type is the standard "U" and "T" assembly. The "T" has a top limb of 3 in. by 3 in., the other arm of the "T" is 2¾ in. wide. The "U" section has all sides 2¾ in. wide and is 2½ in. high. The winding area is approximately 2½ in. on each side of the centre limb, and in most of the constructional data given in our pages a cross-sectional area of 1 sq. in. is assumed.

W8JK Aerial

"While listening to some amateurs the other week I heard a reference to an aerial which was called a W8JK assembly. I cannot find this in any of my books and wonder if you can tell me what it is, and what particular advantages it possesses."—L. P. (W.N.S.)

The aerial referred to is one developed by J. Krauss, in America, and is a directional beam array. It is generally arranged horizontally and consists of a dipole aerial with reflector each of which is crossed at the centre. In this way, instead of directing a beam only in one direction it radiates practically equally in two directions. It is generally used for 20 metres and below, as on 40 metres it would be too unwieldy. It may be fed from a tuned or untuned line, and we have found one of the best for 20-metre transmission, although for reception it does not appear to offer any marked gain over a standard dipole without reflector.

Simple Superhet

"I have wanted to build a good superhet, but am doubtful regarding a suitable circuit for economy operation. I only wish to use a maximum of four valves (excluding rectifier) and should be glad if you could give some idea of the type of set I could build round that number of valves to give me as many advantages as possible of the modern superhet."—H. E. P. (Watford).

It should be quite a simple matter to make a good set on the lines indicated, using as the valve combination a heptode or similar valve followed by a pentode L.F. stage. This should feed a double-diole-triode aerial from the grid, A.V.C. and L.F. amplification and the output stage could be a good pentode. By using all-wave units the set could be made to cover short as well as the standard broadcast wavelengths and it should be quite cheap to run.

"Sparrows Box Three"

"I have been looking through some of your back numbers and am interested in the "Sparrows Box Three." I suppose I am right in thinking that this may be made up with any type of coil, as I have two coils the same as your aerial coil, which would mean that transformer coupling could be used between H.F. and detector stages. Is this all right I suppose?"—A. R. E. (Bryn).

Yes, it is quite in order to use two of the bare coils. If the circuit in question could be built round any spare coils you may have on hand. It is a very simple circuit, and no difficulties should be experienced either in construction or in the operation of the receiver.

Short-wave Coil Design

"I wish to make up an experimental short-wave receiver and propose to use a home-made coil. To avoid the trouble of winding 4-pin coils, and bare wire should be used to facilitate the use of tapping clips. The aerial should be tapped as well as the reaction condenser, and for maximum efficiency it may also be found worth while to tap the grid connection down the coil. We refer you to an article in our issue dated March 14th last wherein the arrangement of tappings on a short-wave coil were given.

Mains Interference

"I am recently experiencing interference, which apparently comes over the mains, and I think this, as a simple three-valve battery set which has been tried on my aerial and does not give rath down the trouble. What would you suggest as the best cure. The mains are D.C., and the trouble is a low hum which sounds like a small motor running under."

PROBABLY the simple insertion of a special H.F. choke in each lead will prove successful. These can be obtained ready-made, or you can wind them yourself, using 100 turnis of 22 D.C. wire on a 4-pin former. The chokes must be enclosed in a box so that no "live" terminals are left in an accessible position. A 2 or 4 mfd. condenser from each side of the chokes to earth will complete the filter. If this fails to remove the trouble we suggest that you communicate with one of the firms which specialises in the supply of interference-suppressing apparatus, and they may be able to suggest a suitable unit.

REPLIES IN BRIEF

The following replies to queries are given in abbreviated form because of our space limitations.

P. B. (W. Wickham). The trouble appears to be connected with the volume control. We would advise a proper examination by the makers.

S. L. (Glas.). Sensitivity can be increased by reducing a little of the carbon granules or by applying a slightly higher voltage through the primary of the inductance transformer.

L. P. (W.E.). A copy of the issue containing complete constructional data can be obtained from these offices price 6½d. It would appear that one or more of the smoothing condensers in the eliminator has broken down. Don't use it until you have made one on this point.

D. R. (Yarmouth). The circuit is satisfactory. A change of baseband can be used according to your own taste.

S. L. (Blaine—Fellini). Any of the receiver could be used with the coil, and therefore cannot guarantee results.

J. D. (Goldsworthy, S. Audley). S.A. details for the coils are given on the blueprint, and this is being sent under separate cover. The detailed instructions are also enclosed.

G. R. (Bolton). The coil should be suitable but we cannot guarantee it as we have not tried the set with it.

THE coupon on page 624 must be attached to every query.
Practical Wireless

BLUEPRINT SERVICE

FURRY
The "Jumby" Crystal Set... PW71

FLYING GELATIN, T.B., Operated...

One-valve: Blueprints, 1s. each...
Alcove-Receiver, Single-Wave (HF, FM)... PW91

Two-valves: Blueprints, 1s. each...
Four-range Super Mag (2, D, PEN)...
Three-valves: Blueprints, 1s. each...
The "Ailing" Express (3G, D, PEN)...

The "Flying" (2 LF, Trans)... PW42
Other... ...

1936 Sonnotone Four-Four (HF Pen, D, PEN, W. STERLING, Pen)...
Battery All-Wave Three, 2 LF (HF Pen...
Twin Monitor (HF Pen, D, PEN)...
The "Kentucky" (HF Pen, D, PEN)...
The "Centaur" (3G, D, PEN)...

R.C. & Trans)...

The "R.M.A." (3G, D, PEN)...
Canoo Midget Three, 2 LF (HF Pen, D, PEN)...

Short-Wave Sets

One-valve: Blueprints, 1s. each...
Simple S.W. One-valve... PW75

Two-valve: Blueprints, 1s. each...
Midget Short-wave Two (2, D, PEN)... PW78A

Three-valve: Blueprints, 1s. each...
The Perfect 3, 2 LF (SF and Trans)... PW81

Four-valve: Blueprints, 1s. each...
Imp... PW93

S.W. Converter-Adapter (1 valve)... PW84A

AMATEUR WIRELESS AND WIRELESS MAGAZINE

BLUEPRINT SETS.

The sets are described in detail in this magazine...

MISCELLANEOUS.

SUPERHEATS.

Battery Sets: Blueprints, 1s. each...

PORTABLES.

Five-valve: Blueprints, 1s. each...

S.W. Converter-Adapter (1 valve)... PW84A

MISCELLANEOUS.

SUPERHEATS.

Battery Sets: Blueprints, 1s. each...

PORTABLES.

Three-valve: Blueprints, 1s. each...

S.W. Converter-Adapter (1 valve)... PW84A

All-Metal Four (3G, D, PEN)... PW27

Mains Operated.

Two-valve: Blueprints, 1s. each...

Three-valve: Blueprints, 1s. each...

Four-valve: Blueprints, 1s. each...

A.C. Wire-Westinghouse Four... PW80

Mains Operated.

Two-valve: Blueprints, 1s. each...

A.T.S. 600, (D), PEN... PW50

Four-valve: Blueprints, 1s. each...

A.C. Wire-Westinghouse Four... PW80

PP4 Three (D, PEN)... PW23

Gea (3G, D, PEN)... PW90

Other... ...

Mains Operated.

Two-valve: Blueprints, 1s. each...

Three-valve: Blueprints, 1s. each...

Four-valve: Blueprints, 1s. each...

1935 Bonnotone (HF Pen, D, PEN)...

The "Jumby" Crystal Set... PW71

Jubilee Crystal Set... PW72

For a complete list of all Blueprint Numbers, which indicates the issue the set is part of, see page 676.

Amateur Wireless...

Mechanicals...

Wireless Magazines...

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This preface is intended to cover the cost of the Blueprint and the issue (stamped over 64- blueprint in the margin) in which it appears. It is the policy of this magazine to publish blueprints of all practical developing interest.

PRACTICAL WIRELESS

September 2nd, 1939

Those Blueprints are drawn full size.

Copies of appropriate interest. Incomplete descriptions of these sets can in some cases be supplied at the following price, which is the price of a Blueprint Number. This indicates that the issue is part of a set.

Amateur Wireless...

Mechanicals...

Wireless Magazines...

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or 56, High Street, Clitham, S.W.4. Monthly 15s.
ROUND THE WORLD OF WIRELESS

Simple Transmitters

UNDER the regulations governing the use of transmitters in this country, amateurs are at first limited to a maximum power of 10 watts. In view of the fact that abroad many amateurs use powers of 500 watts and sometimes more, some amateurs think that very little can be done with such a small power as 10 watts. A few evenings spent in listening to the amateur transmitters on 20 or 40 metres will show you, however, that considerable ranges may be covered at this small power, and a one-valve transmitter may give you some results when conditions are favourable and when the apparatus is properly adjusted. The type of aerial is of course of paramount importance, and a directional beam will ensure that maximum radiation takes place in a given direction. Proper adjustment of the various voltages and loads are also essential, and in this issue we describe a one-valve unit of the triode type which forms an ideal basis for the beginner. It is by no means a "local" transmitter, and it may be modified, if desired, at a later date by the addition of a power amplifier, building this on a separate chassis and building up the receiving part to a larger scale.

Secret Television Transmitter

SOME trouble has been created lately in the U.S. by an unknown television transmitter, operating late at night and completely wiping out the Canadian band. So far the station is unidentified.

Radiotype

A NEW system of communication was recently demonstrated in New York by the International Business Machines Corporation. It functions somewhat like a telegraph, receiving impulses over the ultra-short waves. Messages were sent by amateurs in all parts of the country to the A.B.C.L.L. station at the New York World's Fair and a Radiotype transmitter relayed them to the Hotel Pierre where they were projected on a large Radiotype screen.

Marine Radio in Eire

THE Marconi International Marine Communication Company have established new offices at 49, North Wall, Dublin, for dealing with the maintenance of wireless installations on ships calling at Dublin, and other matters relative to marine wireless in Eire.

News of the Land

THE first of a series of monthly broadcasts, intended primarily for farmers but containing also matter of interest to urban listeners, will be broadcast on September 14th. The title is "News of the Land." The broadcasts are edited and presented by one of the best authorities in the country, Professor J. A. Scott-Watson, Librarian and Professor of Agriculture at Oxford, and author of several books. "News of the Land" will have a fixed time in the programmes—each fourth Thursday from September 14th, at 6.45 p.m. Another monthly programme, "Midland Farmers' Club," will also have a fixed time allotted to it.

Senior Manx Grand Prix

THE Senior Manx Grand Prix T.T. Race on Thursday, September 14th, finds four places in the programmes. At 1.50 to 2.30 p.m., there will be commentaries by Graham Walker at the Grandstand, Tommy Smyth, at Creg-ny-Baa, and Harry Johnson, at Ramsey Hairpin, in the Northern programme, and again at 3.30 to 4.00 p.m. At 4.15 to 5.20 p.m. in the National programme, the race commentary will continue. In the evening, at 9.0, the presentation of the trophies by the Lieut.-Governor of the Isle of Man, His Excellency Earl Granville, C.B., D.S.O., will be broadcast, with Graham Walker as commentator.
ROUND THE WORLD
OF WIRELESS—Continued

Gormless Gawbies
The half affectionate, half critical nicknames that neighbouring towns bestow on each other have already been the subject of two broadcasts from Yorkshire and Lincolnshire. On Wednesday, September 13th, Lancashire takes its turn and listeners will hear why "Tyldenley Bengs," and why "Proud Preston," and why "West Houghton Keadys..."

Belgium's Radio Listeners
At the end of May, 1939, Belgium numbered 1,012,879 receiving licences, of which 2,784 were for primitive crystal sets, 17,419 for free permits to blind or otherwise incapacitated persons, and 29,917 for re-diffusion services.

The Spoken Word
The Berlin Broadcasting House now boasts of a collection of 120,000 electrical recordings, to which many are still added daily. They include, in addition to excerpts from programmes, such items as commentaries on the 1936 Olympic Games, and last but not least, the almost immemorial political speeches made by Hitler, Goering, Goebbels and other prominent officials of the Nazi party.

Mystery Peace Broadcasts
Readers report the reception of anti-military propaganda transmissions from a station apparently in the environs of London, and working on 48.5 m. (6.185 Mc/s). The authorities are taking steps to locate and dismantle the transmitter.

Native Programmes from Nairobi
The Kenya Government proposes to carry out a series of experimental broadcasts in the Kikuyu language for the benefit of the local native population. The transmissions will consist of music, short talks on hygienic matters, and news bulletins.

Musical Comedy Favourites
Norah Moore, the brilliant Manx operatic singer with the Northern Orchestra, on Monday, September 13th, will render songs and selections from "Gypsy Love," "The Merry Widow," "The Duharry," "Wild Violets," and other musical comedies.

"I THANK YOU!"

Yes, it's your old pal Arthur Askey, seen here at home with his family and his Echo television set. Television is Arthur Askey's favourite pastime, but he leaves all the knob-twiddling to young Miss Askey, who seems to know all about it!

Variety at Home
David Porter, the North's variety producer, is at home again and 9.30 p.m. on September 15th sees "Variety at Home" on the air, with Al Reno, Mag and Alice, Mae Bumber, Gerry Chantler, and Harry Torrani, with Henry Reed's Miniature Variety Orchestra.

The Why and Wherefore
Listeners are often puzzled over the fact that the news bulletins in German, French, Italian and Spanish broadcast by the British and French stations are often heard on several channels simultaneously. The reason is because some States for whose inhabitants they are destined could otherwise easily jam the transmission. If an attempt were made to interfere with several channels it would result in so upsetting the medium wavelength that their own broadcasts would be difficult to receive. As it is, on the short waves deliberate jamming of certain wavelengths is nightly noticeable.

Radio Carthage
Previously known as Radio Kebib, the small Tunisian station working on 215 m. (1,385 kcs), is the first studio to own a Moslem woman announcer. Broadcasts are carried out daily in the French, Arabic and Italian languages.

Hungary's People's Set
The first Hungarian People's Set, which is main operated, has just been issued. The cost, 48 pengos (approximately £2), which includes the licence fee, can be paid in monthly instalments.

New Sudan Station
Plans are being considered for the erection of a low-powered station and a short-wave receiving centre near Khartoum (Anglo-Egyptian Sudan) for the main purpose of receiving and relaying the B.B.C. Empire Service.

Piano as Heroine
In "Concert Grand," the repeat broadcast on September 11th of a play by Maurice Horpoul, a Hull radio dramatist, which had great success at its first leaving a year ago, Gladys Young plays the lead with exceptional distinction. The heroine is a grand piano round which the whole action of the play revolves through a period of sixty years.

Exploiting the "Fixed Time" Programme
The B.B.C. announces that the advantages and popularity of "same-day-and-time" radio variety programmes have been exploited more fully than ever in the plans that have been made for Autumn broadcasts.

Certain programmes for which the Variety Department is responsible, notably the reminiscent "Scrapsbook" brochure, and two concerts by Geraldo and his Orchestra, from Queen's Hall, will be broadcast on Sundays.
A TRITET A.C. OPERATED TRANSMITTER

Frequent Requests are Made for a Simple Single-valve Transmitter for Operation off A.C. Mains, so in This Article Complete Constructional Details are Given of a well-tried Circuit

By L. O. SPARKS

The demand mentioned above could be satisfied in many ways, but the writer, after giving all possible arrangements careful consideration, has decided that the Tritet has so many features in its favour that it forms the most suitable design for the average A.A. holder.

To commence with, the circuit is such that it can be said with safety that no part of it calls for super-critical skill in assembly or operation. It is very reasonable as regards cost, it possesses the advantages of being reliable, is a consistent oscillator, while, last but by no means least, it can provide a very satisfactory carrier wave on two frequencies, thus making it a useful two-band rig.

The circuit arrangement. The valve, the 6L6, is a beam power amplifier of the L.F. type, and an examination of the theoretical diagram of the circuit, Fig. 1, will reveal the fact that the valve actually acts as a triode and a tetrode, and it is from this that the circuit obtains its name.

The arrangement can be split into two parts, the oscillator and, for clearness' sake, the anode circuit. The former can be considered as a tetrode oscillator having the normal screening-grid as its anode. It should be remembered, when dealing with a tritetc, that the cathode is virtually at high-frequency potential with respect to earth, the valve in this instance being of the indirectly-heated type. The true anode provides the second part of the circuit, and can be tuned to the fundamental frequency of the crystal or to a multiple. The first arrangement, provided the coil in the cathode circuit is bridged electrically, becomes a standard pentode oscillator, but in the second, when the cathode coil is tuned slightly off the crystal frequency, and the anode tank tuned to double the crystal frequency, the circuit adopts the normal tritetc principle.

It will be noted that in the latter method the cathode circuit is tuned slightly off its fundamental frequency. This statement might appear rather confusing, therefore it should be realised that if the circuit is tuned to the exact frequency, quite large high-frequency currents will be created across the crystal and impose severe strains. These will not only cause very unsatisfactory operation, but will also tend to break down the crystal with dire financial results. In practice, it will be found that it is best to tune the circuit off dead tone on the high-frequency side, and this not only
A TRITET A.C. OPERATED TRANSMITTER

(Continued from page 199)

reduces load on the crystal, but also tends to increase the output. More about this, however, later.

Construction

From the illustrations, it will be seen that the circuit is simple and straightforward, and that the valve and the two coils are mounted on a sub-baseboard to provide for all direct and direct-coupled leads to the tuning condensers. It is necessary to take a little care with the wiring of the anode valveholder, and it is very advisable to solder suitable lengths of wire to the pins before screwing the holder and/or the sub-baseboard in position.

Ordinary Eddystone baseboard type S.W. valveholders are used as coil holders. The grid and anode terminals forming the connecting points for the associated tuning condensers, this method allowing for very short leads.

The anode tank condenser is mounted on an adjustable bracket which, in turn, is heightened by means of a small strip of wood, 2in. by 1in. by 1in. screwed to the baseboard. By using this bracket and an extension rod complete with flexible coupling, the condenser can be accommodated quite close to the anode tank coil.

As it is very essential to be able to take test of anode and screen current, small lugs of the closed-circuit type are wired in series with the H.T. supplies to these two circuits. The latter connection, incidentally, can also be used for levelling if so desired, although many may prefer placing that control in the cathode circuit.

As is provided by means of two resistances, one between grid and the common negative line, and one in the cathode circuit which also acts in a protective sense in the event of the grid circuit becoming open-circuited.

The valvespecified for the grid resistance must only be taken as a guide, as in many cases considerable improvement in operating conditions can be achieved by increasing or decreasing the resistance to suit the particular valve in use.

The fuse inserted in the crystal circuit serves the dual purpose of protecting the crystal from excessive current and indicating what is happening during tuning operations of that circuit. The holder should be of good make, and care should be taken to see that the bulb forms good contact between the two points.

Tuning Condensers

The condenser used for the cathode circuit is a J.B. Short-wave Special, having a capacity of 0.002 mfd., but to provide the correct L/C ratio, a 0.001 mfd. fixed condenser is connected across it in parallel. This forms a total capacity which together with the coil specified enables the correct tuning, as mentioned in the opening paragraphs, to be obtained with safety.

The tip of one of the moving vanes of the 0.002 mfd. is bent outwards just a fraction so that a short-circuit is formed when the vanes are fully withdrawn with the fixed. This position is required when it is desired to operate the circuit as a simple pentode C.O., as the cathode coil and the condenser is then bridged.

The anode tank condenser is an Eddystone type 1053, having a capacity of 60 mfd. The fixed is bent so that it may be seen on the low side, but it is better for doubling purposes than a larger one with a smaller inductance.

The circuit has a maximum coupling of 50 mfd., but to provide a wider margin of safety, a simple shunt is shown connected across it which is brought into circuit by means of an ordinary push-pull switch. The meter with shunt has a maximum reading of 100 mAs. As an additional precaution against H.F. currents, the meter is provided with a micro-by-pass condenser.

Coils

To take advantage of the frequency doubling properties of the Triplet circuit, three coils will be required for two wave-band operation. These are wound on standard Eddystone ribbed and stranded coil formers of the four-pipe type, the wire being 22 S.W.G. enamelled copper or enamelled.

The winding data is given as a separate table on this page and it should be remembered that the connections must be taken to the grid and anode pins, the filament pins being left blank. When fastening the ends of the windings through the appropriate pins, care should be taken to see that the soldering is efficient without being clumsy. Otherwise difficulty will be experienced in fitting the coils into their holders.

Assuming that the crystal is ground to fit the inside of the case, it is advisable to be faced up on the outside of the case, for this purpose. The crystal should be fitted to the crystal holder as shown in the diagram.

WIRING DIAGRAM OF THE TRITET A.C. TRANSMITTER
ON YOUR WAVELENGTH

The New "P.W."

MY thanks to those many readers who without a dis-sentient voice written to congratulate us on the improved form of PRACTICAL WIRELESS. It has not been possible, I gather, owing to the space occupied by the Show reports, to include all the new features contemplated, but I know that the experimenter is not to be left out of the scheme of things. Some readers have made suggestions that we should run a weekly service page, others that we should publish highly technical material. I should like to sound readers' opinions on these matters.

My gratitude also to those readers who posted letters addressed to me at our stand, and to another reader who sent me a greetings telegram. Owing to the poor response from readers I was not able to take more than a few parties round the Show, and one or two readers who desired to join I was unable to fit in.

It seemed a tragedy that with all the efforts which had been put in to make the Show a success, another international crisis should drop like a bolt from the blue on the very day that the Show opened. It did not, however, affect the attendance nor the sales as much as was first anticipated. The attendance has been gratifying, and it seemed to me that a keener public visited the Show this year.

Our staff was kept busy during most periods of the afternoon and evening. As was to be expected, the morning sessions were somewhat slow. The model workshop attracted a great amount of attention. Its introduction was a piece of inspiration, for it has given many constructors a better appreciation of what they get for their money, and of the work which goes to make a wireless component. I understand that the work of planning and installing the model workshop was left in the capable hands of Mr. A. F. Bulgin.

The Exhibition this year had lost the appearance of a cheap-jack market. In former years the claims made for receivers were undignified, and in many cases untrue. Manufacturers this year confirmed themselves to a sober statement of price and performance. I did not notice any announcement to which exception could be taken. The complete re-modelling of Radiolympia is a tribute to the assiduity and ingenuity of the organisers.

Our Catalin Chassis

SOME hundreds of constructors made a close examination of the receivers exhibited on our Catalin chassis. This is an artificial glass which can be drilled and sawn. It is transparent, and enables every wire to be seen without inverting the set. This is a definite step forward in home construction, and although it is a little more expensive than aluminium or metallised wood, it is well worth the extra cost. Readers who desire to utilise this material should communicate with Catalin, Ltd., Waltham Abbey, Essex.

Varley Dry Re-chargeable Accumulator

OUR old friends Varley were welcome exhibitors at the Show. They have not shown for the past two exhibitions, but I observed that constructors gravitated towards the stand with the name so indelibly engraved on the constructor market. They have just placed on the market a dry re-chargeable accumulator. This is a 2 volt dry cell which will give three times the discharge efficiency on each of its discharges as an ordinary dry primary cell of similar size. It can be re-charged a hundred times or more, whereas the ordinary dry cell becomes useless after one discharge. An even voltage is maintained during each discharge, whereas with a dry cell the voltage rapidly falls. It can thus be used for continuous lighting. Being dry, it can be carried in any position, packed and sent to hot countries, stored and then charged, and used to give its full capacity. The ordinary dry cell would be useless under such conditions. Also, it is lighter and smaller than the free-acid types of accumulator—there is no acid, no jelly electrolyte; it can be carried and discharged in any position, even upside down, and it has a higher capacity for its size than the free-acid types. There are no plates to buckle. The necessary sulphuric acid is introduced during manufacture into the elements and a porous separator. The accumulator consists of an extruded cylindrical lead container, the interior of which is heavily coated with spongy lead. A moist, porous, flexible separator, which is unaffected by sulphuric acid, is then coated on to the interior of this negative electrode. The positive element, which is in the form of a lead cage, is inserted centrally in the cell, the whole aperture then being tightly packed with moistened peroxide of lead. The address of the company handling it is Varley Dry Accumulators, Ltd., By-pass Road, Barking, Essex.

A Paeon of Praise

OUR old friend Torch, upon seeing the new presentation of this journal, has been moved to tears or something, for a sheet of paper having the appearance of tear-stains reached me containing the following inditement:

I loved you from the hour we met,
I knew my lifetime's mate had come;
I knew that loneliness had gone,
And all my empty longing done.
You taught me things I never knew,
How you and I might best employ
The passing hours in sweet delight,
And each of them be filled with joy.
I only saw you once each week—
'Twas not enough. Had I my way
What ecstasy had then been mine
Could I have seen thee every day.
Or did anticipation mean a keenener edge?
Did waiting serve to stimulate desire?
Did foolish growth, through empty days between?
At this late date, it serves not to inquire
Let it suffice, that thou art with me still;
The passing years 'twixt us have made no rift,
And ever stronger thy attractions grow,
And me urge to greater deeds must lift;
Age cannot wither, nor custom stale,
The fond desires in me thou hast inspired,
I looked upon thee and I straightway knew
That thou wert all I ever had desired.
Yet as thy charms increase and still more precious grow,
In thee no selfishness is found, no mean device,
To take advantage of thy faithful slave,
Or make devotion pay a heavier price.

Now! Let me name thee that the world may know
To recognise thee. Let thy name be known!
"Miss Practical Wireless," let me introduce.
More fascinating still,
In her new golden cloak.

Motor-car Ignition Interference

T
HE R.M.A. has addressed the following letter to the motoring journals and the Press:

"The subject of interference caused on short and ultra-short waves by the ignition systems of motor-cars has been one which, quite naturally, has engaged the attention of all interested parties—that is, the owners of the vehicles and those whose radio receiving equipment has a reduced performance standard because of the interfering signal.

"It is felt that a better appreciation of what is involved in the problem would do much to clarify the situation, and with this object in view there are one or two points that warrant special attention, especially if it is remembered that the owners of cars are the owners of or are among the prospective buyers of radio and television receiving sets and are, therefore, mutually interested in this question of interference suppression.

"Thanks to the activities of the British Electrical and Allied Industrial Research Association, as disclosed in their report M-T69 and from advice they have been able to give the motor-car manufacturers in conjunction with British Standard Specification No. 100, it is possible to remove or greatly minimise interference from this source.

"The technical report, reference M-T69, entitled 'Radiated Short-wave Disturbance from Automobile Ignition Systems,' showed quite clearly that the magnitude of the electrical disturbance radiated by the ignition system is dependent to a very large extent on the disposition of the various components. For example, a compact assembly with short H.T. leads and with the coil mounted on the engine block brings about a marked reduction in the disturbance level. This method of dealing with the trouble will not affect manufacturing costs, performance or accessibility in any way, while the electrical radiation was materially reduced in each of 32 vehicles tested.

"The conclusions drawn from these investigations are of the utmost im-
portance and it is felt that many motorists have not yet been made aware of the. If the object of this communication, therefore, is to give them the widest possible publicity through the medium provided by the columns of your journal.

"Now, while this simple reassembly produces considerable benefit to the owners of short-wave and ultra-short-wave radio receiving apparatus, and can be regarded as a material step forward in assisting in the reduction of interference, motorists are asked to give very serious consideration to any additional steps which will still further improve matters. For example, the insertion of a suppressor resistance in the coil to distributor lead will, in a very large number of cases, remove ignition interference entirely, and yet the cost is only of the order of 6d. If the motor-car user will consult any competent garage, he can be advised straight away of what steps can be taken with his particular make of car.

"We live in an age where the spirit of co-operation between parties is, at first sight, may have opposing views has been productive of much good, and although car owners would, quite naturally, view with concern any suggestion which would add materially to the running costs and/or upset the engine performance, it cannot be too strongly stressed that this need not necessarily be the case.

"May we seek the public-spirited co-operation of motorists, therefore, in the adoption of these suggestions. By so doing, they will add materially to the pleasure of radiotelephone users and incidentally extend the range and efficiency of those inter-communication systems now being employed by His Majesty's Forces for military and other purposes.

"Film Fans' Hour"

I AM informed by the B.B.C. that, with the object of catering for the enormous public interest in current films, and the stars who play in them, a new type of variety programme is to be introduced to B.B.C. listeners during the first week in October.

Entitled "The Picture Reporter," it will, in effect, be a film fan's hour; it will be broadcast regularly once a month at a peak listening period.

The material for each of these programmes will reflect the many facets—personal, musical and general—of the film industry. It will be an hour's show, and will provide a vehicle, at an excellent listening time, for B.B.C. films, which hitherto have been brought to the microphone as guest artists in various other variety programmes.
SPECIAL STAND FEATURES AT RADIOLYMPIA

The illustration on the right shows the Chloride Electrical Storage Company's stand and gives a general idea of the neat appearance which the stands presented this year, with their simple and uniform design. The colour schemes were in green and buff with chrome ornamentation. The wide range of Exide accumulators and Drydex batteries may be seen on this particular stand.

On the left is a corner of the Exide stand where A.R.P. products were featured. The design includes a section of an Air-raid shelter, showing the application of portable lighting equipment for emergency use. Special units have been produced for this purpose, in addition to the standard torch or portable lamps.

On the right is the Rothermel stand upon which were featured various test instruments and the popular range of Centralab components. The large illustration on the rear wall shows how the well-known Centralab volume controls and potentiometers are constructed. The various Crystal pick-ups were also featured here.

Holson Batteries also had a "wall stand," and the general appearance of this may be seen from the illustration on the left. Dagenite accumulators, Fuller cells and Pertrex dry batteries were exhibited in a very wide range, and in addition to the various radio units there were many other types such as are used for torches, cycle lamps and similar apparatus.
The 1940 "Air-Hawk" 9
Operating Instructions and Further Constructonal Details of this Receiver.

By W. J. DELANEY

The wiring diagram given on page 624 will make clear any points about which you may be in doubt. Note that for the H.T. positive line the two Eddy stone stand-off insulators are attached at each side of the chassis, being screwed over the holding-down bolts found at the positions indicated. The base of the insulator is removed and the hole opened slightly. The bolts on the chassis will then cut their own thread. Stretch a length of bare wire across soldering tags attached to the tops of the insulators, and the various resistors and leads may then be anchored in this wire and risk of short-circuits will be removed. The position of the tapping clamp on the S.G. potentiometer and the end clip on the H.T. resistance will now have to be found. In the latter case it is slipped along about half an inch, the exact resistance required being 300 ohms. In the case of the S.G. potentiometer it is desirable to have a voltmeter available, and the position of the clip should be adjusted so that 110 volts are applied to the screen. The speaker should be wired to a 4-pin plug so that it may be connected to the socket at the rear of the chassis, and care must be taken to connect the field and the transformer primary to the correct pair of pins. The speaker should also be enclosed in a small cabinet or mounted on a baffle placed in a suitable part of the room.

Testing

For preliminary tests a single aerial lead should be used, and a short length of wire may be slung up in any convenient position in the room for this purpose. The plug on the aerial-earth socket strip should be inserted into socket A2, and the end of the aerial inserted into A1. An earth lead may be plugged into E, although it may be found that an earth makes very little difference on some of the short-wave ranges. Plug in the speaker and set all switches in the "off" position. Plug in coils for the 40-metre band (details of construction of coils will be given next week), and then switch on the mains supply to the receiver. It will be remembered, of course, that the receiver is normally switched on and off sound or faint hum should then be audible in the speaker to indicate that the set is "live." If no such sound can be heard, plug in the "phones" and you should then be able to hear it clearly. It should, of course, be unnecessary to add that the L.F. gain control must be full on for the sound to be heard, although the H.F. gain may be off. Now advance the H.F. gain to maximum and set the tone control to base—

![A three-quarter rear view of the receiver showing the arrangement of the screening positions.]

Chassis drilling and cutting dimensions for the "Air-Hawk." 9.

B.F.O. and A.V.C.

When these adjustments have been found, the various controls of the receiver may be tested and adjusted. The A.V.C. control should be tested first, switching this on and noting the effect on a signal. There should be a slight decrease in volume if the A.V.C. is working, although without proper test instruments the only way to ascertain for certain that it is functioning is to note the effect on a weak station which fades. The operation of the switch will soon show whether or not the signal is being controlled. Next, test the Beat Frequency Oscillator. When this is used, the A.V.C. switch must be in the "off" position, otherwise the
sensitivity of the receiver is reduced and very little will be heard. Tilt the two short leads marked C in the circuit diagram, and which form the B.F.O. coupling condenser, for almost their full length, and then with the B.F.O. switch in the "on" position an adjustment of the control next to the tuning meter will result in an increase in the rushing noise. If a.C. signal can be located the control will enable this to be varied in pitch from a low note to a very high musical one and usually the maximum effect will be obtained from 0 to 5 on the small dial which is fitted. This control may also be used as a station finder by setting it to about 3 on the dial and then searching on the tuning control. The carrier will be heterodyned and a whistle obtained, just as with a simple oscillating detector, but to obtain readable speech the oscillator must be switched off.

Balancing the Meter

Next the signal meter should be balanced, and for this purpose the B.F.O. and A.V.C. switches must be "off." Switch on the meter switch and the needle will probably rise to some point on the dial. If it fails to move over switch off the meter immediately. Place a screwdriver in the slotted top of the meter balancing switch and turn this anti-clockwise to its minimum position and again switch on the meter. It should now move very little. Turn the dial so that there is no signal or alternatively remove the aerial lead. Now adjust the meter balancing control until the pointer is exactly at zero and switch on the A.V.C. If the meter then gives a small reading adjust the meter balance again to halve the difference between the two readings and then with a signal the meter should be capable of giving an accurate setting of signal strength. It should be noted that any adjustment of the H.F. gain control will affect the meter.

To ascertain signal strength all that is necessary is to tune in the station, set the H.F. gain control to this predetermined position and switch on the meter. The pointer will rise and after using the receiver for a few weeks you will be able to make your own "R" scale from the signals which you hear. On the original receiver R9 coincides with a reading of .6 m.A. or nearly full-scale deflection. If the A.V.C. switch is on you will be able to see the effects of fading as the needle will rise and fall with

- This view of the underside of the chassis should be examined in conjunction with the wiring diagram on the next page.

Above chassis view of the "Air-Hawk" 9. The B.F.O. unit wiring is shown separately, on the mains transformer, for clarity.
The TRIO-PEN THREE
Further Constructional Details, and Operating Notes of the Simple All-wave Three

A 635
September 9th, 1939

PRACTICAL WIRELESS

8 the condenser C7, which connects from No. 8 socket on the valveholder (V1) to No. 1 socket on the coil base, should be closely fitted and therefore will obscure sockets 2, 3, and 4 on the valveholder, this should be left until the rest of the sockets have been wired, similarly the grid-leak R3.

The filament wiring and earth returns should then be made, and for preference push-back sleeving type wire should be used, the sleeving in each connection being brought right up to the soldering point.

The transformer leads should be carefully handled and not cut too short if it is proposed at any later date to make use of this component again; the coloured leads are indicated in the wiring diagram and the points of connection should be protected by a short length of Sylflex to prevent possible drifting into short circuit with the chassis or any adjacent component.

The rest of the wiring is straightforward, and provided the metal-ended resistors are kept well clear of other components and chassis, little difficulty should be experienced. The screen leads in particular should be well anchored and well earthed to the bus-bar, and any possibility of shorting should be obviated by carefully checking over the wiring in the immediate proximity.

A 5-way battery cable should be used for all leads excepting the L.T. positive and negative, these latter should comprise twisted flex. Reference to Fig. 3 will clearly indicate the respective wander-plug and male terminal connections.

Having satisfied oneself that the wiring is complete in accordance with the diagram, the dials and volume control settings should be carefully adjusted, and in the case of the bandspread vernier, the 100 degree mark on the dial should be set at zero on the vernier indicator with the condenser vanes in mesh, this will leave 9 degrees to the left of the 10 degree mark reading against the 10 vernier degrees.

Testing
Now after making sure, and before fitting the valves, that the H.T. has not found its way into the filament circuit by testing with a torch bulb, the valves and coil can then be fitted, not forgetting the phone jack-plug, the position of the potentiometers, which should be to the extreme left, and the reaction condenser vanes, which should be completely out of mesh with the dial set to zero, and the aerial and earth can be connected and the receiver tested.

A few words now on the vernier movement. On studying the relationship of the dial divisions to the vernier divisions, setting the dial reading so that the 100 degree mark, for example, coincides with the 10 degree vernier setting, it will be seen that the 10 degrees of the vernier cover only 9 degrees on the dial, thus it will be apparent that there is a difference of $\frac{1}{10}$th of a degree between the degrees on the vernier and those on the dial.

When taking a reading, the degree on the dial that matches more closely a degree on the vernier (which falls anywhere between zero and 10 on the vernier) is therefore an exact reading to one decimal place of the dial reading.

Fig. 3.—Panel diagram for the Trio-Pen Three.

is considerable flexibility in the characteristics of the aerial which with this set is used and, provided the usual points are borne in mind concerning efficiency, any conventional broadcast and short-wave scheme (but preferably not of the fractional wave type unless this is of the doublet type designed for the 9-190 m. bands) will be satisfactory.

Operating Notes
The output volume control should be handled in such a way that while "hunting," with the headphones plugged in, loud signals will comfortably be received,
THE TRIO-PEN THREE

(continued from previous page)

increasing the volume to determine whether or not the speaker is of sufficient power and entertainment value to change over to a louder speaker; otherwise infrequent use of this control will result in unpleasant surprises in signal strength.

It will be found that the location of many stations can be accomplished with the reaction condenser brought to a position of sensitivity which will provide that "Superhet" effect and, by carefully re-adjusting the coupling and variable-imm bias, maximum sensitivity can then be obtained by again slightly increasing reaction, using at the same time the bandspread.

For the reception of C.W. it is necessary in most cases to increase reaction after adjusting the other controls in the above sequence to a point where the valve just oscillates, this state being audibly controllable so that a clear "note" is obtained and the signal key click obliterated.

As it will be found that there is always a marginal adjustment for improving signals of widely different frequencies by altering the setting of the coupling condenser, owing to wide variations in the

logging value of not only weak signals but signals of different frequencies, and it has been proved time and again that where a transmission has been quite easily received and discernible on high fidelity headphones this same signal has been unoperable on indifferent earphones.

Different values in H.T., with proportionate changes in grid bias, can be effected to get maximum response on D.X.

FIG. 6.—WIRING DIAGRAM OF THE TRIO-PEN THREE

Fig. 5.—Drilling diagram and details of the aluminum bracket.

constants and reactance of the coupling circuit, this control should not be considered set after a signal setting has been fixed at what is assumed to be maximum sensitivity, but for logging purposes, the fact that inappreciable variation in the tuned-circuit constants is effected by alteration in the coupling, a dial for this control was deemed unnecessary.

It is important to stress here the advantages of using really good quality 'phones, as it is the sensitivity of the 'phones which ultimately governs the decipherability and
Variable Selectivity

I recently made a short-wave receiver with H.F. stage, and as I wanted it to be as simple as possible, I used a simple tuned-anode circuit. This worked as well as a parallel-fed tuned grid, but was not so

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**Theoretical circuit diagram incorporating a variable selectivity arrangement.**

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selective. After some experiments I replaced the fixed coupling condenser by a small semi-variable backboard mounting component with a maximum capacity of 50 μf. I then made the anode coil of heavy wire on a grooved former, and by adjusting the tapping point on the coil I found that I could vary the degree of selectivity, although, of course, signal strength was also affected. The accompanying theoretical diagram shows the final arrangement.—W. LAKE (N.W.J).

Improved Indicator

When using some types of tuning-dial and also to some extent when using certain measuring instruments which are panel mounted, a difficulty is often experienced in noting the exact indicating point. This may be due to the fineness of the dial engravings and thus some form of magnification is desirable. It should therefore be remembered in this connection that the small pocket magnifiers which are obtainable quite cheaply at the popular stores may often be mounted on the panel, and if the handle or stem is drilled it is in some cases possible to mount these on the panel and use the hinge movement to bring the magnifier over the required part of the dial or scale.—D. BOXON (Perth).

A Valve Adapter

The accompanying illustrations show a valve adapter for voltage and current tests. It is both simple in operation and cheap to construct, practically everything being found in the average junk box. Completed, its uses are many. I procured an old type 7-pin valveholder with side terminals, a 5-pin flash type holder, 7-panel sockets, a 7-way battery cord, the base from a 7-pin dud valve, and five spring contact blades from an old wadacro switch.

A 7-pin hole was drilled into the panel to take the 7-pin holder, the terminals of this having been reversed to fix on spring contacts. The top of valveholder is now flush with the top of panel. Next the seven panel sockets are fixed into the panel, as shown in sketch, and a small hole drilled about ½ in. in front of the socket, and in line with holder socket. This hole takes the test prod. Next, the five spring contact strips were fitted to the 7-pin holder by means of two terminals, so that they lay across the corresponding panel socket.

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**ALL HINTS MUST BE ACCOMPANIED BY THE CORRECT CUT FROM PAGE III OF COVER.**

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THAT DODGE OF YOURS!

**Every Reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay 5/- for the best hint submitted, and for every other item published on this page we will pay ½ Guinea. Turn that idea of yours to account by sending it in to us, addressed to the Editor, "PRACTICAL WIRELESS." George Powney Ltd., Tower House, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Black envelopes. "Practical Hints." DO NOT enclose questions with your hints.**

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**A simple valve adapter for voltage testing purposes.**

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A blob of solder on the end of each socket will give greater tension to the blades. The battery cord is then connected as shown, and the other end connected to valve base; each wire being a different colour enables this to be carried out easily.

For test purposes the adapter plug is inserted in the set, and valve under test is plugged into the adapter. Voltage tests are taken at various sockets in the normal way, while current is measured by inserting one test prod into the anode socket on the panel, and the other test prod into a small hole in front of socket. Pressing on this prod pushes down the contact blade which opens that particular circuit; taking out the prod automatically closes it again.

All types of valves can be tested as the circuit at each pin can be opened. The 5-pin adapter is made with an old base and a 7-pin flash type holder connected together to correspond to panel connections. The whole panel fitted into a box together with a motor makes this a very useful tester.—R. BEAN (Newcastle-on-Tyne).

A Make-shift Potentiometer

When trying out parts of a high-power rig recently I found a need for a high-current potentiometer. I had nothing suitable handy and for a time was at a loss as to how to dispose of the unwanted excess. I then thought of the dimmers often used for amateur stage work and accordingly carried out the following idea. I obtained two large screw-top glass jars and filled these three parts full with tap water. A length of heavy-gauge bare copper wire was then placed at each end of the two jars, a single "U" inverted connecting the two jars together. A milliammeter was inserted in series with one of the outer wires and the other side of the meter and the wire in the remaining jar was used as connecting points. When switched on there was negligible current flow and accordingly the conductivity of the liquid was gradually increased by the simple process of adding ordinary table salt. This was dropped into the two jars, pinch at a time, until the current reading desired was obtained on the meter. Of course, the idea is not a permanent one, but is very simple as a make-shift when proper apparatus is not readily available.—R. PERAVY (Stoke Newington).
Radio as a Career—2

Continued from Last Week. This Article Gives Some Helpful Advice to the Prospective Service Engineer and Explains How a Start can be Made

By FRANK PRESTON

To make a diagram of any section of a receiver under test. Actual wiring is difficult to follow, but once a circuit diagram has been drawn the complete arrangement is straightforward.

Practical Experience

It is desirable that the prospective engineer should have had at least a little experience in the construction of components, for he is then in a far better position to be able to make useful tests of components in a receiver which are suspect. A certain amount of mechanical ability is essential, for he must be able to build and re-build receivers in a business-like manner. The ability to make good, neat soldered joints is equally important, for all connections are soldered in commercial receivers. A knack of quick diagnosis of probable faults should be cultivated as soon as possible.

Valveholder connections should be memorized if possible, although it is easy enough to paste a chart of these inside the

Start at the Bottom

It is essential that a start be made at the bottom, for it is the sound knowledge of the underlying principles, combined with the ability to apply those principles in a logical manner, which enables the wireless amateur to become an efficient professional engineer. A complete knowledge of circuit diagrams is essential; the service engineer should be able to look at any diagram and, after a few minutes, have a clear idea of the precise circuit arrangement.

The radio engineer should also teach himself to think in terms of theoretical diagrams, for when he can do that he can save himself an immense amount of time in testing and checking a receiver. At the same time, he should be able quickly to make a diagram of any section of a receiver under test. Actual wiring is difficult to follow, but once a circuit diagram has been drawn the complete arrangement is straightforward.

Lead of the attache case used to carry the service kit. The resistors in all commercial sets are colour-coded, so the code should be learnt by heart. It is not proposed to go into full details concerning these points in this series of articles, for they have all been dealt with previously in the pages of PRACTICAL WIRELESS, and back numbers can be obtained if desired.

Initial Employment

For present purposes, it will now be assumed that the prospective radio engineer has gained the initial experience referred to in the previous article, and that he is able to meet the simple requirements set out above. He should stand a good chance of obtaining employment in a radio factory, but then he might feel that there is no
scope for his ability, if he is employed as an assembly hand. That is no reason to despair; if promise is shown there will soon be a chance to obtain a better position after combining the technical, practical and experimental experience. The new work might be in the same factory, or elsewhere, but the factory experience and general knowledge of factory production methods will be invaluable.

Free-lance Service Engineer

We might suppose that it is decided to start business as a free-lance radio service engineer. What procedure should be followed? In the first place it should be borne in mind that most dealers employ at least one service engineer, and that owners of receivers are more likely to ask the supplier than anyone else to attend to service work. That, of course, applies principally to comparatively new sets. For this reason it often pays to adopt one of the suggestions made last week; that is, to make arrangements with a local dealer who does not employ a service man to allow you to handle his service work. It might also be possible at the same time to work up a connection outside that dealer's area.

Publicity

Should the idea of linking up with a dealer not appeal, a certain amount of capital will be required to obtain local publicity. Well-worded circular letters are often most helpful, although some prefer to send out handbills, take small advertisements in local papers and to take "space" on the screen of a local cinema. One engineer made a very good start by the obvious and rather tiring method of canvassing the area immediately after having handbills distributed. His method was to ask politely if a receiver was installed and if it was working satisfactorily. If not, he offered to make a superficial test on the spot and to suggest the probable remedy for any defects. Should he be informed that the set was in perfect condition, he asked to leave a self-addressed printed postcard on which the word was to be written only his name and address, and post at any time that the set was in need of attention. The card also gave his telephone number.

Service Charges

It is important that this method of making a test free of charge should apply only in the event of initial canvassing, since it is generally found to be bad business to offer any form of free service in normal times. Instead, a fixed charge should be made for testing and reporting on the set. It must be arranged that this charge would be deducted from the account should the engineer be given the work of effecting the necessary repairs.

In giving a report, it is desirable that it should be worded simply and that the cost of repairs should be stated. This saves trouble in collecting payments due and prevents the possibility of later ill-feeling on either side. There is seldom any justification for price-cutting on repairs; make the price a fair one and do not let there be any doubt that the work is efficiently carried out.

Quick Service

When called upon to examine a receiver, the service man should be prepared to give straightforward and intelligent answers to the many questions he is almost sure to be asked. In the majority of cases it is wise to refrain from technicalities.

It is agreed by most service engineers that the receiver should be taken from the owner's hands for a week or more, or at the engineer's workshop for the repairs to be carried out. When other than the simplest of repairs are required this is obviously essential, but even when only a minor job is done it is a wise plan to make a thorough check and take a few measurements before passing on.

A suitably fitted-out attaché case, with good multi-range meter, small tools and a few spares, is essential to the successful service man.

PRACTICAL WIRELESS

September 9th, 1939

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PRACTICAL WIRELESS

September 9th, 1939

The Varley Dry Accumulator

Details of Another New Idea Which May Change Modern Receiver Design

Every amateur is familiar with the modern portable accumulator, wherein the free acid is isolated to prevent spilling and other troubles. An accumulator, as distinct from a primary or dry cell, has the advantage that it offers a higher voltage per cell, and that it may be recharged when exhausted. The nominal voltage of an accumulator is 2, whilst a primary or dry cell is nominally rated at 1.5 volts. The discharge rate of a dry cell is also very different from that of an accumulator, the latter delivering its current steadily at a gradually falling voltage, whilst the dry cell gives maximum current for a short period during which the voltage drops rapidly. It then remains constant for a period at this reduced voltage before eventually becoming exhausted. For years attempts have been made to provide a rechargeable dry cell which, with the drawbacks of any form of free acid, and in the latest Varley Dry Accumulator we find the realisation of these ideas and trials of the research engineers. In addition to the advantages above mentioned it is actually as efficient as the standard acid cell, but much more portable and compact.

How It Is Made

In its basic principles the new Varley cell is identical to the standard acid accumulator, with the difference that the acid is introduced during manufacture into the elements of the cell and a porous separator. There is an extended cylindrical lead container, the interior of which is heavily coated with spogy lead. This is the negative electrode, and on to the interior of this is attached a moist, porous, flexible separator. This separator is unaffected by sulphuric acid. For the positive plate a lead cage is employed and this is inserted centrally in the cell. The whole aperture is finally tightly packed with moistened prismatic lead. It is obvious from these details that the entire cell is a more or less "solid" assembly and no movement of the elements can take place, enabling the cell to be turned about in all directions without danger of breakage, and it may also be subjected to shocks without disturbing the function of the cell.

The chemical action is identical to the normal accumulator, and when the cell is discharged it may be recharged in the usual way, a small quantity of distilled water only being added to retain the moisture in the cell. The water is immediately absorbed by the elements. To ascertain the condition of the cell on charging, all that is required is a voltmeter, the hydrometer or any similar acid proving device being dispensed with. The discharge curve is much straighter than that given by the normal accumulator, and the cell is admirably suited for certain scientific apparatus where a constant steady output is of the utmost importance. Sulphuration and corrosion are non-existent with this new cell, and we have subjected a sample to tests which fully substantiate the makers’ statements.

The advantages of the accumulator, compared with the ordinary dry cell, may be summarised as follows:

1. The cell has a higher discharge efficiency on each of its discharges as the ordinary dry cell of similar size.
2. The cell may be recharged 100 times and more, whereas the ordinary dry cell becomes useless after one discharge.
3. The cell remains at an even voltage during each discharge, whereas the voltage of the ordinary dry cell falls rapidly.
4. The cell may be used for continuous lighting, whereas the light from an ordinary dry cell falls off during discharge.
5. The cell, being dry, can be carried in any position, packed and transported to hot countries, stored and then charged, whereas the ordinary dry cell becomes useless under such conditions.

Compared with the ordinary accumulator the advantages may be summarised as follows:

1. The cell is dry and solid.
2. It is lighter, smaller, and more compact than free-acid types of accumulators.
3. There is no acid to spill; no jelly element.
4. It can be carried and discharged in any position.
5. It can be charged and packed as ordinary dry goods, and sent to any part of the world.
6. It has a higher capacity for its size than any ordinary dry battery of this cell.
7. There are no plates to buckle and it is free from disintegration.

EGWEAR SHORT-WAVE SOCIETY

Secretary: Mr. W. N. Bowley (IEEE/WS CE) Chairman: Mr. W. J. Slade (IEEE/WS CE)

Meetings - Every week on Wednesdays after dinner at the Tunbridge Wells Polytechnic.

Wblers: All radio enthusiasts are cordially invited to attend.

The Society has just been started and meetings will be held weekly from now.

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We have already described in our pages the principles of secondary emission and electron multiplying devices, but until this year's Radiolymia opened its doors the majority of these devices had been produced and used only in the laboratory. On Stand No. 18, however, Vacuum Science Products were showing not only a commercial version of an electron multiplier, but also broadcast and television receivers in which a standard multiplier was incorporated. The new tube is known as the "Augatron" and is an all-British invention. It is to be produced in this country (the samples on view at Olympia having been imported) and will shortly be on the market at a very reasonable cost.

For the benefit of those who are not familiar with the principle of secondary emission, it may be stated briefly that when a surface is bombarded by electron streams certain electrons are released by the surface and these are known as secondary electrons. In modern valves the electron stream from the filament or cathode is directed to the anode, and obviously any hindrance or opposition which would be set up by secondary electrons would impair the efficiency of the valve. Accordingly, various steps are taken to avoid the effect, which is also, incidentally, present in the modern cathode-ray tube.

Electron Multiplier

In an electron multiplier, however, the phenomenon of secondary emission has been taken advantage of, and arrangements are made to pass on the emission from one electrode to another, each adding to the stream and thereby increasing the final current which is obtained. In the "Augatron" each of the secondary electron emitting sources is in the form of a sensitized metal plate in which are a large number of holes in funnel-shaped depressions. The primary emitter, or first cathode, may be any form of electron source, such as a photo-electric or thermionic device, and grid control is provided as current, and thus it gives, for the desired input of 10 microamps, an output slope of 40 mA per volt at 10 mA current, a figure which is three or four times better than the best radio valves on the market.

**Six-stage Multiplier**

To obtain the overall gain of 1,000, a 6-stage multiplier has been standardized, and this runs at an overall voltage of about 2,000—300 volts per stage.

Under these conditions each normal secondary emitter gives a stage-gain of about 20.

The new Augatron which is described here.

The final anode is so arranged that it gives a gain equivalent to approximately 7. Inter-electrode capacities have been reduced and the tube is quite suitable for use on the ultra-high frequencies used for television.

A complete television receiver was, in fact, in operation at the stand at Radiolymia and two of the tubes were employed on the H.F. side of the receiver, followed by the usual de-modulator, etc. Owing to the very high gain, much associated equipment found in standard radio circuits may be dispensed with, and as a result the noise level is kept down and increased amplification is possible. The essential data of the television "Augatron" is as follows:

- Heater voltage: 2.0 v.
- Heater current: 1.5 A.
- Accelerator voltage: 300
- Voltage per stage of multiplication: 300
- Maximum anode dissipation: 1 watt
- Recommended anode current at 125 v.: 8 mA.
- Input capacity: 4 µfd.
- Output capacity: 7.5 µfd.
**AUTHORITATIVE ENGINEERING TRAINING**


Write to-day for "The Engineer's Guide to Success," containing world's widest choice of home-study engineering courses—Wireless, Television, Electrical, Mechanical, Aeronautical, Automobile, Building, Civil, Chemical, Gas, etc., and which alone gives the Regulations governing admission to the Recognised Engineering Institutions. Mention branch, post or qualification that interests you. The T. I. G. B. Guarantee training until successful for the one fee.

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**PROGRAMME NOTES**

**Mr. Walker Wonders**

Even when he blends business with pleasure, Mr. Walker, radio's junk-man, just cannot help getting mixed up with what he expressively calls "pretty how-d'ye-do's." Each summer, when the junk business suffers its annual slump, he joins the exodus to the coast, there to peddle novelties and toys and so keep in touch with things and provide "the milk and honey." This year, at Brighton, however, he became involved in a remarkable affair—so exciting that he became an aneunissis. Ernest Dudley, has deftly turned it into a first-rate thriller for radio, and it is to be broadcast on September 19th (National) and September 21st (National). Set against a background of concert parties, the bathing pool, fun fair, a dance hall, and all the other entertainments of the big resort, the story intermingles the plot with plenty of amusement. Production of "Mr. Walker Wonders" will be by Gordon Erier.

"Further Outlook, Warmer" is for the broadcast writer's table. The author of this farcical comedy for broadcasting writes comparatively rarely for radio; but when he does so a memorable production is always the result. H. H. Jeans has this time turned his impish fancy to the predicament of Sidney Tripp, schoolmaster in a small country village. Mr. Tripp is suspected by his wife one morning of a slight attack of 'flu. He protests that he feels perfectly well, but on the doctor being summoned it is found that he has rather more than a normal temperature. This rises by alarming leaps and bounds, finally breaking the thermometer. Next a slight smell of singeing is observed and people feel uncomfortably warm; if sitting too near Mr. Tripp; he remains his simple and imperturbable self. Finally, a series of disastrous fires are traced to Mr. Tripp's presence in their neighborhood. His subsequent adventures in a circus and elsewhere provide, in the play, nationwide consternation andecd, and in Barbara Burnham's production, prove widely amusing. Richard Gooden will find in Mr. Tripp a role after his own (acting) heart. This broadcast will be given in the National programme on September 8th.

**A Student Vagabond**

When he was a student at Birmingham University, Gabriel Seal, now a teacher in a London secondary school, spent his vacations cycling in Poland, Russia, Scandinavia, and the Balkans. He covered more than 5,000 miles and spent less than £1 a week. In a "Seeing Life" talk on September 11th, from the Midland Regional, Mr. Seal will tell of his travels. He has broadcast before—in Midland radio plays, and while in Birmingham he undertook occasional work at repertory theatres.

Two Islands—a Study in Contrasts

SYDNEY S. Griffith, author of the Anglo-Welsh novel "Little Calvary," will give a talk on September 13th, in which he will describe two islands he knows. They are St. Helena and Bardsey—the talk will be a study in contrasts.

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**PRACTICAL WIRELESS**

September 9th, 1939

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**NEW PRODUCTS**

ARMSTRONG QUALITY YEAR

Our 1939 range of chassis has been designed with one aim in view—Quality. We appreciate the details of "Success" are pure, high quality bringing the real thing that matters and the only vital reason for introducing a new receiver. Our 1939 chassis include the following:

MODEL S810
"SUPERFINT-Straight" 5-valve High Fidelity Receiver chassis. All-valve, superfinet and providing ample power for output of 10 watts to loudspeaker with R.F. pre-amplifier. R.C. coupled push-pull tunnel output capable of handling 8 watts. **PRICE £12 12: 0**

MODEL AV36 5-valve All-wave Superfinet chassis. This all-wave finet chassis has all R.C. coupled circuits and gives an excellent output of 8 watts for the R.C. coupled output tube, capable of handling 8 watts, and gives good quality reception with high radio and gramophone, for an economical price of 8 gns.

SEE AND HEAR THEM AT OUR SHOWROOMS

ILLUSTRATED ART CATALOGUE ON REQUEST
ALL CHASSIS SENT ON 7 DAYS APPROVAL

ARMSTRONG MANUFACTURING CO.
WARLERS ROAD, HOLLOWAY, LONDON, N.7.
(Arching Holloway Arcade) Phone NORA 3273
Leaves from a Short-wave Log

Tune in Montreal

PENDING the construction of a high-power short-wave transmitter, the Canadian Broadcasting Corporation for the relay of the Montreal radio programmes commenced to use the 100-watt station CFYX, on 49.96 m. (6.005 mc/s). Broadcasts may be picked up on weekdays from B.S.T. 13.45-19.30, and on Sundays from 15.00-04.15. All announcements are made by a man.

The Voice of France in the Far East

GOOD signals are now being obtained from the 12-kilowatt Radio Saigon Station FXO (French Indo-China), on 49.05 m. (6.116 mc/s). Broadcasts for Europeans; with announcements in French and English, are made daily from B.S.T. 05.46-06.15, and from 12.45-14.40, with a special English programme between B.S.T. 12.00-12.15. (11.75 mc/s). A European programme is given from B.S.T. 03.30-03.45, and between 06.15-06.45, with a transmission for English speaking peoples between 03.15-03.30. The interval signal is one stroke on a gong, and the call as above with its French translation: La Voix de France en Extrême Orient.

Haiti in the Log

Haiti, Port-au-Prince (Haiti), on 31.25 m. (9.06 mc/s), 100 watts, was recently logged after midnight B.S.T. Announcements were made by a man in French, Spanish and English; with four chimes as an interval signal. The address is Boite Postale A/177, Port-au-Prince, Haiti.

Broadcasts from Hsin-k'ing

WITH the call: This is the Voice of Manchukuo, daily, on 25.48 m. (11.775 mc/s), NTYC, a transmitter at Shinkyo (Hsin-k'ing) broadcasts a musical radio programme, followed by a news bulletin in several languages, between B.S.T. 22.00-23.30. The transmission closes with the National Anthem of that country followed by a series of chimes.

Alterations in Amateur Transmitting Band

ACCORDING to the decisions taken at the Cairo Conference the frequency bands for amateur transmitters, which came into operation on September 1st, are as follows: 5 m. (60 mc/s) 5.128 m. (58.5 mc/s) 10 m. (30 mc/s) 10.71 m. (28 mc/s) 20.83 m. (14.4 mc/s) 21.45 m. (14 mc/s) 41.67 m. (7.2 mc/s) 42.86 m. (7 mc/s) 75.95 m. (3.95 mc/s) 81.41 m. (3.685 mc/s) with the exception of the channel 78 m. (3.946 mc/s) 82.53 m. (3.645 mc/s) 85.71 m. (3.5 mc/s) and 150 m. (2 mc/s) 174.9 m. (1.715 mc/s).

Fiji Islands Calling You!

A MALAGAMATED Wireless (Australasia) Ltd., of Suva (Fiji), are using a 400-watt station with the call VTFD, for a weekday programme between B.S.T. 11.00-13.00. The power of the transmitter will be increased to 10 kilowatts in the near future. In the meantime the channels used are 19.79 m. (15.16 mc/s) 25.22 m. (11.985 mc/s) 31.44 m. (9.542 mc/s) and 48.94 m. (6.13 mc/s).

Listen to Guatemala

RADIO programmes from TGWA, Guatemala City, on 30.98 m. (9.685 mc/s), can now be heard at good strength on most nights after midnight B.S.T., until 03.00, or 04.00-08.00 on weekdays. The station also works on 19.28 m. (15.17 mc/s) on weekdays from B.S.T. 19.45-20.45 and on Sundays from 19.45-00.15. The call is Broadcasting Nacional, La Voz de Guatemala.

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Armstrong Manufacturing Company

A Thoroughly new Armstrong catalogue only a small amount of data in a folder. It is full of most interesting details of their special series of chassis receivers. All the chassis are complete with valves and each is guaranteed accurately gauged and individually tested under severe conditions. Prices are sent on seven days' trial and money is returned in full if the chassis does not meet all your requirements. The chassis include A.V.C. (50), A.C. and B.C. (40), A.C. and D.C. (20), and B.C. (10). A.C. and D.C. (40), A.C. (50), and B.C. (10). A.C. and D.C. (20), and B.C. (10). A.C. and D.C. (10), A.C. (5), and B.C. (5). A.C. and D.C. (10), A.C. (5), and B.C. (5). A.C. and D.C. (10), A.C. (5), and B.C. (5).

Taylor Electrical Instruments, Ltd.

A BROCURE issued by this company gives full details of the various test instruments in which they specialise, including universal meters, test-meters, valve testers, signal generators, oscillographs, etc. Supplementary leaflets give more exhaustive data on the individual items, all of which may be obtained on application to the makers. The 70-piece goniometer kit. Taylor-meter is the most effective instrument rated at 2,000 ohms per volt, and measuring voltage and current either A.C. or D.C. resistance, and by means of a small selector, output capacity and inductance.

Cabinet Models

Stentorian Universal Principal & Extension Speakers

Whiteley Electrical Radio Co., Ltd., Mansfield, Notts.
TELEVISIONS

Televising Newsfeeds

There is still a good deal of opposition among cinema exhibitors to the present practice of allowing the B.B.C. to televise current newsmell in the normal Alexandra Palace programme. When it was first remembered that these films never last longer than ten minutes and are generally shorter even than that, it is difficult to see how this can be a menace to the box-office receipts of cinemas. Surely the main cinema appeal, apart from the news, is the theatre, with the two feature films, and since features other than those obtained from non-commercial sources are still barred to the B.B.C., there seems little reason for all this talk about newscasts. In any case, one supplier of the newscast is already a company interested in big-screen television. To meet the situation, people's receiver, and according to the latest information transmission time in that country has been extended to the radiation of programmes continuously from 3 p.m. to 10 p.m. each day. In Berlin itself a second ultra-short-wave transmitter is to be erected on the top of the Kastel's store in the east end of the city. This will be used in conjunction with the Feldberg and Brecken stations which are due to be opened in the early autumn. If this does happen, then the German television station will be capable of providing satisfactory programmes to a quarter of the country's population.

C.R. Tube Spot Distortion

The standards of performance for cathode-ray tubes manufactured for television picture reconstruction need to be very stringent if the results are to be completely satisfactory. Certain characteristics must be formed and one of most interesting in this connection is that for "too small a focus". It is a condition which is known as "astigmatism" which is a distortion of the spot, such as that when it is focused to give maximum definition in one direction of deflection, it does not give maximum definition in the other direction. The extent to which this defect exists is determined by an observation of the line-width under specific conditions with an exchange of horizontal and vertical deflections but without any readjustment of focus. Then, again, under conditions of modulation it is possible for the spot area to change in size and position, and possibly the shape of the spot may be affected by modulation. This form of distortion is best observed by the application of modulation which will form a regular pattern on the screen with sudden transitions from black to white. For example, a 10-kilo-cycle frequency producing traverse in the horizontal direction, together with a 50 cycles linear traverse in the vertical direction, will produce a good mesh pattern for test purposes. Deflection deforming can also occur in both cycle-type and electromagnetically-operated tubes, and with a pattern produced on the screen all cycles linear traverse in the vertical direction, will produce a good mesh pattern for test purposes. Deflection deforming can also occur in both cycle-type and electromagnetically-operated tubes, and with a pattern produced on the screen all cycles linear traverse in the vertical direction, will produce a good mesh pattern for test purposes. Deflection deforming can also occur in both cycle-type and electromagnetically-operated tubes, and with a pattern produced on the screen all cycles linear traverse in the vertical direction, will produce a good mesh pattern for test purposes. Deflection deforming can also occur in both cycle-type and electromagnetically-operated tubes, and with a pattern produced on the screen all cycles linear traverse in the vertical direction, will produce a good mesh pattern for test purposes. Deflection deforming can also occur in both cycle-type and electromagnetically-operated tubes, and with a pattern produced on the screen all cycles linear traverse in the vertical direction, will produce a good mesh pattern for test purposes. Deflection deforming can also occur in both cycle-type and electromagnetically-operated tubes, and with a pattern produced on the screen all cycles linear traverse in the vertical direction, will produce a good mesh pattern for test purposes. Deflection deforming can also occur in both cycle-type and electromagnetically-operated tubes, and with a pattern produced on the screen all cycles linear traverse in the vertical direction, will produce a good mesh pattern for test purposes. Deflection deforming can also occur in both cycle-type and electromagnetically-operated tubes, and with a pattern produced on the screen all cycles linear traverse in the vertical direction, will produce a good mesh pattern for test purposes. Deflection deforming can also occur in both cycle-type and electromagnetically-operated tubes, and with a pattern produced on the screen all cycles linear traverse in the vertical direction, will produce a good mesh pattern for test purposes.
A Hope Not Fulfilled

ALTHOUGH rather forlorn, the radio industry, indeed the whole country, still hoped that Parliament, before it went into recess, would at least make some concrete statement on the television situation. This would have given an enormous fillip just prior to the opening of Olympia, and added materially to the business done. But as it is known that the prolonged delay of provincial extensions has convinced a number of potential set-buyers in the Alexandra Palace service area that the television transmissions are still experimental and purchases have been withheld. It is impossible to find any justification for the Government's silence on this important issue, and an early opportunity is being taken by interested M.P.s to remind the Treasury of questions to which the Postmaster-General has been subjected during the past few months. One has gone so far as to ask whether he will not now, in a position to make a statement to the House with reference to the development of television throughout the country, including Wales, and whether he can state the order of priority for each of the provincial centres. Perhaps this will be instrumental in drawing forth a concrete reply instead of the evasive answers which until now have characterised the P.M.G.'s attitude.

Big-screen Television in Germany

THE attitude of the German television industry towards big-screen working seems to be following on rather parallel lines to that of this country in so far as reluctance is being placed in projection type cathode-ray tubes. In the north side of Berlin the Fernseh Company have installed a complete receiver, the half accommodating an audience of between 300 and 400 people. The projector itself has an imposing appearance, as will be seen by a reference to Fig. 1. It is not of the twin type like that of the Baird Company, and the anode voltage employed is between 60 and 80 kilovolts. The large lens seen on the front skipping panel has a focal length of 16m., and an aperture of f/1. Front projection is employed, and the screen size is approximately 12ft. by 10ft., which is below the largest employed in this country. Furthermore, instead of the controls being located on the projection unit they are housed on the control desk, shown in Fig. 2. The equipment is both neat and efficient, but rather more bulky than the commercial installations already undertaken in a number of German cinemas in London. Cathode-ray oscillographs on the control desk enable the engineer to set up the apparatus satisfactorily, while the use of a very high anode voltage gives a bright picture, a fact which is still further assisted by 120 square feet of screen area as compared with the 180 square feet used by the latest apparatus in London.

Shutter Working

THE Fernseh Co., who have built and installed the equipment described in the previous paragraph, are not confining their attention to projection type cathode-ray tubes wherein the small but brilliant picture built up on the fluorescent screen is lens-projected directly on to a remote screen with a prepared silver surface. As is the case with other countries, experiments are being conducted in the hope of devising a satisfactory form of electronic relay or shutter which can be opened or shut to allow a beam from a high candle power lamp to be modulated in this way. Naturally the prime difficulty associated with any scheme of this nature is to find satisfactory shutters which will respond to the modulation imparted by the rapidly moving stream of electrons. In America, for example, the suggestion was put forward in all seriousness that a relay panel made up from human hairs working on the gold leaf electroscope principle, would meet the case. In Germany, however, one idea proposed was the use of a mosaic of tiny nickel-coated shutters carefully pivoted and backed by a wide mesh grid. The scanning beam, modulated by the incoming television, signals, is then directed against this series of shutters and due to their particular construction secondary emission takes place. This builds up a charge on every shutter element and the electrostatic field so produced in conjunction with the wide-mesh grid imparts movement to the shutter to a degree dependent on signal modulation at the instant of impact. The light and shade of the televised picture is thereby imparted to the complete mosaic of shutters, and if this is interposed on the path of an intrinsically brilliant light beam, the emergent rays produce a remote screen an enlarged version of the scene at the transmitting end. Naturally, the detail obtained will be dependent upon the number and size of the elemental shutters, but the scheme is certain a practical one and capable of development.

Service Area Range

THE recent publication of the R.M.A. service area map showing the range of reception under which satisfactory results can be anticipated without modern equipment has been welcomed by dealers and manufacturer alike. It has provided a satisfactory basis of discussion in all doubtful cases, and has served to sweep away the rather pessimistic assumptions of service range which persisted for so long, in spite of the large number of published reports that proved conclusively that good results in regard to signal strength, and picture quality, were being secured well outside the initial figure of 25 miles. Copies of the map may be obtained from the R.M.A. at 2s. 6d.
Promenade Concert Programmes
Our Music Critic, Maurice Reeve, discusses the Principal Items in this Week's Concerts at Queen's Hall

THIS week's programmes open with another wonderful collection from the Wagnerian treasure house. That exists under a master's care at the Good Friday Music, where Gurnemanz takes from Kundry's bosom a golden flask and a crystal king of the Holy Grail; the forging song from Siegfried. This magnificent song which, in the opera, is sung in the depths of a forest to the accompanying flames from the smithy and the blows of hammer on anvil, has few equals for dramatic effect the whole of the opera. The "Song of the Rhine Daughters," surely the most miraculous "water music" ever penned, wherein Siegfried, journeying along the banks of the Rhine, is suddenly tempted to give up the mystic ring by the Rhine Maidens, who sing of all possible love and beauty and charm. The Prelude to "Tristan," "Hans Sachs," Monologue from "Die Meister-Singer," "Flying Dutchman," and "Elsa's Dream," from Lohengrin, complete a memorable evening, so far as part one is concerned. The soloists are Isobel Baillie, Arthur Carron and Harold Williams.

Mozart
Tuesday's concert may be said to act as a rivulet for our attention—that is, if we cannot attend to both—for it is given up to the work of Mozart, music's "miracle man," to whom has been given for enchantment to flow from it. Staring me in the face, as the centre piece, is the Fortissimo Symphony in G. Written in the last months of the master's all too brief life, and when he was wracked with that fell tuberculous malady which had so soon to claim him, music never so completely belied the atmosphere in which it was created. Sparkling champagne can best describe Mozart's "Twelfth," who can imagine it being written by a dying man in extreme poverty? Truly "music's miracle man."—Then there is the last aria from "Giovanni," "Il mio tesoro," which has been called the most perfect of all songs and the jewel of a tenor singer's repertoire. One of the best of the piano concertos, "K. 453 in G," is also down, a bassoon concerto (bearing the number "K. 191") which we can presume that the master had not yet passed his entrance for the kindergarten, and a Nocturnal Serenade for strings and tympani complete part one of an evening we must all do our very best to hear.

Wednesday is Old Man Bach again. In pressing upon you the merits of Mozart, Wagner, Beethoven, etc., I know I am doing you a service for which those of you, at any rate, who have not yet become too familiar with those Masters, will thank me when you do. But with Bach and Brahms I am more different. Although nurtured on them myself, and still love and hate in spite thereof, I recognise that the old saw about one man's meat, etc., continues to hold good. As the last in the last thing in the world I want to do is to poison you, I leave it entirely up to your own experiment or own discrimination. I think I can assure you, however, that you will not regret hearing the Brandenburg Concerto in D for piano, flute, violin and strings; the fifth piano concerto in F major from the violin concerto in A minor, and the two Church Cantatas Nos. 31 and 202.

Beethoven
On Friday we have what I venture to suggest is the most beloved work in the whole music, Beethoven's Fifth Symphony. For over a hundred years it has been the most frequently performed work, the most widely known, and consequently, the most sought after. It has been every conductor's greatest "vehicle" and every orchestra's greatest "draw," and who can say the world is wrong. There can be no work which, in the musical language, covers the whole gamut of human feeling with such completeness, and satisfactorily satisfies the every want of the most intractable and exacting appetite with such perfect satisfaction, as Beethoven's Fifth. It is a triumph in accomplishing. The epicure who "dines" on this luminous table d'hote satisfies himself to repletion, even to wine and cigars of the finest vintage and leaf. The Promenade season will know no bigger draw and Sir Henry Wood and his forces will receive no greater applause than for their performance of this unique work. Amongst other works down for the same night is the Overture to the "Meistersingers" and the Concerto for Piano, Violin, Cello and Orchestra, played by the Grinco Trio.

LISTZ
Saturday's programme also contains a work which might be said to rival the "Fifth's" claim to world's favourite, Schubert's "Unfinished." Perhaps it is the least well-known of all his masterpieces. It is one of those who accord it their preference. Perhaps were it not unfinished it might stand unrivalled. It does not require me to remind readers that its two movements are music of the purest and most unadulterated romanticism. I do not know Bax's symphony very well, and great admirers of those works of his that I do. There is probably no more original mind now writing music. Although already, for some time, he may lack the tender wistfulness of Elgar, also that great master's "Englishness," it is great, rugged, nascent music, original in every bar, yet legitimately descended from the main historical current of music, which is not what one can say of everyone writing music to-day.

THE TWO ARTISTS AS RADIO'S GRACE MORE
Two artists will play the Grace Moore part when the B.B.C. broadcasts, on September 26th (National) and September 27th (Regional), Douglas Muddle's radio adaptation of the film, "One Night of Love.
Already one of them has been booked—Hella Toros, the well-known Italian operatic singer, who will take the singing part which, as cinemagoers remember, includes a large amount of operatic work. The problem now facing the Music Productions Section is that of matching her singing voice in their choice of an artist to take the speaking part of the role. Though an Italian artist, Hella Toros sings operas in English. A pupil of Liebert, she began to play the piano when she was six years old; she was also very fond of singing. Her parents, intending her study to music, sent her to the famous conservatorium in Vienna. She then sang at a children's party, with the result that someone who heard her persuaded her parents to allow her to sing at a charity concert, where, at the age of twelve, she scored a big success. After that, medicine was forgotten; her only wish was to go on the operatic stage. Emmy Destinn trained her voice so that when she was only eighteen, she made her debut in Prague, where she worked under Alex Zemlinsky, one of the greatest Mozart conductors on the Continent. Subsequently, she was engaged as guest-artist in Berlin, Vienna and many other Continental musical centres, and was, in fact, one of the youngest leading operatic artists. Through marriage, she left her career for four years, but meanwhile studied with Amelia Torg- nagnin-Borgini, last living pupil of the great Franz Liszt. After coming to England, Sir Thomas Beecham and Percy Helming again gave her the opportunity to appear in opera, and she made a second debut at Covent Garden. She has also worked on the concert platform, and in television and broadcasting.
The B.L.D.L.C.

SIR,—As a comparative newcomer to the band of short-wave listeners, I have regularly read your excellent magazine for several months now, and I am particularly interested in the British Long-distance Listeners' Club.

I should be very pleased to become a member of the Club, and would be very much obliged if you could forward me particulars of enrolment.

With best wishes for the success of the new Practical Wireless.—LEWIS MARRISON (Leeds).

[Full particulars concerning enrolment in the B.L.D.L.C. are given in our issue dated September 2nd, 1938.—Ed.]

From a Folkestone Reader

SIR,—I think the new form of Practical Wireless a great improvement.

All the wireless information I have gathered has been from your journal, and the one incorporated with it.

I am particularly interested in the short waves, and once, and only once, received a call from Sydney, Australia.—CHARLES F. READ (Folkestone).

A 14 mc/s Log from Southampton

SIR,—I append my 14 mc/s 'phone DX log in the hope that it will be of some interest to other readers. Reception was, as usual, on an S.G.-v.Pen. (commercial) set with 'phones:

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I will gladly exchange my QSL with anyone interested.—R. D. GINGER ("Holmehale," Albany Road, Bishop's Waltham, Southampton).

The "Air-Hawk 9"

SIR.—I think the new Practical Wireless a great improvement, and wish it every success.

I notice you are still publishing photos of readers' sets, so excuse mine. My set is now a 9-valve superhet, with bandspread and 5-metres.

Until recently it was but a modest 8v. without any trimmings. An extra I.F. stage made a vast difference; it is definitely worth the extra trouble, and the cost is very moderate.

I am very interested in the modified "Air-Hawk 9" and notice that an extra A.F. stage is provided for higher gain. My set actually is modelled roughly on the lines of the original "Air-Hawk," and this new version comes very close to my circuit, except that I use regeneration in the second I.F. for high selectivity.

Turning to aerials, I used a doublet for a long time, but lately have changed to a 60-foot inverted L, which gives rather better results, because the doublet was directional, almost due N. and S., where there are far too few stations.

Wishing the new Practical Wireless even greater success than before.—W. J. MARINICK (Windsor).

[We were very interested in the photo of your den, but regret it was not clear enough for publication.—Ed.]

Exchanging QSL Cards

SIR,—I have been a regular reader of your paper for more than a year now, and being a short-wave enthusiast I should like to exchange cards with any A.A. or full ticket "ham" or short-wave listener in the world. All cards will be acknowledged by return of post with one of my own cards.—R. R. POULTON, 57, Edgehill Road, Wotton, Bournemouth, Hants.

Page Problems

PROBLEM No. 364

JASON had a four-valve A.C. marine receiver which had preceded well for some time, but had, his valves developed a fault which took the form of distorted signals and increased hum. He replaced a microphone in the H.T. negative lead and found that the current was much in excess of that which normally should be indicated. He tested all valves and found them in order. He placed the meter in each anode circuit and the current readings were more or less erratic. What was the most likely cause of the trouble? Three books will be awarded for the first three correct solutions opened. Entries should be addressed to The Editor, Practical Wireless, 14, George Verner, E.C., Tower House, Southampton Street, Strand, London, W.C.2. Readers must be marked Problem No. 264 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, September 15th, 1939.

Solution to Problem No. 263

When Jackson wired his coil-holder he overlooked the fact that the screen grid resistor was connected to the plate as viewed from the pin end of the coil, and accordingly they should have been reversed when using a headband-mounted coil-holder.

The following three readers successfully solved Problem No. 262, and books have accordingly been forwarded to them:—L. S. T. Edmonds, 7, Fulham Road, Chelsea, E.4; E. J. D. Jay, 14, Kingswood Avenue, Tolworth, Surrey; R. M. L. de, 9, Chelsea Road, Twickenham, Kent.

Radio as a Career—2

(Continued from page 659)

Radio impression and might be useful. It is best to have the tools neatly arranged in one compartment of the case, the other compartments being used for the meter and a few spare parts. An ordinary attaché case lined with baize, felt, or leather is best. I advise the "emergency" kit.

"Loan" Receivers

When the engineer also acts as a seller of receivers it is often a good plan to have a receiver always available when going out on service work. Should the instrument to be tested be an old one in poor condition a sale can often be effected at a time when the old set has "packed up." In other cases it might be considered desirable to loan a new set to the owner while the old one is being repaired. Many sales have been effected through following this course, when the owner had, in the first place, no idea of exchanging. After hearing an up-to-date receiver in his own home he appreciates the vast improvements that have been made and realises that he would be better off with the new receiver than by keeping the old one. Instantly, these service men who—perhaps owing to lack of capital—not do propose to specialise in the sale of receivers, can often obtain supplies as required from the manufacturers of an arrangement being made to split the profit. It is hardly necessary to point out that courtesy and an obvious interest in the customer's pleasure are sound assets of the service engineer. An off-hand manner is a serious disadvantage, as is volubility.

Impressions on the Wax

H.M.V.

RISK of the new season's films is "Naughty But Nice." Maxine Sullivan has recovered the songs from this particular movie—"Come Prima" and "I'm Happy about the Whole Thing."—H.M.V. B 8033.

Also in the August lists appears records by that inimitable pair Jack Hulbert and Cicely Courtneidge. They don't appear to have made a record, then same name, though Jack and the Rhythm Brothers give a riotous rendition of that nonsense song "Hold Tight!"—I want some Sea Food, Mama." On the reverse side he, quite rightly, sings "You're Driving Me Crazy."—H.M.V. B 5942.

Cicely Courtneidge changes the mood with the "Birthday of the Little Princess" and "The Little Toy Train."—H.M.V. B 8941.

Making its bow in the H.M.V. list is one of the most famous of Continental orchestras. For his first record George Boulandet leads his band through two delightful performances of his own compositions. These are "Dream Serenade" and "When I'm Happy."—H.M.V. B 8845.

"Dream Serenade" was also part of the programme by the Hungarian Gipsy Band that was actually recorded at the Hungarian Restaurant, London. On the other side of the record, Bola Bizony directs a medley of his own popular and famous "Soul of Roumania."—H.M.V. B 7278.

Read "The Cyclist"

2d. Every Wednesday
In reply
to your letter

Kestrel Tuning Control

"I wish to build the Kestrel S.W.4, but I note that you give no maker's name for the special mechanical hand-spread tuning control, or the price. Could you tell me who makes this and how much it costs?"—T. R. (Barndale)

THE dial in question is supplied by Messrs. Peto & Co., and the price is 15s. 6d.

Detector Anode Circuit

"In some of the circuits you have published recently I note that you use a resistance where I am accustomed to see an H.F. choke. I should be glad if you could tell me the purpose of this resistance, as it is obviously not the anode load component, which is joined to it."—P. R. (Plymouth)

THE resistance in question is often employed in a short-wave receiver, where it fulfils the same function as an H.F. choke. It has the advantage, however, that it is not resonant to any particular frequency, which is sometimes the case with a choke, and thus resonance is likely to be more smooth, and erratic tuning points are avoided. Of course, a minimum of resistance must be employed for the purpose.

Plug-in Battery Leads

"In a recent set you used a plug and socket idea for the connection of battery leads. I should think that this was a much more effective scheme than the usual soldered-on flex lead idea, and wonder why it is not more generally employed. Is there any reason for this?"—W. J. T. (Hythe)

THE only drawback to the plug-in system is that if the ends of the leads become dirty or corroded this can give rise to trouble due to the high resistance which might be set up. As the H.T. battery relies for its efficiency upon clean and uncorroded leads it is obviously not always desirable to add to the "friction" form of connection in these circuits and therefore a properly made joint to the wiring is desirable. The plug-in idea is perhaps nearer and leads itself more readily to circuit modifications, but the utmost cleanliness must be maintained at all times.

Padder Tuning

"I am in one of your articles (I forget which) there was some reference to a padder of tuning, as distanced from the padders or trimmers in a superhet circuit. I should be glad if you could give me some idea what this is about and how I can apply it to any given circuit."—P. R. (Gloucester)

THE idea was presumably mentioned in connection with some circuit where a minimum tuning width was required. For instance, if you examine the circuit of the Air Hawk 9 recently published you will see the idea incorporated into the Beat Frequency Oscillator circuit. Here is a coil with a fixed condenser across it. The condenser has a movable plug and sockets which will shortly be described. A similar idea is used, the necessary coverage being obtained in exactly the same way. It is, in effect, a hand-spread idea with a fixed band-setter.

Speaker Cabinet

"I have recently made up a fair-sized box in which to place the speaker. The size is approximately 20" high. I find, however, that there is an unpleasant bass resonance, and I wonder if you can help me to overcome this. I want the box back closed in to keep out dust, and the speaker sounded all right before putting it in the box."—E. E. (Dewsbury)

RULES

We wish to draw the reader's attention to the fact that the above rules are retained only for the solution of problems or difficulties arising from the construction of receivers described in our issues, from articles appearing in our pages, and from general matters. We regret that we cannot, for obvious reasons—
(1) Supply circuit diagrams of complete multi-valve receivers.
(2) Supply any exceptions or modifications of receivers described in our contributors.
(3) Suggest alterations or modifications to commercial receivers.
(4) Answer queries over the telephone.
(5) Grant interviews to queries.

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

Requests for Blueprints must be accompanied with a postal order.

Send your queries to the Editor, PRACTICAL WIRELESS, George Street, W.2. The Queries must be enclosed with every query.

A although the speaker may have sounded good when standing alone, it may have a prominent bass resonance. This would not be very noticeable without a baffle. An enclosed box will, however, give rise to resonance and special precautions must be taken. The sides of the cabinet should be lined with thick felt, or the entire inside filled with kapok or similar material, leaving a space round the speaker to prevent the cone movement from being restricted. It may be necessary to cut holes in the back of the cabinet and cover these with gauze or other dust-proof material.

Crystal Damping

"I have read that a crystal detector imposes very heavy damping on a circuit and accordingly the tuning is very flat. Is this correct? If so, how can it be overcome?"—L. P. (Barnet)

THE damping effect is very constant and may be overcome by tapping the coil. The tuning condenser is then adjusted across the coil, and the crystal should be connected to a point some distance from the "top" of the coil—that is, the end opposite the earthed end. This procedure is also often adopted with some valve rectifiers for the same reason. The damping effect may also be varied by using a carbon-membrane crystal with an applied potential.

Low-resistance 'Phone

"I attach a sketch of a single 'phone receiver which I have and I should like to use with my home-made aerial. I am told that it is not suitable and I should be glad if you would confirm this or tell me how to use it."—F. S. (Preston)

THE 'phone is apparently an ex-Government standard earpiece and as such will have a low resistance. To use it in this circuit of your receiver you will have to obtain a step-up transformer having a ratio of at least 10 to 1. Low-resistance 'phones are sometimes recommended on account of their robustness, but they are generally not so sensitive as high resistance components and these, therefore, to be preferred.

Trimming Necessary

"I have a commercial superhet, and there has developed a peculiar fault. When tuned direct to a station according to the scale there are very weak signals. As soon as I detune slightly the signal increases in volume but suddenly ceases as though there is a short-circuit across the condenser. Can you explain this?"—J. R. (Metherby Tyffill)

THE trouble may be that the circuit is in need of retuning. When you tune a superhet it is not trimmed properly the first time or sometimes instability. As you detune the circuits are gradually brought into resonance, giving the increased volume, and then oscillation takes place, resulting in absence of signals. We advise you to have the set inspected by an engineer who is familiar with the particular make.

REPLIES IN BRIEF

The following replies to queries are given purely as an illustration of the kind of correspondence we receive, and because the point raised is of general interest.

J. C. (Bradstone),"The cell could be used in conjunction with a simple L.T. valve superhet circuit, without any changes or alterations in its constructional details but you should carry out one or two improvements to its reception qualities, connecting the cell to the metering terminals."—J. E. (Fuller, Essex)."The details of the circuits are explained in our book, Wireless Transmitters for Amateurs," but for address you must obtain the "Radio Amateur Co. Book."—This costs 6/-, post free. (J. E. H. (Wiltshire))."Good reception?—D. J. L. (Northampton)"A very good idea, but it depends very much on the crystal and the circuit you use. I have recently adopted this system in a receiver and have obtained good results. Can you explain your case regarding your crystals efficiency?"—J. L. (W. O.):"The coils may be satisfactory or some component may be missing. A circuit would help us to trace the faults."—E. E. (Wheaton, D.)."The reference to a sounding wind indicates that there is probably an open-circuit, and you should check carefully the winding across the E.P. transformer secondary."—B. S. (Burgess Hill)."We regret that we are unable to give a copy of the print in question."—E. W. (Afterham)."The circuit you have made does not appear an improved model and must be remagnetized so that the field is placed in the heart of the core. If you print a row of the set and the makers are apparently no longer in business."—H. M. (or sheffield)."The apparatus may be obtained from Messrs. E. E. (Buxton)."T. K. (Sutton)."The crystal may be wrongly wired or damaged. It would help to have details of the parts and thus we cannot arrive at definite conclusions."—W. G. (Molesey)."As transferring the aerial improves reception the trouble need not be due to the aerial itself, but may be some defect in a component of the H.F. valve."
ROUND THE WORLD OF WIRELESS

Servicing

The radio service engineer is now a skilled technician, and modern receivers can only be serviced satisfactorily when a sound electrical knowledge has been obtained and the proper equipment used. The old type of receiver could be "serviced," or at least put into working order, with the aid of a simple voltmeter. But the modern receiver is so complicated and the values which are employed perform dual functions, with the help of special knowledge, that it is necessary in order to locate faults and remedy them. There is an increasing demand for service men who can quickly handle the modern receiver, and in America, where this branch of radio has reached a high standard, technicians visit the homes of listeners with portable equipment and carry spare parts with the result that in a few minutes they can trace a fault and replace the defective part and be out of the house within a very short time. A modern television receiver, however, could not be handled quite so easily, but when the subject is studied properly the process is not a difficult one.

Amateur Transmitters

On August 30th the Postmaster-General withdrew all licences relating to the use of amateur transmitters owing to the outbreak of hostilities. In last week's issue we published details of a transmitter, but this had already gone to press before the permission to use such apparatus had been withdrawn. It should therefore be noted that it is now illegal to make up or use such equipment, and all licensed transmitters have been impounded by the authorities.

New Australian Stations

The new Australian Broadcasting Company's station in Perth will, it is understood, be on the air within the call VLA. The frequencies which have been allocated are 6,130, 9,360 and 11,839 kc/s, corresponding to 48.84, 31.38 and 25.36 meters.

Indian Radio Papers

From Bombay come news of three new publications, all devoted to radio. Under the titles The Indian Radio Review and the Bombay Radio Times, the former is to act as a link between listeners and the broadcasting organisation, whilst the latter will provide technical material and short-wave programmes. The remaining journal is Radio Services, full details of which are not yet available.

Hollywood Studio Honour

The Hollywood studio headquarters of the Columbia Broadcasting System, which were opened early this year, have been awarded the distinction of being held as an outstanding example of modern architecture by the Southern California Chapter of the American Institute of Architects.

New Sets for Old

An interesting scheme is being tried out in Switzerland to encourage listeners to purchase new receivers. Upon giving their old equipment to a recognised benevolent organisation the listener is given a coupon which entitles the holder to a 15 per cent. reduction on the purchase price of a new receiver.

American Radio Profits

It is announced that the net profit for the first half of this year made by the Radio Corporation of America was more than $350,000 less than the corresponding period last year.

Experimental Licences Withdrawn

By an official notice in the London Gazette dated August 30th, the P.M.G. announced that all experimental transmitting and A.A. licences, as well as those for wireless telegraph sending and receiving stations for Royal Naval Wireless Auxiliary Reserve purposes, are withdrawn. The notice do not, of course, apply to the ordinary broadcast receiving licence issued to the general public.

Luxembourg on Short Waves

It is understood that Radio Luxembourg is to use a wavelength of 31.49 metres (9,527 m/s), and that transmissions will be given between 4 and 6 p.m. G.M.T. in five languages.
ROUND THE WORLD
OF WIRELESS—Continued

New C.B.C. Station

The opening ceremony of the Canadian Broadcasting Corporation's 50,000-Watt station in Saskatoon took place recently. This is the fourth of the proposed chain of high-power stations across the Dominion. It is situated at Watrous, near Saskatoon, and will use the call sign CKB.

Marconi Museum

It is reported from Italy that the villa in Pontecchio, near Bologna, where Marconi conducted his early experiments, is to be maintained as a museum. The villa has been given to the "Guglielmo Marconi Foundation," created by Signor Mussolini shortly after Marconi's death.

The Praying Mantis Got a Shock

The huge WLW (Cincinnati) transmitter went off the air for four minutes recently, owing to one of the odder accidents ever reported at a radio station. According to the station engineer, a praying mantis crept into a 12,000-volt filter condenser in the basement of the transmitter building at Mason, Ohio, and caused a short-circuit. A discharge of 220 microfarads of energy from the condenser produced a sound like a thunderbolt.

W8XAL Changes Call Letters

Call letters familiar to short-wave listeners throughout the world were changed last month when the Federal Communications Commission changed the identity of the Crosley Corporation's International broadcasting station from W8XAL to WLWO. The assignment of the new call letters indicates that the station has been removed from the experimental classification, and may transmit commercial programmes internationally, in line with a recent decision of the F.C.C. Upon completion of a 50,000-watt transmitter, WLWO will be one of the most powerful international stations in the United States, and by use of a beam antenna will be able to concentrate its signal in a given area.

WLWO, under the name W8XAL, began operation in 1924, and is one of the pioneer international broadcasting stations of the world. When its power is increased to 50,000 watts, it has been given authority to broadcast on all six international short-wave bands. The frequencies at which it will operate are 6,060, 9,590, 11,870, 13,270, 17,700 and 21,650 kilocycles. The increase in power is scheduled to be effective during the autumn.

Swedish Licences

It is estimated that there are approximately 206 receiving sets per 1,000 inhabitants in Sweden, where the total number of licences in force at the end of June was 1,301,666.

High-power Station in Pyrenees

NDOVA, the small State in the Pyrenees, now has a powerful broadcasting transmitter, which was opened recently by the Minister for Public Works. The masts at the station are nearly 6,000 feet above sea-level. The programmes from this station, which will be in three languages—French, Spanish and Catalan—will be radiated on 410 and 23.35 metres. It is reported that its medium-wave power will be 350 kW.

Borough Polytechnic Radio Courses

The Radio Engineering and Television Courses at the Borough Polytechnic, Borough Road, London, S.E.1, open Monday, September 29th. Prospective students can be enrolled on September 18th, 20th and 22nd.

A five years' course, including Radio-Communication, Television, Acoustics, Electrical Engineering, etc., has been arranged for Ordinary and Higher National Certificates, City Guilds Examinations, etc. Special attention is given to latest developments in Television.

There are part-time Day and Evening Courses for Radio Service Engineers.

SESSIONAL FEE:

Students under 18 . . . 8s. 6d. to 12s. 6d. Students over 18 . . . 10s. to 30s.

Further details are obtainable by quoting reference No. 301.

NOW READY!

WORKSHOP CALCULATIONS, TABLES AND FORMULAE

By F. J. CAMM

Automatic Frequency Control

Operating Details of a Useful Unit of Special Interest to the Experimenter

In connection with automatic frequency control circuits for superheterodyne receivers the following description of a proposed discriminator unit may be of interest. A direct current voltage is derived from the intermediate frequency energy when the latter shifts from the assigned intermediate frequency value. In addition to the discriminator unit a frequency control valve is provided, electrically connected across the local oscillator tank circuit in such a manner as to simulate across the tank circuit a reactance of a predetermined sign. The direct current voltage output of the discriminator unit is employed to regulate the magnitude of the simulated reactance across the oscillator tank circuit by varying the operating characteristics of the control valve, and the regulation is such that the oscillator frequency is shifted to a frequency depending on the setting of the receiver tuning device, the frequency and strength of the station being received and the discriminator unit characteristic.

It has been found that the frequency control valve may have an adverse effect upon the strength of the signals generated in the local oscillator circuit, intermittent instead of continuous oscillation sometimes occurring, or in some cases complete cessation of the generation of the local oscillations. The adverse effect is due to damping introduced by the frequency control valve and may be effective over the whole of the range of frequencies covered by the system, the oscillator being in some cases completely damped out on the short-wave range.

Out-of-phase Component

Experiments have shown that, due to capacity coupling between the local oscillator and frequency control valve circuits, there exists an out-of-phase component in the voltage which it is intended to apply to the control valve from the oscillator. The value of this out-of-phase component is increased due to the wavechange switching arrangements employed in multi-wave range receivers.

Circuit Modifications

This difficulty can be overcome by modification of the conventional circuit as shown in the accompanying illustration.

Referring to the drawing, a local oscillator valve 1 is shown having its control grid 2 connected through a switch 3 to one of alternative tuned circuits of which two, 4 and 5, are shown, a tuning condenser 6 serving to adjust either of these circuits.

The rectangle 15 represents a frequency discriminator circuit which provides controlling potentials which are conveyed by a conductor 16 through a resistance 17 and leak resistance 18 to the control grid 12, a condenser 19 being connected between the end of resistance 18 and earth. A switch 20 serves to connect one or the other of two resistance/condenser combinations 21, 22 or 23, 24 in series in the control grid circuit. The values for the resistances and condensers included in the combinations 21, 22 and 23, 24 are selected to effect compensation for phase shift due to capacity coupling between the control grid of the oscillator valve and the control grid of the frequency control valve so that the control valve appears as a substantially pure reactance, and does not introduce damping into the local circuit. The values will, of course, be finally determined by local circuit conditions, but in a particular example for the long-wave range, the condenser 22 is of .01 microfarad, the resistance 21 of 10 ohms and in the case of the medium-wave range the condenser 22 is of .001 microfarad, the resistance 23 being of 75 ohms. The condenser 11 may conveniently be of 0.1 microfarad, the leak resistance 18 of .5 megohm, and the resistance 17 of 1 megohm.

While in the arrangement described the desired correction has been effected in the grid circuit of the control valve, it will be understood that the desired effect may be produced in other ways.
The 1940 "Air-Hawk" 9

Coil Winding Data for This New Communications Receiver

By W. J. DELANEY

THE wave range covered by this receiver extends normally from 9 metres.
As it is primarily for short-wave work the bands terminate at 170 metres, thereby including most of the useful amateur transmitting bands. Furthermore, these ranges are covered conveniently by standard commercial plug-in-coils, and accordingly they may be purchased for the aerial circuit. For the first detector and oscillator, however, the coils must be made up as there are not suitable commercial products on the market. In the original model described last year a 6-pin coil was employed in the first detector stage, as a tapping point was provided on the secondary winding. This tapping is not now needed, but the 6-pin holder has been retained, and this is utilized for a 4-pin winding. If desired, of course, a 4-pin coil could be used as replacement and then the standard commercial components could be used. The connections to the coil-holder would be standardized. In the Eddystone range, the coils needed for the aerial circuit are types BB, LB, Y, R, W, these splitting up the bands into 9 to 14, 12 to 26, 22 to 47, 41 to 94 and 76 to 170 metres. Similar coils will be needed if the 4-pin arrangement in the first detector stage is adopted. For the oscillator winding a single solenoid with a tap is needed and the data for this, together with that for all the remaining coils, if you wish to wind them yourself, are given below:

<table>
<thead>
<tr>
<th>Range</th>
<th>Primary</th>
<th>Grid</th>
<th>Wire Gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>9-14</td>
<td>26</td>
<td>2</td>
<td>20 Enam.</td>
</tr>
<tr>
<td>12-26</td>
<td>47</td>
<td>2</td>
<td>20 Enam.</td>
</tr>
<tr>
<td>22-47</td>
<td>47</td>
<td>2</td>
<td>26 Enam.</td>
</tr>
<tr>
<td>41-94</td>
<td>91</td>
<td>9</td>
<td>28 Enam.</td>
</tr>
<tr>
<td>76-170</td>
<td>13</td>
<td>55</td>
<td>30 Enam.</td>
</tr>
</tbody>
</table>

The coils for the shorter ranges are wound with spaced windings, and the threaded Eddystone or similar forms are needed to obtain accurate winding. The spacing provided should be 14 turns to the inch. The largest two coils are wound with turns touching. If desired, the primary windings may be inter-wound on these two coils, and tests have shown that there is not a great deal of difference in performance with this particular range. The position of the cathode tap is quite important, and if for any reason the point indicated does not

The above illustrations show the three coils needed for each waveband, with the connections to the pins. The lower illustrations show the pins, viewed from below the coils—that is, the under-chassis view of the coilholders. For the three smallest coils threaded formers should be used, and for the remainder plain formers are required. Note that all windings are in the same direction. The coils for the shorter ranges are wound with spaced windings, and the threaded Eddystone or similar forms are needed to obtain accurate winding. The spacing provided should be 14 turns to the inch. The largest two coils are wound with turns touching. If desired, the primary windings may be inter-wound on these two coils, and tests have shown that there is not a great deal of difference in performance with this particular range. The position of the cathode tap is quite important, and if for any reason the point indicated does not

only point where an adjustment is needed and which will affect results is the screen voltage for V2. As already mentioned, the voltage is obtained by a potentiometer of the "fixed" type, and a spare clip is specified in the list of parts. The total resistance of the component is 15,000 ohms, but the extra clip will short a portion of the winding thus providing a resistance of about 10,000 ohms across the H.T. This will pass a very high current and furthermore the valve operates more efficiently than when a high-resistance potentiometer is used for the supply of the screen voltage. The exact position of the tapping clip is best found by connecting a reliable meter between earth and the clip, and moving it until a reading of 110 volts is obtained. This will be with the clip approximately one-third of the distance from the right-hand end as seen in the wiring diagram, which was published last week. The total anode current is approximately 88 mA and the meter reading on average good signals (R9) was 0. On very powerful stations and local amateurs the needle will give full scale reading, and it is therefore essential to make use of the meter on/off switch. If for any reason the meter does not give the desired reading, or the balancing resistance does not enable the pointer to be brought back to zero, then the value of resistance R15 should be modified. A value between 30,000 to 75,000 ohms may be tried. 

A view of the chassis of the Air-Hawk showing the effective screening arrangements.

...
Radio as a Career—3

Cultivating the “Knack” of Rapid Fault Tracing
Choice of an Efficient Multi-range Meter.

REFERENCE was made last week to the “knack” of recognising and diagnosing the cause of different faults. The service man who can develop this will find it a great asset, because of the time-saving which it effects in making laborious tests throughout the circuit.

It would be difficult to give an accurate description of this “knack,” for it is something which is gained by experience. But examples of its use are not difficult to find. Thus, one service man might immediately think that a certain form of distortion was due to a defective output valve, or to a fault in the loudspeaker, whereas another would be compelled to start at the beginning of the circuit and work through it with meters and other test gear before he could ascertain the source of trouble.

A Ferrari multi-meter, with accessories.

One of the popular Ammeters, designed for A.C., or D.C. use.

Systematic Tests

Of course, a “feeling” that any particular trouble is due to a certain cause must not be allowed to interfere with the more accurate checking afterwards. Thus, if it were considered that the output valve was at fault, the proper course would be to take some measurements of anode current, anode voltage and heater current. It might then be found that the trouble was in one of the external circuits of the valve; if not, it would then be feasible to try the effect of replacing the valve by another of the same type. Should it have been determined that the fault was in, say, the anode circuit of the valve it would probably be an easy matter to find exactly which component or connection was defective.

A service man who had been taught, or had learned, to make a systematic examination of the complete receiver as a first step might well miss the obvious and therefore spend a considerable amount of time unnecessarily. As an example, I remember a case where a competent, though “rule-of-thumb,” engineer tested throughout a receiver from which reproduction was accompanied by a very “mushy” background, only to find eventually that the aerial lead-in had become detached from the plug connector inside the latter component. A more experienced man would probably have noticed the low sensitivity of the set and checked the external connections before proceeding further.

An Easy One!

Another engineer spent a good deal of valuable time making voltage and current tests through a superhet that would not receive any good signals, despite the fact that it sounded to be “alive” and there was a peculiar form of heterodyne whistle which was unaffected by movement of the tuning condenser. This would at once have been recognised by a better man as a sign that the tuning condenser was not operating, and, after investigation, that the condenser drive was not gripping on the spindle of the gang condenser.

An experienced engineer would not waste much time testing the low-frequency end of a receiver which failed to bring in any broadcast transmissions, and yet would operate when a gramophone pick-up was connected. Similarly, he would know that if the bulb of one of the valves in a mains set (excepting a diode, of course) was quite cold while all of the others were warm, that valve was probably at fault; it might be making poor contact with its holder or the fault might be internal.

Then again, a service man has wasted a lot of time testing the L.F. stages when distortion has been troublesome, only to find that the speaker cone was in need of centreing or that there was some dirt in the air gap. This would generally be looked for if the reproduction was “scratchy,” and sometimes if it “cracked” on high or loud notes.

Useful Experience

Those are just a few of the instances—all so simple that the points are easily missed when testing—which come to mind.

If a real attempt is made in every case of trouble to determine the exact cause, rather than to effect a cure by any means, a considerable amount of useful knowledge will be accumulated. And it is knowledge that could not be gained by reading all of the technical books which are published, nor by making an assiduous study of every article that has been written on service work.

This “knack” is valuable, but it is far from sufficient in itself. There are many

(Continued on page 10)
A new type of mica condenser in which, instead of alternate layers of foil and dielectric, the makers employ mica sheets which are metallised by a special process. These condensers are assembled with high insulation stiffening members, thereby affording mechanical strength, and are ideal for circuits where extreme stability and close accuracy are required. They cost 1s. upwards according to capacity.

**A new Rola speaker.** The 6Z-5.5 P.M. This has a 4½in. cone and weighs 1½lb. It is an excellent model for portable or similar receivers where the space available is limited, the overall diameter being 6½in. and the overall depth 2½in. The speech coil has an impedance of 3 ohms and the price of the speaker is 16s.

An ideal accessory for the serviceman, this magnifier incorporates a powerful light source. The magnification is approximately 20 diameters and the handle houses the battery. This is a Servisol product, and the length is 7in. The handle is 31in. diameter and the price is 15s. 6d.

An air-dielectric trimmer of novel design produced by T.C.C. By means of an ingenious threaded device the action of rotating the screw results in successive interleaving of the vanes somewhat in concertina fashion. The graph shows the comparison between the condenser and ordinary types. The straight line is the capacity variation plotted against screw turns. High smoothing properties, with compact size, are the main features of this neat electrolytic condenser. These Midgets are produced by T.C.C.

A pictorial illustration and theoretical circuit of a light-sensitive set-up which was exhibited on Stand No. 18, and which included the new electron multiplier described in these pages last week. The small diagram shows the general principles upon which the electron multiplier operates, and in the example a photoelectric cathode is indicated.
ON YOUR WAVELENGTH

Keep Going!

Once again we find ourselves engaged in hostilities, but under somewhat different circumstances to those which obtained in the last. Wireless was not born until after the last war, and the Government relied upon the newspapers for the dissemination of news. I do not know how many of my readers can recollect the last war. It was not until 1916, two years after the war started, that for the first time in the history of this country conscription was introduced. This time conscription was in force on the outbreak of hostilities. During the last war there were a few amateur transmitters struggling along with coherer-type apparatus. This time some thousands of amateur transmitting sets were immediately conflagrated. All licences for the establishment of wireless telegraph, sending and receiving stations for experimental purposes, wireless telegraph receiving stations for experimental purposes, and the use of wireless sending apparatus in conjunction with artificial aerials, and wireless telegraph sending and receiving stations for Royal Naval Wireless Auxiliary Reserve purposes are withdrawn. In the last war wireless receiving sets were confiscated, but in this we are enabled to retain them. We should be sufficiently grateful that we can immediately get official news within a few minutes of its receipt, and at regular periods throughout the day. It has exerted a remarkable influence on the proceedings of the nation. It has been used to instruct the public on air raid precautions, and what to do and where to go. It has been able to warn shipping, to announce the result of international discussions, and we have been enabled to hear the Prime Minister and the King. It will play a most important part in bringing this war to successful fruition. There cannot be any doubt that the war will end in success for this country. There is a possibility that, in view of the shortage of wireless receiving sets, because most firms will be turned over to the production of war materials, home construction will revive. Those odd parts that you have lying around in a junk box will, therefore, stand you in good stead. If you have not a stand-by receiver it is your duty to build one at once.

I am told by the Editor that this journal will do its best to carry on. It has an important part to play as one of the few technical journals dealing with wireless. I suppose that there will be difficulties in the way of publishing details of new inventions. My readers will understand, therefore, why on particular occasions I may not be able to refer to particular aspects of radio. As in the past our readers will loyally support us, I know, in our efforts to carry on under these difficult circumstances. I will, for my part, do my utmost to keep alive the interest which every reader of this paper, in the Services and out of it, has in radio.

It is the fervent wish of all that hostilities may soon cease. We can help at this end by endeavouring as far as is humanly possible to carry on as usual. You will help us if you endeavour to do the same. Difficult times lie ahead. Wherever my readers are I want them to feel free to write to me in the knowledge that I shall individually reply to each of their letters.

Wizardry

Hereewith a letter I have received from K. H., of Blackrock:

"I was rather intrigued with the Editor's description in his open letter in the first issue of the new PRACTICAL WIRELESS of the radio industry, as one of 'wizardry.' I wonder if others who have been 'fiddling' in the web of the 'constructor-experimenter' since 192

sometimes feel that they can scarcely keep pace with the progress of the developments in what is our hobby, as we think of the old neutralised H.F. valves, then the S.G.'s, and now multi-electrodes of every design, to mention only one vital part of it.

I suppose the trade naturally likes to sell trade sets, but there have been many new constructors won by receiving a home-constructed set, and knowing a lot about it eventually. And, must it be said, there has in many instances been much more spent by the home-constructors.

"Well, and we sometimes ask: 'Is it worth it?' Time, trouble, thought and handiwork also. But whether it is or not, we are still 'fiddling'!

"Wishing PRACTICAL WIRELESS continued success."

Our Transparent Chassis

H. J. W., of Bristol, writes as follows:

"With reference to your remarks in this week's issue under the heading of 'Our Transparent Chassis,' in my own opinion a board-built set need not be either 'unwieldy' or 'amateurish,' or even have long leads where it is important that they should be short. In some places long leads do not matter, as you must know. Your transparent chassis you say 'enables you to see every wire and connection.' Can you deny that a board-built set does the same? I have nothing against the chassis method, so long as I can get what I want, and not what the designer thinks I ought to have.

"Having been a constructor for some years, taking a designer's idea and altering it to suit my own requirements, I shall probably continue to do so. For instance my present set is a straight 4, but I can use the H.F. valve or completely isolate it and use Det and 2 L.F.; or I can use Det and 1 L.F. on 'phones, when the L.S. might be objectionable. How many chassis sets offer these advantages? My set may not be extra pleasing to the eye, but it is easily kept in order, and it is pleasing to critical ears."
That Rejected Manuscript

JUST to please many thousands of readers, and I hope not to amuse
those who do not like Torch's style, I print the following from his pen:

If you've written a play that's turned out a dud, and is always rejected because it's no good, and disillusion need this ever bring—
It may still win you fame—if you pull the right string.

When the "right string"'s been pulled and the play is broadcast,
The critics exclaim, with amazement again:
"Oh, can it have been that genius we missed?"
And they offer "Glad Hand," and not tightly-closed fist.

They laud you, and praise you, your talents they sing.

You've a wonderful time—when you've pulled the right string;

And from that day forward, whatever you write
Will be brilliant, stupendous, delightful and bright.

From the instant it's published, it's certain of fame.

Though there isn't much in it—it still bears your name:
"Plays not a play, but only a song,
Still, the same careful "pulling" will boost it along.

If you once get it "broadcast" you'll fallow in riches,

And may use diamond buttons to hold up your breeches.

On the top of the world you may ride like a king.

If at Broadcasting House you can pull the right string.

And all the old rubbish you wrote in the past
So often rejected, will win fame at last;

Words which the experts have turned down in scorn

Win the B.B.C. "catchet"—and at once are re-born!

Artificial Aerial Amateurs

The new regulations relating to amateur transmitters will affect each of the three classes of amateur—about 2,000 beginners who are allowed to operate sets on a closed circuit with an artificial aerial which does not radiate signals, about 1,700 who may use real aerials but must not use a power of more than 10 watts, and about 800 licensed transmitters using more than 10 watts. Most of the latter, of course, are operated by firms manufacturing wireless equipment. Post Office officials have already collected the equipment of two members of the staff of this journal.

Post Office engineers are always on the look-out for unauthorised transmitters, and it is thought that with all amateur work closed down, the Post Office engineers would be able to detect any secret transmission by means of direction-finding apparatus. Many amateurs, of course, have already volunteered for specialised war service. For the last five years they have been under a gentleman's agreement to work for the Navy in time of war, and in return for this they have received free licences. At the beginning of this year the system was put on a regular basis by the formation of the Royal Naval Volunteer Wireless Reserve. The full strength of the R.N.V.W.R. is adequate for the purpose in view. I am not permitted to give the exact figure.

Broadcast of the King's Speech

A S soon as King George VI ended his broadcast in the Home and Empire Service on Sunday evening, September 3rd, a translation of his message was transmitted in French, German, Italian, Spanish and Portuguese by B.B.C. stations for reception overseas. Thus, within half an hour of his Majesty's address, which was also broadcast by the American networks, the King's words were made known to a large part of the listening world. Later, translations of his Majesty's message were broadcast in Arabic and also in Spanish and Portuguese for Latin-American countries.

The B.B.C. has already received reports of good to excellent reception of the King's speech from Australia, India, Bermuda, Hong Kong, Jamaica, Kenya, Sierra Leone, the United States of America, the Argentine and Brazil.

Until further notice, news bulletins broadcast on short-wave from London in English and foreign languages are available for re-broadcasting from any station in all countries of the world, except in certain Empire countries to which notification to the contrary has been sent. Re-broadcasting from stations in Australia, India and Ceylon is now permitted. These bulletins are also available for re-publication in Latin-American countries only, and for public audition on board all ships at sea.

As this notice gives unrestricted permission, it is impossible to say accurately how many stations are making use of it. From inquiries which have reached the B.B.C. it can be stated beyond doubt that the bulletins are being re-broadcast very widely in all Empire countries where permission has been granted. It is also known that both the English and the Spanish bulletins are being re-broadcast in a number of South American countries.

Reduced Surface Losses

It is well known that high frequencies travel on the surface of a conductor, and in certain short-wave apparatus the coils and some other components are silver-plated to ensure high conductivity which will not be marred by oxidation.

In some cases experimenters have attempted to obtain the desired effects by using ordinary brass or copper components and polishing with a chromium "plate" or similar liquid artificial plating chemical. The majority of these chemicals are, however, nurcery in solution, and although when first applied they may fulfill the desired purpose, there is a risk of deleterious chemical action at a later date which will be worse than the trouble which it is intended to overcome. A better plan is to clean the parts very thoroughly and then paint with clear lacquer or celluloid in solution to prevent oxidation.

Lubrication

Many moving parts in modern receivers are employed as conducting paths and thus in addition to good contact between the adjacent surfaces, it is essential to keep them clean and free from foreign matter. Switches, for instance, are a typical instance of a moving contact surface, and many amateurs clean these periodically by rubbing with emery or fine sandpaper. Whilst this may be in order in some cases, the metal dust which is thereby obtained may find its way into some place where it will introduce trouble and the procedure is not therefore ideal. Special chemical cleaners are available for the purpose, and these should be used. Where lubrication is necessary celluloid graphite is a very good material to use, but it should be applied sparingly.

Valve Positions

In many modern receivers valves are placed in a horizontal position. This procedure is quite in order with the majority of modern valves as the filament suspension is well designed. In an A.C. or indirectly-heated valve, of course, the question of a sagging heater or filament does not arise, but in some of the older types of valve this may prove a source of trouble. The filament may sag and come into contact with the grid, and therefore care should be taken when designing a receiver where the valves will not take up the usual vertical position. Electrolytic condensers must also, in some cases, be mounted in a vertical position and this is indicated on the containing case.
Volume Control Arrangements for Remote Loudspeakers

Details are Here Given of a Motor-driven Gain Control for an Amplifier

Present-day wireless receivers and radio-gramophones are usually arranged so that the volume of sound from the loudspeaker is adapted to be adjusted by varying the gain or amplification factor of the amplifier, and it has been suggested to control the volume of sound from a remote point by connecting a secondary volume control situated at the remote point in circuit with the windings of the loudspeaker. Again, when an extension loudspeaker has been used, a proposal has been made to vary the volume of sound from the extension loudspeaker by means of a secondary or independent volume control connected to the leads for the remote loudspeaker. With either arrangement the maximum volume of sound which can be obtained for any given strength of received signal is governed by the position of the gain control for the amplifier, the secondary volume control merely being effective to reduce the sound to a desired level below that which would be obtained in the absence of the secondary volume control. There is, in consequence, a tendency to operate the receiver at or near the point of maximum gain, and this may result in the amplifier being overloaded, and the reproduced sounds distorted during reception of local or powerful stations.

Gain Control Adjustment

According to the improved scheme of volume control here outlined, the secondary volume control—to be referred to simply as a volume control—or each volume control in the case in which a number of loudspeakers is employed, is associated with the gain control for the amplifier in such a manner that it may be moved between the positions of maximum and minimum volume to increase or decrease the sound level at the loudspeaker it controls, and beyond those positions to cause the gain control to be adjusted. This arrangement ensures that the sound level of any selected loudspeaker will be at a maximum during adjustment of the gain control to increase the gain of the amplifier, and, by choosing suitable values for the gain control and the volume control or volume controls, it is possible to ensure that local or powerful stations can be received at normal volume of sound with the gain control some distance away from the position of maximum gain, so that the risk of overloading the amplifier under these conditions is eliminated.

Motor-driven Control

The scheme will first of all be described with reference to a wireless receiver provided with an extension loudspeaker incorporated in the cabinet of the receiver, and with one or more extension loudspeakers situated at a position or positions remote from the receiver; the gain control for the amplifier is adapted to be driven by a reversible electric motor, and volume controls arranged in the circuits of the loudspeakers are adapted to be operated manually.

Each volume control is arranged to close switches or contacts when moved to its positions of maximum and minimum volume, and these switches or contacts are connected by leads to the windings of the reversible electric motor; thus, all the switches or contacts which are closed when the volume controls are moved to the positions of minimum volume will be connected in parallel and in series with a winding of the motor which is adapted to cause the motor to rotate, for example, anti-clockwise, and drive the gain control in a direction to reduce the gain of the amplifier; and the switches or contacts which are adapted to be closed by movement of the volume controls to their positions of maximum volume will be connected in parallel and in series with the windings of the motor which produces a clockwise rotation, and causes the gain of the amplifier to be increased.

The gain control for the amplifier will usually be set initially in a position such that a normal volume of sound is obtained from each loudspeaker during reception of a local station when the volume controls for the loudspeakers are set in their median positions, and thereafter the sound level of any loudspeaker may be increased or decreased independently of the remaining loudspeaker or loudspeakers by moving the appropriate volume control towards or away from its position of maximum volume. If, however, the volume of sound from one loudspeaker is insufficient when its independent control has been moved almost to its position of maximum volume, a further movement in this direction causes the motor to be energised to drive the gain control of the amplifier in a direction such that the gain of the amplifier is increased; when the gain of the amplifier has increased to such an extent that the sound level is somewhat in excess of that required, the independent control may be moved away from the position of maximum volume to open the circuit of the electric motor, and make the final adjustment of the sound level.

Redjustment of Controls

The increase of the gain of the amplifier will increase the volume of sound from all the loudspeakers, and this may be counteracted where necessary by readjustment of the local or independent controls from each loudspeaker.

Conversely, if the sound level for a particular loudspeaker is too high when the volume control for that loudspeaker has been moved almost to the position of minimum volume, a further movement of the control to lower the volume will result.

Remote Motor Control

In a further arrangement a wireless receiver is provided with a local loudspeaker mounted in the cabinet of the receiver and one remotely situated loudspeaker, the independent volume control for the local loudspeaker is controlled manually, and the volume control for the remote loudspeaker is driven by a reversible electric motor.
VOLUME CONTROL ARRANGEMENTS FOR REMOTE LOUDSPEAKERS.

(Continued from previous page)

A motor which may be controlled from the remote point. The adjustable member of the gain control for the amplifier is mounted integrally on a shaft which is rotatably mounted within the cabinet of the wireless receiver, and the adjustable control for each arm forms a rotatable control, forming respectively the independent volume controls for the local and the remote loudspeakers, are supported one at each end of the shaft. The resistance element of the control for the remote loudspeaker is mounted on a control spindle coaxial with the gain control shaft, and this spindle projects through an aperture in the cabinet and is provided with a manual control knob at its outer extremity. The resistance element of the control for the remote loudspeaker is mounted on a further spindle located adjacent to the opposite end of the gain control shaft and concentric therewith, and this further spindle is coupled to the reversible electric motor. Leads from the reversible motor may be taken to the remote loudspeaker and connected to a pair of press-button switches mounted on the cabinet of the remote loudspeaker, the arrangement being such that one button may be pressed to cause the resistance element of the gain control shaft to be reduced and the other button may be pressed to obtain an increase in the sound level. Each resistance element of the volume controls is provided with a pair of stop members, arranged respectively at the positions of maximum and minimum volume, which stops are adapted to be engaged by the adjustable contact-carrying arm on the gain control shaft so that upon rotation of one or other of the spindles carrying the resistance elements the selected resistance moves relative to its contact arm until the position of maximum or minimum volume is reached; at this point a stop engages the contact arm and further movement in the same direction causes the contact arm, and thus the gain control shaft, to be rotated. The controls are arranged so that upon movement of a volume control to maximum, a further movement of the control in the same direction will cause the gain of the amplifier to be increased, and upon movement of the control to minimum, further movement in the same direction will cause the gain of the amplifier to be reduced.

The gain control of the amplifier may be set initially so that a normal volume of sound is obtained from the loudspeakers during reception of the local station when the volume controls are in their median positions.

Operating Details

In operation, if, for example, it is desired to increase the sound level at the local loudspeaker, the control knob of the volume control at the receiver is rotated to increase the volume of sound from the local loudspeaker, and if the sound level is insufficient when the maximum position is reached, continued rotation of the control knob in the same direction causes rotation of the gain control shaft to increase the gain of the amplifier; when the sound level at the local loudspeaker is somewhat above that required, the direction of rotation of the control knob is reversed, lost motion occurs between the stop on the resistance element and the contact arm and the sound level is reduced to the required level by means of the volume control. The sound intensity at the remote loudspeaker may be controlled by operation of one or other of the press button switches mounted on the cabinet thereof. If, for example, it is necessary to increase the sound level, a press button is held down, the appropriate winding of the reversible electric motor is energised and the motor operates to move the resistance element of the volume control for the remote loudspeaker relative to its contact arm and in a direction to increase the volume; if the position of maximum volume has been reached before the press button is released, the resistance element engages the contact arm and moves the arm and, consequently, the gain control shaft in the direction required to increase the gain of the amplifier. The press button is held down until the required volume of sound is being received, and it will be apparent that the volume of sound may be reduced at any time by actuation of the other press button which controls rotation of the motor in the opposite sense.

Varying Sound Level

An important advantage of the arrangement resides in the fact that the gain of the amplifier may be increased or reduced within limits to increase or reduce the sound level at one of the loudspeakers without materially altering the sound level at the other loudspeaker; thus, if the gain control shaft is moved by the volume control for the remote loudspeaker in a direction to increase the gain of the receiver for the purpose of increasing the sound level at the remote point, the contact arm of the volume control for the local loudspeaker is moved in the same direction, since it is mounted on the gain control shaft, and this movement is such as to move the volume control for the local loudspeaker towards the position of minimum volume. The increased volume of sound at the local loudspeaker, due to an increase in the gain of the amplifier, is thus compensated automatically within limits by the reduction in the sound level due to the volume control being moved towards the position of minimum volume.

PRACTICAL WIRELESS

September 16th, 1939

A GOOD METER IS ESSENTIAL

For normal experimental work a good milliammeter will serve most purposes, but for efficient service work a good multi-purpose instrument is necessary. In addition to its undoubted value in testing, a business-like meter creates a good impression on the client. One of the best-known multi-purpose meters is the "Avo-meter," and an A.C. D.C. model of this will serve for almost every need. There are multi-purpose instruments of similar utility and a few are illustrated here; when it is essential to cut down initial expenditure an "Avo-meter" is a good compromise. All of these multi-purpose meters are accurately calibrated and give the necessary self-contained resistors for the different ranges. Some of them can be used for simple resistance measurements, in addition to their use for voltmeters and currents.

RADIO AS A CAREER

(Continued from page 5)

occasions on which there are so many possible causes of the fault that is experienced to investigate each one separately would take far longer than would be required to make a few systematic tests and to take meter readings at all of the important points throughout the circuit. Besides, even when the fault has been localised it is necessary to track it to its source before a cure can be effected. That is why a first-class meter, and a first-class and intelligent knowledge of its use, is an absolute essential.

A Good Meter is Essential

For normal experimental work a good milliammeter will serve most purposes, but for efficient service work a good multi-purpose instrument is necessary. In addition to its undoubted value in testing, a business-like meter creates a good impression on the client. One of the best-known multi-purpose meters is the "Avo-meter," and an A.C. D.C. model of this will serve for almost every need. There are multi-purpose instruments of similar utility and a few are illustrated here; when it is essential to cut down initial expenditure an "Avo-meter" is a good compromise. All of these multi-purpose meters are accurately calibrated and give the necessary self-contained resistors for the different ranges. Some of them can be used for simple resistance measurements, in addition to their use for voltmeters and currents.

Resistance and Capacity Tests

It is not very difficult to make a bridge if a good multi-range meter is available for test purposes, but most engineers will prefer to buy a ready-made unit unless they have had at least a little experience of instrument-making. Those who do propose to make some of their own equipment will find full instructions in "The Practical Wireless Service Manual," which is obtainable from the publishers of this journal or from a bookstall; the price is 5s. 6d. post paid. This book also gives instructions for the use of the various test instruments -- instructions which could not be dealt with fully in this short series of articles.

One of the most important instruments, excluding a multi-range meter of the pattern referred to above, is a simple modulated oscillator. This is invaluable when aligning and gauging a modern superhet; in fact, accurate alignment is well-nigh impossible without an oscillator of this kind. Some notes on its use will be given in a later article in this series.

A typical set analyser, made by the Western Electrical Instrument Co.
A Servicing Stand

I DO a lot of servicing and as this involves sub-chassis testing, I devised the following stand to prevent the chassis toppling backward and damaging the valves, etc., but at the same time leaving both hands free to undertake the necessary tests.

Two lengths of 1-in. quartering were drilled with 1-in. holes 1 in. apart along their length, and were screwed to the back of the bench about 1½ in. apart, in a perpendicular position. Two more lengths were drilled with 1-in. holes 1 in. and 2 in. from one end. Four 1-in. metal strips were drilled with 1-in. holes 1 in. from the end, and were fastened to the other ends of the lengths of wood, two to each end, leaving about 1 in. protruding. A 1-in. strip of brass, or any other workable material, was bent as in the drawing, and a 1-in. wide slot was cut as shown. There were two of these strips needed, one for each arm. The back slats can be any height to accommodate any size chassis, and to enable it to be held on its end, or on its side. To secure the chassis adjust the arms to the height (or width) of the chassis, place the top of the chassis against the ends of the arms, and push back the metal strips until the chassis is fast; then tighten the wing nuts to fasten the strips in position. Make sure all nuts are tight, and there will be no danger of the chassis toppling over.—G. S. Domnson (Stepney).

THAT DODGE OF YOURS!

Every reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay 2/- 10/- for the best hint submitted and for every other item published on this page we will pay half-price. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL WIRELESS," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Practical Hints." DO NOT enclose Queries with your hints.

SPECIAL NOTICE

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

Shock Absorbers

MODERN receivers are generally susceptible to effects of vibration, especially where tuning is very sharp. This may be avoided by mounting the tuning condenser on a resilient platform. One way of doing this is to bolt the condenser to a flat plate and to support this on the chassis by long bolts, over which are placed standard rubber grommets, and another way is to use thick sponge rubber. Kneeling pads are obtainable quite cheaply and may be cut up for the purpose. This material is also useful to place beneath an existing chassis to minimise the effects of vibration, and this helps to reduce microphony in old model receivers. The material may also be used in the large sheets for supporting speakers, car radio apparatus and similar equipment. If the kneeling pads are not large enough, or a thicker material is required, it may be purchased in the flat sheets in all thicknesses up to 2 mm., the price of the latter being about 4s. per square foot.—D. Francies (N.W.).

Class B Transformer

THE class B transformer has a primary winding suitable for a maximum input of 250 volts, and is generally provided with tapping points so that it may be used on voltages down to 200 volts. In some of these transformers one of the secondary windings is rated at 250 volts and a winding with a centre-tap is generally provided for this. The ratio of this winding to the primary is approximately 1 to 1, and therefore it may often be used as a make-shift Class B input transformer with satisfactory results. A 300-volt secondary may also be similarly employed in some cases where a slightly different ratio is required. The primary is, of course, treated as the normal primary winding, and the secondary connected in the standard manner. The remaining windings on the transformer are ignored.—J. F. (Watford).

A Novel Protection for Tubular Condensers

WHEN soldering certain types of wire-ended tubular condensers, and particularly when more than one connection has to be made close to the component, the heat of the soldering iron can soon render the condenser useless by melting the wax, and loosening the connecting point to one "plate." To meet this possibility in the J. nil.

A simple method of protecting tubular condensers.
A simple 3-range tester such as is used by many listeners for general test purposes.

To be a successful serviceman, a good preliminary ground-work is essential, and haphazard servicing leads not only to inefficient repairs but also to needless or unnecessary expense. As we have already mentioned, a properly trained serviceman can call at the house of a listener, locate a fault and replace the defective part without putting the listener to any inconvenience. The old days of collecting the receiver and holding on to it for weeks or even months and then returning it only half done, are now a thing of the past. Dabbles will still, however, work on these inefficient lines and, therefore, if you wish to obtain a successful connection as a serviceman it is essential to cover the preliminary groundwork, although this may for a time appear boring. Apart from the use of instruments a certain amount of mathematical knowledge is necessary, although for all normal work there is no need to go into the Higher Calculus or any such branch of maths. Ohm’s Law, which is such a stand-by in radio practice, is a simple calculation which should be capable of application by even the youngest schoolboy. If you intend to plod steadily along you may need a little more mathematical knowledge than this, and this will be desirable if you intend to make use of very simple instruments. If, of course, you intend to obtain a modern Fault Finder such as is marketed under various names, very little technical knowledge or similar capabilities are needed, beyond a little common-sense in the application of the tester. These multi-purpose units enable every part or even the most complicated modern receiver to be properly tested stage by stage and very little, if any, calculation is needed.

Colour Codes
The serviceman must, however, also make himself perfectly familiar with the various colour codes which are employed in modern components and wiring, and although it is possible to carry data sheets of these about with you, the load may be reduced if they are memorised. A little practice will soon enable them to be grasped and the components may be identified rapidly. Components such as valves need exhaustive tests in some cases, whilst in others a mere check for filament continuity will suffice. A modern receiver may, however, be giving a poor performance, and a proper valve tester may locate the source of the trouble without the need of checking each part of the circuit. Calculation may be necessary to work out certain valve characteristics, but generally a “goodness” test for the valve will suffice. Individual component tests are possible with some testers, whilst in other cases current or similar tests will enable the component to be checked — again with a little mathematical aid. It will be seen, therefore, that servicing is not really a difficult task, but, like every other job which has to be done well, it has to be tackled properly.

Formule
For the start we must, therefore, tackle the essential formula which will be needed, our old friend Ohm’s Law taking pride of place. This states that Current equals Voltage divided by Resistance. This is normally expressed by the formula

\[ I = \frac{V}{R} \]

This brings us to our first difficulty, the substitution of letters for various factors used in radio work. They should be memorised as far as possible, although many of them may not be needed except on very rare occasions. The full table is as follows:

- Amplification
- Amplification Factor
- Ampere
- Anode A.C. resistance (impedance)
- Anode Current

![Here is a factory tester which does all circuit testing without dismantling any parts or leads. It is in the G.E.C. factories.](image)

- Anode Potential
- Anode Circuit Inductance
- Current (R.M.S. Value)
- Current (Instantaneous)
- Capacity
- Dielecric Constant
- Energy
- E.M.F. (R.M.S. value)
- E.M.F. (Instantaneous)
- Frequency
- Farad
- Grid-anode Capacity
- Grid Circuit Inductance

![A modern valve tester which checks all types of valves and which should be in the possession of every serviceman.](image)
I

Henry

Grid

Magnetic

Mutual

Mass

Lengtl

Inductance

Impedance

Length

Mass

Inductance

Impedance

Magnetic Flux

Magnetic Flux

Density

Codes

The colours adopted for resistances
are the most important in the codes,
although mains transformers and
fuses also have coloured leads which
must be capable of identification.
The resistance colour code is as
follows:

<table>
<thead>
<tr>
<th>Colour</th>
<th>Fig.</th>
<th>No. of Tenths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>0</td>
<td>None</td>
</tr>
<tr>
<td>Red</td>
<td>2</td>
<td>00</td>
</tr>
</tbody>
</table>

Modern test equipment is compact but with
a high degree of efficiency.

The order of reading these colours is:
Body, Tip Dot. An example should
make the idea clear. A resistance with
a red body, a black tip and an orange
spot or band will have a value of 20,000
ohms. If there is no dot on the body
then it is assumed that the dot is of
the same colour as the body.

A code is used in multiple conductor
blocks and this is as follows:
The highest capacity positive voltage  Red
The second highest positive voltage  Yellow
The third highest positive voltage  Green
The fourth highest positive voltage  Blue
The fifth highest positive voltage  Violet
Principal negative connection  Black
Second negative connection  Brown
Third negative connection  Grey
Centre connection for voltage doubler
condensers  White

Fuses

Fuses for use in battery or mains
receivers are also coded to indicate the
value and this code will be given
next week.

A multi-range tester can be used for all normal tests. Here is a set being tested.
Vision by Cable in the U.S.A.

BEARING in mind the recent developments in this country for the distribution of sound signals into the home by cable, it is not without significance that in the United States "wired television" is being regarded as a distinct possibility of the near future. One large company has already been formed solely to deal with this development, it being pointed out that whereas up to a few months ago technical opinion was in favour of a costly coaxial cable, or a series of relay stations for the distribution of television signals, the special experiments recently concluded by A. T. and T. have pointed the way to the use of existing telephone wires as video signal carriers. This new company has been formed as a result of the information obtained on this subject. It is pointed out that in the principal American cities television reception on the ultra short waves is proving difficult, because of the very nature of the skyscraper buildings, and the multitudinous reflections which occur unless a very elaborate receiving aerial array is employed. As against this it is suggested that a wire network within the city will bring into any house, from a central point, both radio and television without interference from static, or any other form of electrical disturbance. At the same time as this development is taking place it is learned that the sales of television sets in America, since the service was inaugurated on April 30th by the National Broadcasting Co., has been very disappointing, and now indicates a sharp decline. This is a direct contrast to the very optimistic figures quoted earlier in the year, where a total of 10,000 in a few months was glibly talked about. This disappointment is attributed to a vicious circle, for while the set manufacturers realise that sales may be worth while while prices are lowered, this cannot be undertaken until the consumers' demand increases. The disappointment is due to the appearance of a flood of cheap sets, which in turn affects the potential of the programmes. The broadcasting companies show considerable improvement, for whereas the radio receivers are good, techniques in television demand better transmission in order that their programme value is rated at a very low level. The transmitting companies under the national scheme which holds in America cannot spend money on giving better programmes without the support of sponsors, but permission to radiate an advertising programme is vested in the Federal Communications. Commission. This ruling body so far has refused to grant concessions to any companies until the industry is standardised in every aspect, and also fully grown, so that this state of impasse shows no sign of breaking, and will not do so until one of the parties involved takes a long view and makes a drastic change.

An American Proposal

THE Americans show every symptom of making a determined effort to take the lead in television in order to carry signal coverage for a large proportion of the whole country is concerned. They realise only too well that the radiation of television programmes from one or more transmitting centres, in addition to that of New York, is one of the easiest ways of bringing about a rapid expansion in sales of sets, for it will convince the public that the service so recently inaugurated in that continent is by no means experimental. According to the latest reports the plan now being formulated provides for the direct linking of the R.C.A. station built on the Empire State Building, with the G.E.C.'s transmitter at Schenectady. This is only the first step in the network, and for many months engineers have been engaged in finalising all the details. The scheme is scheduled to be put into operation before the end of this year, and each station will be capable of providing broadcast programmes for radio in both. This information would seem to show that the Americans are satisfied with the methods they have developed for the transformation of signals from point to point. It is a matter of deep regret that such a state of things does not exist here. At the Radiolypedia Television Convention, Sir Noel Ashbridge stated that either the cable or radio link would be suitable, but consideration of first cost, running costs, control and so on, technique of system and so on, of course had to be taken into account. Lady by a speaker, it being said that the delay in connection with the development of provincial television was entirely due to their efforts in postulating the claims of cable links so that the Post Office would maintain the control of signal distribution in their own hands, and derive revenue on a rental basis.

In Canada

FOR many years the Canadian authorities, that is, Government officials and certain of the engineering staff, have been conducting experiments in television, and it was felt that ultimately the public would be given demonstrations of high definition equipment using English apparatus. This hope has not materialised how-
WHILST the majority of short-wave enthusiasts follow with interest and appreciate the rapid strides which are being made in the design and development of short-wave receivers and circuits, many cannot afford to take advantage of the practice and must perform remain satisfied with the equipment to hand.

Fortunately, modifications and improvements can be carried out at low cost. For example, in some instances a set of coils are to hand which enables the experimenter to use his short-wave T.R.F. or T.R.F. and regenerative detector and T.R.F. stage receiver for medium-wave broadcast reception.

Selectivity Problems

Before going further, let us take into consideration the common defects associated with the straight regenerative short-wave receiver and the tuned radio-frequency type. Selectivity is mediocre in both instances, compared with that of the superheterodyne. I do not mean to infer that short-wave receivers other than the superhet are useless, because the degree of selectivity obtainable when using either a regenerative detector or T.R.F. receiver, depends upon its general design, layout, wiring, and efficiency, or otherwise, of the tuning coils used. Nor must we overlook the importance of the aerial and earth system used in conjunction with it; also, aerial coupling arrangements.

This brings us to a very important point often ignored when discussing short and medium-wave selectivity problems. That is, in many instances, poor selectivity is the price paid for simplicity of control. Take, for example, single and two-stage T.R.F. type receivers. The aerial circuit is usually made aperiodic, and thus receives all signals at equal strength.

Thus we have the desired and undesired signals picked up and passed on to the first H.F. valve and amplified, causing cross modulation when band-pass or variable-mu are not features of design.

Using a Wave-trap

This state of affairs, however, may be overcome in a very simple manner. Fig. 1 shows in theoretical form a receiver wave-trap fitted in series with the aerial. All that is required is a .0003 mfd. variable condenser, a coil mounting, a medium-wave coil and three or four single winding short-wave coils, which may be of the new obsolete two-pin type.

The idea is an old one, but when used in conjunction with short-wave receivers, serves a number of different purposes. It can, of course, be used as a wave-trap on all bands, and will prove worthwhile.

When inter-station interference is experienced, the unwanted signal may be tuned to its full volume on the receiver, and then reduced to the minimum, or completely cut out with the trap circuit, after which the set should be re-tuned to the desired signal.

The writer has always been, and still is, a strong advocate of tuned aerial systems. Quite apart from man-made static and integral receiver noises, we experience natural static or background noise.

Background noises are experienced by everyone to a greater or lesser degree, and the same applies to integral receiver noise, but man-made static is not universally experienced.

Reducing Interference

If man-made static is experienced, there are special aerial systems which may be used in order to reduce such interference, but there is no system available which will totally eliminate it, and one must be prepared to sacrifice a reduction in signal volume to some degree, and view the subject from the point of clearness of the signal due to the reduction of interference of the man-made variety originates closing to the lead in. Should such interference be a quarter of a mile away, things are pretty hopeless.

Natural static or background noise external to the set is, however, a different proposition altogether, and not only can it be considerably reduced, but completely eliminated in certain instances, but so also can signal volume be increased at one and the same time.

For example, whilst it may appear paradoxical, natural static has been experienced on a particular frequency which in itself is free from interference. Such interference being worse in the evenings, the aerial system will discriminate between wanted signals and unwanted interference. Provided that we can accomplish this nothing desirable state of affairs, a reception of the desired volume will be obtained to totally override noise, and by tuning the aerial system to resonance, we can achieve our objective. This is not high-sounding theory, but a fact all too little appreciated.

Aerial Resonance

There are various methods, complicated and otherwise, from which to choose. Using the coil and tuning condenser arrangement described is the most simple, and does not make for tricky operation. For example, suppose we tune the set to 31.25 metres and aerial tuner unit condenser at zero and set our aerial signal up to maximum volume. Now follow by tuning the aerial tuner unit. The point is not that this may be the correct one, but that a set of new resonance is brought into resonance, volume definitely increases until a point is reached where the signal is stopped, and the over from adjacent frequencies.

The point of maximum sensitivity falls a fraction below resonance, therefore, we must tune carefully for maximum signal volume which denotes that point by adjusting the aerial tuner unit and slightly correcting the receiver tuning or reaction condensers. By following this procedure, we not only obtain maximum volume, but override signals which spread over from adjacent frequencies.

An important feature to note is that this wave-trap arrangement enables one to reduce the input to the H.F. stage, and is especially useful in this respect when screen voltage is controlled by a potentiometer acting as a pre-decay volume control. In some measure this allows maximum sensitivity to be obtained or decreased at will, without excessive noise on the one hand, together with freedom from what may be described as knock reaction effects on the other.

In conclusion, it should be understood that a unit of this type will prove to be an asset when used with either straight regenerators or T.R.F. receivers.
Leaves from a Short-wave Log

U.S.A. News Bulletins

It is often useful to secure the latest news of happenings in European countries at times when no broadcasts from Great Britain or the Continent are available. In such circumstances it is possible to turn to a number of transmitters in the United States which, at stated times, put out news bulletins in English. The following will be found a useful list of times:

- G.M.T. 12.00 and 13.00 from WPTT (late W3XK), East Pittsburgh (Pa.), on 13.98 m. (21.54 mc/s); at G.M.T. 13.00, also from WNBI (late W3X1, Bondbrook N.J.), on 16.87 m. (17.78 mc/s); at G.M.T. 16.15 through WCAI (late W2XAU), Philadelphia (Pa.), on 19.63 m. (15.27 mc/s), 17.30 through W2XE. Wayne (N.J.), on 16.83 m. (17.81 mc/s); Saturdays Excepted; also at 20.55 through WGEA (late W2XAD) Schenectady (N.Y.), on 19.67 m. (15.53 mc/s).

There are transmissions daily from WNBI (16.87 m. = 17.78 mc/s), and WPTT on 19.72 m. (15.21 mc/s), and also at 17.00 from the same studios. Special bulletins are made by W2XE, Wayne (N.J.), on Monday, Tuesday, Thursday and Friday, on 16.83 m. (17.81 mc/s) at G.M.T. 21.50, and at 22.00 on Wednesdays, when a special commentary on topical events is also given. Special news bulletins are also broadcast on Monday and Friday every week by WPTT on 25.27 m. (11.87 mc/s) at G.M.T. 22.45, and at G.M.T. 02.30 on Sundays only by WCAI, Philadelphia, on 49.5 m. (606 mc/s).

Treasure Island Broadcasts

The General Electric transmitter on Treasure Island (San Francisco, California (U.S.A)), so far known as WDX51, has adopted the call-letters KGEI. During the past few days simultaneous transmissions have been carried out on both channels, the mid., 31.48 m. (9.53 mc/s), and 19.57 m. (15.53 mc/s), and the broadcasts have been extended to G.M.T. 04.00.

Good Signals from Caracas

With its slogan: 'The City of Perpetual Spring', at Caracas-Caracas (Venezuela), now provides regular musical programmes nightly until, roughly, G.M.T. 03.00. On 51.72 m. (5.8 mc/s) this 2.5-kilowatt station puts out powerful and well-heard signals, and the broadcasts, in addition to the call in Spanish and English, can be identified easily by the four deep-toned bells used during the intervals, and preceding or following an announcement.

Siam Now Thaiid

The name of Siam will shortly disappear from the map as the Kingdom has now adopted a new title: 'Thailand'. HSSOP, the 10-kilowatt station at Saldung, Bangkok, continues to broadcast at B.S.T. 14.00 on 31.50 m. (9.61 mc/s); HSSOP, at 19.7 m. (15.33 mc/s) is not so regularly on the air. Bangkok is roughly 5,500 miles from London and the local time is seven hours ahead of G.M.T.

Prompts from Formosa

On 31.13 m. (9.64 mc/s) a news bulletin in the English language is broadcast daily through JFO. Tainan, Taiwan (Formosa), at G.M.T. 15.00. During the past few days a simultaneous transmission appears to have been made through another station working on 30.96 m. (9.98 mc/s). The studio uses a gong to open and close the broadcast, all announcements being made by a woman.

Daventry's New Channels

From September 1st, two new channels are to be used in the Empire Service, namely, GSU, 41.32 m. (7.26 mc/s), and GSW, 41.49 m. (7.23 mc/s). The schedule is now as under: G.M.T. 11.00-14.45; GNP, on 25.3 m. (11.86 mc/s), and GSW: GNYX, at 30.96 m. (9.98 mc/s), and GSA, at 49.50 m. (6.05 mc/s) taking the G.M.T. 18.00-23.00 transmission. Both are destined to European listeners.

Rome Tests on New Frequency

From 16th, Rome (Italy) has been carrying out experimental broadcasts on 31.50 m. (21.51 mc/s), between G.M.T. 14.00-14.50, with a power of 250 kilowatts.

A Siren Wait from Trujillo City

On the 25-metre band a recent test run a clear call was heard from the Dominican Republic; it emanated from HIN, Ciudad Trujillo, on 24.03 m. (12.49 mc/s), which announces itself as the Broadcasting Nacional de la República Dominicana. The siren of a siren precedes all announcements.

Havana Wobbles

The regular logging of COBC, Havana (Cuba), is not always an easy matter as the station frequently deserts its original and advertised wavelength. It has been found on channels varying between 29.07 m. (30.08 mc/s), and 30.06 m. (9.98 mc/s), although the latter frequency is given in its announcements. The call is a long one as it is coupled to that of the medium-wave transmitter: Estaciones COBC del Programa Cubano y los Grandes Ateneos del Caribe, which brings out two medium-wave transmitters in Havana and Cuba. COBC, with its 998 megacycles on 998 transmitters in Havana and 998 on Cuba, is the only Spanish-speaking station in Havana, Republic of Cuba. The intercal signal, as one would expect in these circumstances, is a cockerel every fifteen minutes.

New Season’s Components

Below is one of the new 4-slate vibratory H.T. eliminators recently produced by Mannix, Balham. The unit is rated at 50 mA at 120 volts. Also seen in the group is one of the new model vibrators and its holder, and on the right the element of the vibrator removed from the containing case.

Above is one of the push-button tuning switch units including a new 4-way type. In the foreground are the new Unit coils which are available for straight or superhet receivers for tuning from 6 to 2,500 metres. Midget plugs and sockets and strip connectors may also be seen.
INTERESTING PICK-UP CONNECTIONS

Some Useful Suggestions Regarding Pick-up Connections for Various Types of Radio Receivers.

The usual method of connecting a gramophone pick-up to a receiver employing a triode or pentode detector valve is well known, and in the case of the simplest sets it is usually sufficient to shunt the pick-up across the grid leak, without the complication of switching, but it is generally considered good practice to disconnect the detector grid from the radio-frequency circuits in order to prevent break-through of radio programmes when records are being reproduced. The basic circuits of these conventional arrangements have been published in these pages from time to time. Recent developments in receiver design have rendered it necessary to modify the pick-up arrangements in many circumstances, while the characteristics of the pick-up itself must also be taken into consideration when deciding the actual circuit to be employed. One of these developments is the steady increase in the sensitivity of the modern superhet receiver as a result of which it is found that, unless special precautions are taken, radio programmes are liable to impose themselves upon the gramophone reproduction, even although a switch is incorporated to isolate the grid of the valve to which the pick-up is connected from the radio-frequency portion of the receiver. This break-through is probably due to capacitative coupling, and in order to avoid this risk, it is good practice to omit the isolating switch, merely switched direct to the output valve, but this connection should be taken to the volume control if this component directly precedes the output valve as it does in most superhets employing a diode detector.

The more general use of a diode detector presents further problems in connection with the feeding of the pick-up output into the receiver circuit, as it sometimes happens that the pick-up voltage available is not sufficient fully to load the output valve. Where there is a first stage of low-frequency amplification between the diode and the output stage, the solution is quite simple, the pick-up may be connected to the grid circuit of the first low-frequency amplifier with a simple change-over switch to insert the pick-up, and disconnect the detector output. No change in grid-bias arrangements will be necessary in this case.

This arrangement is for use where a separate volume control for the pick-up is fitted, as is often the case, the volume control being incorporated in the base of the detector triode, or supplied as a separate unit. In receivers where the manual volume control for radio is included in the diode detector circuit, it may be desirable to use this to control the pick-up also, in which case the pick-up must be switched across this control, and steps similar to those already described taken to prevent radio break-through.

Special Cases

In many cases, a double-diode-triode valve is used in place of a separate diode and low-frequency amplifier, and in such instances the pick-up can again be connected across the grid circuit of the triode portion of the combination tube. The actual arrangement will depend, to some extent, on the design of the low-frequency section of the receiver. If, the volume control of the receiver is connected between the diode detector portion and the triode amplifying portion of the double-diode-triode valve, it may be employed as gramophone volume control, or switching may be so designed that a separate volume control for the pick-up is used. In some circuits, however, the volume control of the receiver is placed between the triode amplifier and the output stage. While in this position it certainly controls the volume on gramophone, but it may fail to fulfil the other function of a volume control, namely, to avoid overloading. If the pick-up is connected directly to the grid of the triode section of the double-diode-triode, it is possible that with a sensitive pick-up, or on certain classes of record, the pick-up voltage will be too large to be handled without introducing distortion by the triode. It may be advisable, in such circumstances, to fit a separate volume control directly across the pick-up itself.

There are two other cases in which the inclusion of a separate pick-up control may be necessary. The first is where the only manual volume control for radio is a potentiometer or variable resistance controlling the grid bias to variable-mu H.F. or I.F. valves. This practice is found usually in straight T.R.F. sets employing an amplifying detector. In order to avoid the complication of two volume controls on the panel, the gramophone volume control may conveniently be ganged with the radio volume control, unless it is incorporated with the gramophone tone-arm or mounted on the motor board.

The other case where separate gramophone and radio volume control may be required is when the pick-up manufacturer recommends a total resistance for the volume control which is much smaller.
Points About R.C. Coupling
Some Details Regarding Component Values in the Quality Type of Low-frequency Circuits

The relative merits of transformer and resistance coupling are still matters of serious controversy. Some few years back R.C. coupling was unquestionably superior, but the very great improvement in transformer design in recent years leaves little to choose between the two. Nevertheless, a properly designed R.C. circuit usually scores inasmuch as the response curve is practically straight, apart from the inevitable tailing off in the extreme bass and treble. There are certainly no resonances which, however slight, are inseparable from even the first-class transformer. The requirements of any L.F. stage are good amplification and a faithful reproduction of the original signal.

No Step-up
With an R.C. stage we must remember that there is no transformer step-up; consequently, the theoretical voltage magnification cannot exceed the amplification factor of the preceding valve, and in practice it is, of course, very much less.

In order to obtain the maximum voltage step-up, the anode load must be as high as possible, and theoretically an infinite resistance would give the maximum step-up, but this is impractical. In practice it is wise, from a quality standpoint, to exceed 25,000 ohms, even though this may mean a loss. The self-capacity of the resistance, together with the associated wiring, may be considered as a condenser in parallel with it, and if we use a high value of resistance, the reactance of the capacity in the extreme treble may be comparable with the resistance itself. The anode load is thus reduced, and the amplification of the higher audio-frequencies suffers. If, however, we keep the coupling resistance low, the by-passing effect of a small capacity is unimportant, and is only noticeable at a point well outside the audio-spectrum. Similarly, one should never choose a value of coupling condenser which necessitates a high resistance grid-leak.

Signal Loss
Unfortunately, only part of the signal appears at the grid of the following valve. The coupling condenser and grid-leak form a potential meter, and only the voltage developed across the resistance is accepted by the L.F. valve. At low frequencies the reactance of the coupling condenser increases, which in effect means a lower voltage developed across the grid leak. In order that amplification shall not suffer in the bass, the grid-leak should be as high as possible and the coupling condenser large, but there are two important reservations. As pointed out above the leak must be kept reasonably low to avoid high-note loss. The second reservation needs more investigation.

After each successive wave-train the grid potential of the L.F. valve must return to its normal value, i.e., as determined by its normal negative bias. One method to allow the grid-leak to discharge to leak away sufficiently quickly to attain this desirable state. Unfortunately, the condenser takes a very definite time to discharge, which is determined by its own capacity in microfarads multiplied by the leak resistance in megohms. The result, the "time-constant," is in seconds, and indicates the required interval for the condenser charge to fall to 37 per cent of its initial value.

Avoiding Distortion
In order to avoid the distortion known as "grid blocking," in which a straggling effect, it is important that the time-constant shall be short compared with the shortest interval likely to be experienced between two successive oscillations. As modern amplifiers and speakers often show a good response as high as 12,000 cycles, the problem is not an easy one.

In practice it is customary to tolerate a little grid-blocking in order to preserve the lower frequencies; furthermore, this trouble is rarely noticeable unless the signal is loud and the time-constant very high. A good rule is to choose a value of leak and condenser which will give 90 per cent of the theoretical amplification at frequencies. Such a combination would have a time-constant of approximately .0066 and any values of leak and condenser may be chosen to give this product, with the reservation as to too high a resistance.

"Broadcasting in Everyday Life"

The B.B.C. announces that the results of a survey undertaken for the Corporation in two recently deserted working-class neighbourhoods—probably the first experiment ever undertaken—to discover what social changes had been brought about by broadcasting in this country are now complete.

As Mr. F. W. Ogilvie, Director-General of the B.B.C., says in a Foreword to their report, "Broadcasting in Everyday Life," published on September 1st, is of practical concern to the Corporation and may very well be of historical interest in years to come.

The investigators were Miss Hilda Jenkins and Miss Winifred Gill, of the Bristol University Settlement, and in view of the importance of finding how far broadcasting is helping to level up the interests and cultural opportunities of the less privileged sections of the community, a comparatively small, thickly-populated working-class neighbourhood in East Bristol was selected for their survey, in preference to one which was predominantly middle-class.

They declare that, for the wage earner of all grades, broadcasting has taken its place as a normal feature of home life.

Avoiding Distortion
It was found that certain annual broadcast events keep most people at home. A local headmaster in his Street survey, Day one year on Derby Day will not make that mistake again. Some popular events are the same every year—e.g., "Ireckon Gracie Fields fetches us all home." Broadcasts of national importance, especially those which touch the popular imagination, keep nearly everyone in. At the time of the Duke of Windsor's Abdications speech, the streets are said to have been deserted.

The investigators found that broadcasting was partly responsible for the fact that families keep much later hours than formerly, while some listeners volunteered the information that broadcast services were foremost among the civilising influences which had brought about so great a change since the war.

Copies of the booklet, "Broadcasting in Everyday Life," may be obtained on application by post, price 1d., to B.B.C. Publications Department, 35, Marylebone High Street, London, W.1., or, price one shilling, on personal application to the B.B.C. Bookshop, Broadcasting House, Portland Place, London, W.1., or to any B.B.C. Regional office.

INTERESTING PICK-UP CONNECTIONS—(Continued from previous page)—than that used for the normal radio volume control. In some cases, however, the difficulty may be overcome by shunting the pick-up by a resistance equal to that recommended for the volume control, and connecting the whole in parallel with the radio low-frequency volume control.

A Modern Method
Possibly the most interesting of the problems connected with gramophone pick-up switching is that which arises when the diode is followed immediately by the output valve and yet an additional stage of low-frequency amplification is required. A certain amount of the intermediate-frequency reproduction to an additional stage of low-frequency amplification is required. A certain amount of the intermediate-frequency signal can be passed into service, the pick-up voltage being applied to its grid, and the connections of the valve altered by suitable switching to control the valve to act as a low-frequency pentode. The grid-leak resistance-capacity coupled to the output valve.

A very ingenious adaptation of the idea has been used in some of this season's excellent models. It consists of using the intermediate-frequency valve, which is a variable-un screened pentode, for amplifying the pickup voltage, but the pentode characteristic of the valve is not employed. Instead, the valve is made to function as a triode amplifier, its auxiliary grid or screen being used as the anode, and the radiofrequency and intermediate-frequency signal circuits being rendered inoperative by disconnecting the grid-leak, altering the negative bias to the frequency changer control grid, and increasing the negative bias to the frequency changer.

PRACTICAL WIRELESS SERVICE MANUAL
By F. J. Camm.
From all Booksellers, 60/-. or at retail, 2/- net.
NATIONALISM “will out”. And that truth applies in music as instinc
tively and spontaneously as in any other walk of life. Just as people are
impelled to help their country at a time of need when, perhaps, they haven’t
treaded within a thousand miles of it since they were children, and feel it necessary to enter
any quarrel in its behalf. No matter how long it may have been since they so much
gave it one serious thought, so will a
musician be led to betray his origin, the
moment he sits in front of his music paper and
commences writing on it, by including some tune which is
heard in his composition. If you were to ask him
why he wrote it I don’t suppose he could
tell you why any more than a dog could tell you
why he turns round three times before
finally settling down to go to sleep. “Be
cause I’m a Spaniard,” or “Because I’m a
Russian,” would be the only practical ones.

As with so many things in music, and
in all the arts for that matter, the real
answer lies in the way in which
the minds of the troubadour and the
minnesinger wended their way along the
countries singing their “chansons” and
playing the tunes current in those times.
And to the bands of folk dancers who used
to maintain their skill in their native
dances on every possible occasion, and
in which everyone was eager to join. Instead of
hiking or walking down to Brighton read on a
together, our forefathers would
dance round the maypole, or honour and
praise the harvest, the Yule log, or the
spring eulogy in verse, song, and dance.
In consequence, distinct traditions of
melody and rhythm were bred into the
peoples of the various nations, which have
been handed down to the present day by
each succeeding generation, until now, these
twists and turns that make one piece
“so Spanish” and another “so French” etc., are more or less instinctive with
most writers.

National Idioms
I think it will be generally agreed that
easily the most poignant and the strongest-
flavoured of all the national idioms in
music is the Spanish. The reason is not far
to seek. The Spanish music is almost
exclusively written in dance rhythms con-
fined within the smaller musical forms
such as were used by Chopin. It is the
least symphonic of music. I don’t think there is
one single work, at least of merit, in one of
the larger forms used by Beethoven and
the greatest masters. Consequently it
lacks all the depth and profundity of
the greatest music, and is entirely like sparkling
champagne. Of the leading Spanish writers, Albeníz, Granados, Turina, de Falla, Nin, etc., only de Falla has attempted to use
the sonata form. He has written some fine
chamber music and a large scale work for
piano and orchestra, “Nights in the
Jardines de Eros.” We know very well that
this little title will confirm most of what I have just said.
Spanish music is a veritable microcosm.
The “gavotte,” the “mazurka,” the 
“polka,” etc., with castanets and tambourines
either constantly in use or being imitated, as
in the piano works. Picturesque, dreamy,
passionate by turns, and always seductive.

Because of its insistence on these dance
rhythms, it would naturally stand to be
easily imitated. Every literature contains
some imitation Spanish music—ever
Chopin wrote a bolero and “Midnight in
Madrid,” “Sunshine in Seville,” or “Caprice
Espagnol,” is an easy way to popularity.
But of all its copyists, none is so 
tempted by the Russians in catching
the true Iberian lift and gaiety. The
Spanish works of Bimsky-Komarov,
Balakirev and several others are truly
remarkable in their fidelity to alien origin.

Russian Music
Next to the Spanish in atmosphere and
pungent flavour is, probably, Russian
music. And for the same reason. Although
there are several Russian symphonies—
notably by Tchaikowsky and Borodin, the
dance is ever present. But here the
folk dances, or rhythms, are used rather
than the set dances as in Spanish music, such as
that haunting example in “1812,” just
tofore the Russian onslaught on Napoleon
conquers. Even a scherzo in a
Russian master’s symphony is a dance—
a Cossack flourish, or something—and
not the “form” as in Beethoven or Brahms.

French music, too, has a very personal
flavour, but the difference between it and
the dance rhythms in its nature
is that most of the dance rhythms
it employs, such as the gavotte,
mazurka, etc., are extinct as dances, and
are now just musical forms. It is the
same with English music, and, I believe,
with Italian. The German would seem to be
the least symphonic with any particular
“nationalist” bias, and the reason is most
interesting, because the exact opposite
of what I have just mentioned. It is essen-
tially symphonic in character, and, conse-
quentially, furthest removed from primitive
origins. It is the musicof the most profound
and the most consistently and continuously
developed music in the world. It is almost
like a scientific invention, such as the motor
car or the aeroplane. Never satisfied, no
matter how wonderful the examples to hand
may be, it must always be seeking greater
perfection. Even among those German
writers who completely fail loudly think
they have succeeded; they set out on their
path of conquest with all humility! The
few “German Dances” which Beethoven,
Schubert, Brahms and some others wrote,
are the most magnificent trifles when
compared with their major works. And
the dance, as such, hardly ever gains a
foothold.

Hungarian music is similar to Spanish
insomuch as it is based exclusively on such
national folk dances as the csardas and the
polka, and eschews the classical forms, but
itis inferior because poorer melodically and
harmonically. It is rhythm, rhythm, all
the way, and those exotic and nostalgic
harmonies—especially when they pass
through the melodic cornet—endear
Spanish music to most of us, are largely
absent. But the “collections” or “pot-
spourris” of Hungarian folk music, such as
Lizt dashed up in his famous “Rhapsodies,
are very insinuating, and the characteristic
figure, “dum-dum-dum-dum,” is one of the
most forced, and widely imitated, there is.

American Music
American negro music is still in a very
primitive stage. For any other nation
at this: most of the dance rhythms
it employs, such as the gavotte,
mazurka, etc., are extinct as dances, and
are now just musical forms. It is the
same with English music, and, I believe,
with Italian. The German would seem to be
the least symphonic with any particular
“nationalist” bias, and the reason is most
interesting, because the exact opposite
of what I have just mentioned. It is essen-
tially symphonic in character, and, conse-
quentially, furthest removed from primitive
origins. It is the music of the most profound
and the most consistently and continuously
developed music in the world. It is almost
like a scientific invention, such as the motor

Municipal Orchestra and studio concerts
with the B.C. Orch. Orchestra.

Miss Ethel Fouracre, inventor of the
well-known Pioneer switch and trud-
ing as the Pioneer Manufacturing Co., tele-
vised on her early experiences in the radio
industry in the morning programme from
Radlofonikus on the opening day of the
show.
LATEST PATENT NEWS

Abstracts Published.

LUMINESCENT INDICATING APPARATUS.—Telefunken Ges. Für Drahtlose Telegraphie, No. 506848. A dial and pointer indicator comprises a source of high energy emitting a high proportion of waves towards the violet end of the spectrum, for illuminating the dial or the pointer either of which is coated with luminescent material, for example, a composition having a radium content or a phosphorescent paint. Thus the whole dial may be coated with phosphorescent paint and then coated, for example, black, to leave luminescent scale indices exposed, or, a glass scale to be illuminated from behind may be formed by coating the back thereof with black material except at the scale indices and then coating the whole back surface with phosphorescent paint. A glow discharge tube with a luminescent blue gas is preferably used as the source of radiant energy.

CATHODE RAY TUBES.—Ring, F. No. 500811. To obtain a persistent image on the fluorescent screen 2 (Fig. 1) it is suggested by a modulated beam of a gun 10 to produce a charge distribution on the screen, which is then gradually increased by electrons from a floating cathode 6, these electrons being accelerated by an electrode 4 in front of the screen. The potential of the electrodes and the screen material are chosen so that—due to secondary emission resulting from the impact of the scanning beam—the charges on the screen are above or below a critical datum potential; the floating electrons from the cathode 6 will take the areas above this critical potential to an upper datum level determined by the potential of the electrode 4, while those areas below the critical potential will sink to zero potential. The electrode 4 collects secondaries emitted from the screen. The screen is returned to a datum potential which may be zero or the upper datum set by the electrode 4; the return to a datum may be effected by a beam preceding the scanning beam, by a light ray or by lowering temporarily the potential of the electrode 4.

Reference has been directed by the Controller to Specification 481094.

AUTOMATIC VOLUME CONTROL.—Spen- cer, R. E., No. 500779. A thermionic amplifier with automatic gain control comprises a high frequency stage including a valve 1 having at least three grids, from one of which is derived an A.V.C. voltage which is applied to a grid between that last mentioned and the anode. The valve shown is a special hexode with two separate screen grids, the tuned circuit 8 (Fig. 2) is broadly resonant to the same frequency as the output circuit 9 and is connected to the grid 5 of the circuit 8 and the anode, its impedance being small compared with that of 9. The voltage across 9 is rectified at A.V.C. and applied to the outer grid 6.

The circuit 8 may be a series resonant circuit and the valve 1 may be a standard hexode with two connected screen grids separated by a control grid to which the A.V.C. voltages are applied. The invention may be applied to a frequency changing stage.

B.B.C. WAVELENGTH CHANGES

The B.B.C. recently found it necessary to make the following changes in its programme service to home listeners. It has been recognised that these changes, which are due to the national emergency, will cause unsatisfactory reception in certain areas.

All listeners are asked to adjust their sets to a wavelength of 290 metres or 440 metres. This means that they should tune in on one of two points on the dial of the receiver—either that marked Scottish Regional or that marked North Regional—and select whichever is found to give the best results, without regard to past experience.

Until further notice a single programme, without alternatives, is being broadcast continuously, on these two wavelengths only, from 7.30 a.m. to 12.15 midnight.

There are news bulletins at: 7.0 a.m., 8.0 a.m., 9.0 a.m., 12.0 noon, 1.0 p.m., 2.0 p.m.

In addition there may be new announcements at the following hours: 4.30 p.m., 6.0 p.m., 9.0 p.m., 12.0 midnight. The bulletins at 7.30 p.m. and 10.30 p.m. will henceforth be devoted to announcements.

EVERYMAN'S WIRELESS BOOK

by F. J. Camm

(Early Edition)

A Radio Consultant for the Listener, Expert and Amateur Constructor, explaining the Operation, Upkeep and Overhaul of all Types of Wireless Receivers, with Special Chapters on the Principles of Radio Telegraphy, Installation, and Systematic Fault-finding.

With 200 Illustrations

Only 5s. net.

(By post 5/6)

GEORGE NEWNES, LIMITED

A Helping Hand

Sir,—Some time ago you published a letter of mine in which I stated my willingness to give what help and advice I could to beginners in wireless. As a result of this, I received about fifty letters, three-quarters of which were requests for wiring diagrams of "A simple two- or three-valve set." One person even went so far as to ask me for a complete wiring diagram of a mains-driven transmitter, receiver, phone monitor and power pack. It happens, however, that I have had time to answer only thirty of them, and I should be very grateful if you would let those readers who have written to me know that they can now expect a reply within a fortnight's time. Owing to the rising cost of living, I cannot guarantee a reply unless postage on it has been prepaid—P. W. Whittam (Soutgate).

Another Reader's Den

Sir,—At long last I am able to forward a photograph of my radio den. Since the photograph was taken a grapple tunnel has been opened at the back of the cabinet which, by the way, is of wood.

A brief description of the apparatus is as follows: A drawer houses the power pack (batteries) and the meter shown in the centre of the panel indicates the H.T. current conditions.

The second drawer down is a mixer panel, and also houses the input transformers from tube, etc. The six rather indistinguishable holes each side of the knife switches are sixpenny metal switches (English manufacture), and when heavily lacquered with celluloid varnish proved to be insulated well enough for the fairly low voltages used.

The third drawer contains a two-valve, R.C. coupled amplifier; the fader and tone control potentiometers being visible, together with further mixing switches and indicator bulb holders.

In the drawer beneath this is housed a medium-wave and short-wave detector unit, the S.W. unit having a valve detector while the medium wave unit has a semi-permanent crystal. The outputs from these two units are fed to the second drawer mixer panel, and from there to the amplifier.

The three panels are used for reproduction and very good quality is obtained from the crystal detector unit. The microphone shown is housed constructed from an ex-R.A.F. chest nut.

At the bottom right-hand corner is the mains check meter and under this in the box are a changer unit and beltronic-transformer, the outputs of which are fed to the top panel through a screened cable.

The receiver on top of the filing cabinet is a home-constructed S.W. portable of the Dozi, L.E.F. type—A. W. Millar (Edgware).

Proposed S.W. Club for West Bridgford

Sir,—I would like to get in touch with all short-wave enthusiasts who reside in West Bridgford, with a view to forming a short-wave club.

Will anyone interested please communicate with me, at the address given below—GEOFFREY READFORD, 14, Patrick Road, West Bridgford, Nottingham.

A compact arrangement of apparatus in the den of Mr. A. W. Millar, of Edgware.

A Reader's Experiments

Sir,—With reference to your request for listeners' experiments, etc., perhaps some of mine may be of interest to other readers.

Priced Problems

PROBLEM No. 365

(First prize 10s. 6d., second prize 5s., third prize 2s. 6d.)

O RELA has made up a simple three-valve battery set, using one R.C. and one transformer stage. Quality was not too good, so he decided to parallel-plate the transformer, which is a very well-made component. He did this, and although quality seemed to be generally improved there was a bad hum annoyance. What was the reason? Three books will be awarded for the first three correct solutions opened. Entries must be addressed to J. Barlow, 28, Albion Street, West Bridgford, Notts.

Solution to—Problem No. 364

A leaky electrolytic condenser was the cause of the trouble. It was sent to Jordan's workshop. The leak did not occur until the set had been switched on for some minutes. The following are the instructions for Problem No. 364 and leaky electrolytic condenser: To Mr. Jordan: D. Ainsworth, 18, Hylton Avenue, Birmingham; G. J. Litchfield, 9, Woodfields, Earlsdon; J. B. R. Blackwell, 17, Becket Road, Nuneaton; Mr. Jordan's address: The Cyclist, Road Club.
Earth Connection

"I took some pains to make a really good earth connection when I moved into my present house. I used a roll of new galvanised iron, and soldered the connection to it. This was buried end on in the ground and is at least 18in. deep. I noticed the other day that the lead had come off, and when I fixed it on again there was no improvement in reception. The connection is good and the lead is not broken. Can you suggest the cause of the failure of the earth to give improved results?"—B. K. A. (Shrewsbury).

Although the earth connection may be well made and soldered you must bear in mind that it is essential for the buried mass of metal to make good contact with the actual earth. Your earth may be in a dry condition and this could cause the inefficiency. Thoroughly moisten the earth surrounding the plate and you should note some improvement. On some circuits, of course, an earth does not greatly affect results.

Speaker Smoothing

"I have an old energised speaker, designed for a 6-volt accumulator energising. I am building a mains set, and I wondered if this would be good enough to put in the H.T. positive lead with the necessary series resistance to drop only 6 volts across the field. Can you advise me regarding this point?"—K. L. E. (S. E. 5).

The field is probably of the type requiring 5 or 1 amp, field current and, therefore, you could not use it in the manner you suggest. The H.T. current is only of the order of 0.6 amp, or so, and consequently, apart from the fact that the field would not be properly energised, the winding would not be large enough to provide normal H.T. smoothing.

Accumulator Connection

"When I received my accumulator back from the charging station the other day I connected up in rather a hurry. I noted that signifying a loud 'pop' so clear, I was listening to the news I did not worry. At the end of the news, however, I was looking round and then found that the accumulator was connected wrongly. Have I done any damage to the battery, or the set in connecting it in this manner?"—L. R. (Edmonton).

In most normal circuits no trouble should arise from the wrong connection, and accordingly it is only necessary to reconnect the accumulator in the correct manner and carry on as usual.

Extension Speakers

"I wish to use three or four loudspeakers in different rooms and wonder if there are any special precautions to take. I have two extension speakers already and should buy similar models for my purpose, but I am not certain whether all speakers working together will affect results."—Y. E. (Norwich).

This speakers should be chosen so that the lead out is kept at the correct value. This may be done by using proper matching transformers, or by using low-resistance speakers with a special output transformer connected to the receiver. There are many devices which can be employed to provide perfect matching, but these will be dealt with in a subsequent article in these pages.

Series Aerial Condenser

"When I connected my condenser-in recently I made a very poor joint and I found this out subsequently when cleaning up. I remade the joint but then signals were much louder, but the set tuned very flatly. Is there any reason for this and can you explain how to get back to the original condition, which made the set much more useful?"—L. P. (Kirby).

The poor connection undoubtedly gave "contact" by a capacity effect, and thus you were inclining to a series-aerial condenser in the aerial lead. This would give the slightly reduced signal strength and the improved selectivity you can obtain the same results, but more efficiently, by using a small variable or semi-variable condenser, joining one side to the aerial lead and the other to the aerial terminal. The condenser should be adjusted to give the desired results.

Valves in Parallel

"I have a four-valve set which gives quite a good output but is not capable of delivering the signal which I am sure the H.F. and other stages will produce. I have a good triode in the output stage and a similar one on hand. Could I include this in any way to increase the output? I believe the idea is known as parallel output."—T. A. (Highbury).

If the valve you have spare is exactly similar to the one in use you can certainly parallel the two. They are merely joined filament to filament, grid to grid and anode to anode. Of course, double the normal current will be taken, but the output may not necessarily be improved as the valves will have to share the input. The increased amplification may, however, be of use. Push-pull is the only satisfactory solution where overloadking is present and a greater output is desired.

Short-wave Adapter

"I have built a short-wave adapter as per the enclosed circuit. I am using this coupled to the grampophone and the results are satisfactory. I am a member of a commercial all-mains set, but as the adapter requires battery supplies I should like to take advantage of the mains set and so do away with all batteries. How can I do this?"—J. G. W. (Dublin).

The adapter circuit is quite standard except that an L.F. coupling component has been included with a coupling condenser and grid leak. It is thus in order to connect this type of adapter to the pick-up terminals of a receiver. To use the mains supply of the receiver it would be preferable to dispense with the valve now used in the adapter and to use a mains type valve in its place. Between the valve and the valvholder a special adapter should be connected, and this in turn should be wired to a similar adapter inserted between the detector valve in the mains receiver and its valvholder. The provision of the H.T. voltage may occasion some difficulty, and experiments would therefore be made with a view to obtaining a stable output, for which purpose a flexible lead may be attached to the H.T. positive point on the adapter and connected at one point in your mains set. The adapter may be of the type supplied by Messrs. B.T.S. or Bulgin.

Pick-up Leads

"I have been trying to get my radiogram working but cannot make certain regarding the pick-up connections and most suitable arrangement for this component. I have tried short and long leads and there appears to be no difference in results, but there is a faint background whistle all the time. I do not get this on radio reception, and the quality on gramophone is not so good as radio. Can you suggest anything?"—B. R. E. (Bristol).

The fact that you mention a faint whistling leads us to suppose that you have not broken the grid circuit when connecting the pick-up, although you give no details at all concerning the circuit arrangements of the complete apparatus. You are probably including a grid circuit in addition to the normal tuning coil, and thus are getting a certain amount of H.F. interference between the present H.F. circuit and tuning coils and the long pick-up leads. The grid-circuit should, of course, be turned off switch fitted so that the tuned circuits are cut out, whilst the pick-up is in use.

The output should be found worth while also to reverse the connections to the secondary terminals of the L.F. transformer.

REPLIES IN BRIEF

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

F. E. S., (Swich, S.O.), Write to the Armstrong people, who specialize in chokes.

H. E. (Batteri). The receiver in question may be improved by us stepping up the gain of the r.f. amplifier by increasing the r.f. output transformer. We are unable to supply a blueprint of this or any similar circuit.

W. C. P. (Lymington). We suggest the Beginners One-valve, blueprint P.W.S.

The coupon on page iii of cover must be attached to every query.
A REVIEW OF THE LATEST GRAMOPHONE RECORDS

Dancing Time

One of the loveliest of the new dance hits has undergone a series of bewildering title changes before finally emerging under the present one of "Why Begin Again?" Originally composed by a young coloured trumpeter named Charles Shavers under the name "Blue Dilemma," it was heard by Artie Shaw, and after a slight modification he broadcast it under the title of "Pastel Blue." Now Artie has again changed the title to the present one which either has been sung by Dick Todd on H.M.V. BD 730, or played by Artie Shaw and his Band on H.M.V. BD 731.

Another new record by Artie Shaw contains swing versions of two musical comedy tunes. These are Noel Coward's "Ziguener" and the popular "I lover Come Back to Me." H.M.V. B 89377.

Undecided," has been recorded by Benny Goodman and his Orchestra on H.M.V. B 8938. Aside from Benny's clarinet playing in this number, the "fans" will welcome a brilliant piano solo by Jess Stacy, the Goodman pianist. For the reverse side of this disc the band have recorded "The Lady's In Love with You," which comes from the film "Some Like It Hot," which features Gene Krupa, who until recently was the drummer in the Goodman band.

For No. 3 in their series of Jazz Chassies, H.M.V. have chosen to revive a ten-year-old disc, by Paul Whiteman's Orchestra, of "Ol Man River" and "There ain't no Sweet Man that's Worth the Salt of My Tears."

In addition to the vocal choruses by none other than Bing Crosby, this record features superb solos by the late Dix Beiderbecke, the famous trumpet player. Yet another version of "Why Begin Again?" is the one by Gerald and his Orchestra. This is coupled with "Air that's Coming Out!" played as a comedy waltz on H.M.V. BD 5002. The latest novelty dance is "Boompom Daisy." This has been recorded in strict dance tempo by Jack Harris, on H.M.V. BD 5005, and as a comedy waltz by Artie Shaw on H.M.V. BD 5499. Jack Hytton has also made a lovely recording of "Our Love," which is based on a famous Tchaikovsky melody—H.M.V. BD 5500.

SUSPENSION OF EMPIRE AIR MAIL SCHEME

This Postmaster-General announces that the Empire air mail service, whereby all first-class mail has been forwarded by air for Empire destinations served by the England-India-Malaya-Australia and England-South Africa air mail services, and for Egypt and Iraq, have been suspended. Subject to what is stated below, all first-class mail for the countries in question will be forwarded by surface route, the rates of postage being:

For all the Empire destinations in question and Egypt: Letters—first ounce, 1d.; for each subsequent ounce, 1d.; postcards, 1d.

For Iraq and Kuwait: Letters—first ounce, 2d.; for each subsequent ounce 1d.; postcards, 1d.

Correspondence for any of the countries hitherto served under the Empire Air Mail Scheme can still be forwarded by air mail, in airmail sender's despatches, in which case they must be fully prepaid at the rate of 1s. 3d. per half ounce (postcards 7d.) and a blue air mail label must be affixed at the top left-hand corner of the address side of the envelope.

The latest times of posting air mail correspondence at the Head Post Office, London, E.C.1, will be as follows, with correspondingly earlier times elsewhere:

England—East Africa: 12 noon Tuesdays.

(Continued from next column)
ROUND THE WORLD OF WIRELESS

Power Packs
A GOOD power pack or mains unit is always a useful piece of apparatus, and if made up from spare parts which you may have on hand, you will often find that it may be called into use with the utmost satisfaction. You may be testing out some new circuit or piece of apparatus, and need a good H.T. supply. If batteries are not available, a good power pack will, no doubt, deliver the necessary H.T. or at least will have a source which may be used for the purpose. Similarly, you may wish to try out some new valves, and the low-tension windings provided on a standard unit will undoubtedly be found of use. In the past described in this case there are both H.T. and L.T. windings available, and the latter are suitable for English or American Valves. Such a unit will fill a valuable position in the experimenter's workshop, and although it may not be needed at the moment, it will, no doubt, come in handy at some time or another.

Travancore Radio
Travancore State in preparation for the opening of the new broadcasting station which is being installed there at a cost, it is stated, of Rs. 280,000.

Indian Licences
At the end of June the total number of licences in force in British India was 76,841. The increase for the first half of the year was 12,361, compared with 4,730 for the same period last year. There were 18,117 sets imported into India during the half-year ending June, 1939.

Bournemouth Studio
New studios and a control room were formally opened recently at Bournemouth in connection with the new Start Point transmitter. The studios are situated in Majestic Chambers, Westover Road, and were opened by the Mayor. The output from the control room is fed to Bristol by Post Office land lines.

German Radio
It is announced that all broadcast receivers in Germany, other than the People's set, have been confiscated. This is stated to have been done to prevent the German people from listening to broadcasts from other countries, as the People's set will only receive the local stations.

Loudspeaker Nuisance
In view of the fact that many people are now working through the night on A.R.P. and similar work, the B.B.C. is repeatedly asking listeners to keep the volume of sound as low as possible in the daytime, so that these night workers may obtain the necessary undisturbed sleep. Perhaps readers would assist in complying with this request.

Pirate Waves
One feature which has already been brought out by the war is the raising of wavelengths by one country in order to broadcast news and give the impression of military occupation of that place. Warsaw, for instance, was reported in German hands and broadcasts were apparently being made from Breslau on Warsaw's wavelength.

New York Television
A THIRD television transmitter is proposed for New York, and the Mutual Broadcasting System has applied to the Federal Communications Commission for a licence to operate this on a power of 10 k.w.

B.B.C. German Broadcasts
An increase in the number of broadcasts in Germany is to be made by the B.B.C. in anticipation. Already there are six short wavelengths in use for these, and in addition there are broadcasts in ten other languages. The original London National wavelength is also being used for broadcasts in German, and it is anticipated that more medium wavelengths will be used, as the majority of German receivers are unable to pick up the short-wave stations.

A camouflaged army signal post, which was one of the features at Radiolympia.
ROUND THE WORLD

OF WIRELESS—Continued

World’s Broadcasting Stations

It is estimated that there are about 30,000 broadcasting stations in the whole world, of which about 8,000 are land stations, and the rest are mobile installations in ships, etc. Of these 8,000 land stations, 1,600 are regularly used for entertainment, and the rest for communications purposes. Moreover, over two-thirds of these are American stations.

Masteradio: Change of Address

We are informed that Masteradio, manufacturers of radio and electrical appliances, have now taken possession of a new factory and offices at 193, Rickmansworth Road, Watford. Telephone: Watford 9885. Their premises at Newton Street will be closed pro tem.

It will be the firm’s policy to carry on business as usual during the present emergency.

Hunting for Cosmic Rays

Dr. Robert A. Milligan, of the California Institute of Technology, has recently set out from Los Angeles on a cosmic ray hunting tour of the Equator and adjacent countries. His equipment will include the world’s smallest radio station, and 225 balloons. The balloons are capable of reaching a height of 20 miles and they will be released in Australia, New Zealand, the East Indies, India and Egypt. The balloons will carry delicate recording instruments up to altitudes which receive the full force of the bombardment of this planet by the mysterious rays from outer space.

B.B.C. Foreign Broadcasts

With the start recently of news bulletins in Polish, the B.B.C. is now using nine foreign languages daily in its service for reception overseas.

The nine languages, in effect, mean working in eleven different tongues, as the idiom and accent used in Spanish for Spain, and Portuguese for Portugal, are very different from that required for the Spanish and Portuguese broadcasts for Latin America.

These are the languages in which news bulletins are now broadcast daily: Afrikaans, Arabic, French, German, Italian, Magyar, Polish, Portuguese, Spanish.

Reports from Hungary state that the news in Magyar is arousing considerable interest, and is being quoted extensively.

“Do We Make Up Our Minds?”

Peter Grant, WLW announcer, will be one of the speakers at the first Luncheon Forum of the Woman’s Club of Cincinnati, on October 6th, discussing “Do We Make Up Our Minds?” His talk will concern the influence of press, pulp, radio, cinema and stage in moulding popular thought.

The King’s Portable Radio

It is reported that additional radio sets, including portables, have been bought by the King for use at Buckingham Palace. The orders will ensure that the King and Queen, and the staff at Buckingham Palace, will have radio everywhere, including the Royal A.R.P. centre.

B.B.C. Appointments

We are informed that all appointments to the B.B.C. permanent staff are now suspended. With regard to posts advertised in recent weeks and at unfulfilled, applications already submitted must be regarded as cancelled.

The Corporation is receiving many offers of temporary help from the public. While these are welcomed and are being scrutinised, they cannot, owing to pressure of work, receive individual acknowledgment. Any person who has made such an offer and whose services are required will be notified in due course.

A.R.P. Loudspeakers at Hove

It is reported that eleven loudspeakers have been placed on rooftops in Hove, so that information on A.R.P. matters can be broadcast. The air-raid warning sirens will also be relayed through these speakers.

Chinese Radiophone Service

Following the opening of the radiophone link between Chungking and Hong Kong recently, it is reported that preparations are in hand for linking Chungking with Hanoi, Rangoon, Singapore, Manila and Bombay.

JOIN NEWNES’ PRACTICAL GROUP!

PRACTICAL MOTORIST

The owner-driver’s journal which tells you how to repair, overhaul, and obtain the best performance from your car.

PRACTICAL MECHANICS

The only English journal of its type. It deals with every branch of Engineering, Mechanics, Invention, Model-Making, Chemistry, Astronomy, Photography, Television.

THE CYCLIST

The leading weekly for every Cyclist, Clubman, Utility Cyclist, or Triathlete. Join “The Cyclist” Road Club and take advantage of the Y.M.C.A. Lunch Club offer.

26—Every Wednesday.

Salem looks are appropriate to men as familiar with crime as these (in the radio studio). They are William Green, left, who is starred in the Doctor in W.L.W.’s “Unsolved Mysteries” programme, and Charles Sleel, who plays the part of Sleets, his assistant. The programme is heard each Friday from 9 to 9.30 p.m., E.S.T.
The "Home Service" Two

A Simple Two-valve Battery Receiver, Designed Mainly for the Reception of the Special Home Service Broadcasts

The readjustment of broadcasting in this country, and the adoption of only two wavelengths (391 and 449 metres) has made the use of many multi-valve receivers unnecessary. There are also many listeners who now require to listen to one of these stations in order to obtain the News Bulletins or Special Announcements, and who previously have not made use of a broadcast receiver. A simple two-valve receiver is, therefore, quite a valuable piece of apparatus at the present time, and many requests have already been received for a set on these lines. The theoretical circuit shows that the simplest possible arrangement has been adopted, and instead of the customary dual-range coil we have used a 6-pin medium-wave coil of the B.T.S. "One-Shot" Inductor type. This fits into a standard 6-pin coil-holder, and thus, if desired, it is possible to use the receiver on other wavelengths merely by changing the coil. The standard detector and L.F. arrangement is utilized, with transformer coupling, and a plain baseboard assembly has been adopted in the interests of simplicity and cheapness. As a further aid to low cost of construction, a plain wooden panel has been employed, with solid dielectric tuning and reaction condensers.

Construction

The baseboard is made from plain 3/16 in. plywood, measuring 8½ in. by 8½ in. The panel is of thinner ply, ½ in. being suitable, and measures 8½ in. by 8½ in. As there is little weight on the panel it may be attached to the baseboard by ordinary screws driven in at the lower edge, but if a stronger job is required standard panel brackets may be attached at each end. At the rear edge of the baseboard two terminal mounting strips are fitted, and these are cut from a strip of ebonite 2½ in. wide. Alternatively proprietary terminal strips may be used, and these may be of the type having terminals or plugs and sockets. The coil-holder, valveholders and transformer are mounted in line, the approximate positions being shown in the Wiring Diagram. In a simple set of this type there is no need to adopt rigid measurements, and provided that the parts in question are laid in position so that it is ascertained that they will all go on the baseboard, no other precautions need be taken. Place them as shown and mark out the fixing holes with an awl or similar sharp-pointed tool. Screw them down and mount the panel components, after drilling the panel from the details given in Fig. 2. It is possible to carry out all wiring in this simple receiver without calling in the aid of the soldering iron, all components, except the transformer, fixed resistances and condensers being provided with terminals. The wire ends of the smaller components may be attached beneath terminals, and the wiring diagram illustrates this. Now connect up, following the details given in the plan, and note that flexible leads have to be attached for the battery supplies. A standard 2-volt accumulator and 120-volt H.T. battery are needed, with a 9-volt grid bias battery for the output valve. The valves specified are Cossor 210 H.F. and 220 H.F.T., the grid bias rating for the latter at 120 volts being 4½ volts. The resistance in the anode circuit of the detector valve will ensure that the H.T. applied to the detector is adequate for smooth reaction effects and at the same time enables a single H.T. positive lead to be employed.

Operation

There is nothing difficult in operating a receiver of this type, as tuning is carried out on a single centre control and signal strength boosted as desired by means of

WIRING DIAGRAM OF THE "HOME SERVICE" TWO
CONSTRUCTOR HINTS
A Discussion of Simple Points Often Overlooked
by the Constructor when Building a Receiver

ALTHOUGH the construction of a receiver is a comparatively easy job provided that a full-size blueprint is available, we find that there are several important points in connection with the work which are often overlooked by beginners. These are mostly simple points which are guarded against by a matter of course by the experienced constructor but which, if not carefully attended to, can spoil the beginner's first effort at set-making.

Chassis
The metallised wooden chassis is very popular nowadays owing to the case with which it can be worked. When one of these is used, however, care should be taken to see that it is of reliable make and is effectively metallised on the upper surface; in connection with this it is emphasised that aluminium paint should not be used for metallising an ordinary wooden baseboard, as this type of paint cannot be relied upon to provide good metallic contact. It is also necessary to use a clean chassis as the metallised covering loses its effectiveness if covered with a layer of dirt, and therefore constructors should work on a clean table or bench and the hands should be kept reasonably clean. If there is any doubt concerning the effectiveness of the metallising the points shown connected to the chassis on the blueprint should be joined together by means of ordinary connecting wire.

If a receiver of the simple type having only one tuning condenser and tuning coil is being made it is unnecessary to use a metal chassis, but if two coils are used a metal covering for the baseboard is desirable and if the coils are of the screened type they should be separated by a vertical screen of aluminium or copper. As with the metallised wood chassis, cleanliness is again of great importance as an aluminium sheet covered with dirt or grease may be a very unreliable conductor.

Coil and Condenser Chassis
Most modern coils and gang condensers are of the screened type with the earth connection joined to the screening can. When components of this type are used, great care should therefore be taken to ensure good contact between the coil or condenser chassis and the receiver chassis. If the coil cans are painted the paint should be scraped off underneath before they are screwed to the chassis. In the case of gang condensers the chassis are sometimes supported on legs, but these legs cannot always be relied upon to provide good contact between the condenser and receiver chassis. Constructors are therefore advised to connect a length of wire between the condenser chassis and the metal or metallised chassis of the set.

The fixed vane tags or terminals of the gang condenser must be kept clear of the set chassis, however, and in cases where two sets of fixed vane tags are provided for, make sure the unused tags are not used and that they are kept up so as to avoid the possibility of a short-circuit occurring between them and the chassis. The same warning applies in connection with valve holder and terminal strip sockets; care should be taken to keep these clear of the metallised covering of the chassis.

Joints
All constructors are not agreed concerning the best type of joint to adopt; some prefer pressure joints, whereas others favour soldered joints. Unless the beginner is an experienced solderer, however, pressure joints should be used where possible. If terminals are not provided there is better to twist the wires tightly together than to apply solder incorrectly; a soldered connection is preferable to the pressure type only if effectively done. The wires to be soldered should be perfectly clean before the solder is applied, and the tip of the soldering iron should be well tinned and at the right temperature—just sufficiently hot to make the solder run.

Wiring
Care should be taken to keep the wiring short, avoiding straggling wires and loops, especially in the H.F. stages, and wires associated with tuned circuit components (gang condensers and coils) should be kept clear of each other. If long leads cannot be avoided in the H.F. stages it is advisable in some cases to enclose the leads in screening sheaths. The cap lead of the S.G. or H.F. pentode valve is often screened in this way, as shown above. This type of screen covering is generally made of braided wire, which can easily be soldered. Great care should be taken not to apply too much heat when soldering, however, as the insulation covering the wire may become damaged and a short-circuit will occur. In some cases we have found that constructors have connected the lead to the metallised chassis instead of the screening cover; it is emphasised that the lead passing through the metal covering must not be in contact with the latter, and only the covering should be connected to the chassis.

In mains receivers of the A.C. type the valve heater is fed from raw A.C. and therefore it is customary to twist the heater leads together. Usually, by this means the fields around the two leads are balanced out and interaction is avoided.

Chassis construction simplifies wiring and enables a compact receiver to be made up, bulky components being accommodated beneath the chassis.

PATENTS AND TRADE MARKS
Any of our readers requiring information and advice respecting Patents, Trade Marks or Designs, should apply to Rayner and Co., Patent Agents, of Bank Chambers, 29, Southampton Buildings, Chancery Lane, London, W.C.2, who will give free advice to readers mentioning this paper.
Radio as a Career—4

Some General Notes on the Trimming and Aligning of the Tuning Circuits of a Modern Receiver. Reference is Made to the Most Suitable Types of Meters and Instruments

By FRANK PRESTON

Reference has previously been made in these series to the ganging and aligning of receivers. This is an aspect which is of extreme importance to the modern radio engineer, for great accuracy in this respect is essential if the receiver, especially if a superhet, is to operate satisfactorily.

The average home constructor carries out the ganging, trimming and tracking simply by adjusting the various trimmers until maximum signal strength is obtained from any particular transmission, the volume control being turned down as the work progresses. The reason for turning down the volume control is that changes in volume level are more readily detected on weak reproduction than on loud signals.

Use of a Modulated Oscillator

This simple method is, of course, entirely unsuited to the needs of the engineer, who must work with a far higher degree of accuracy—the actual degree depending to some extent on the design of the set—and who must, therefore, be equipped with suitable test gear. Basically, what is required is a generator which will provide a steady modulated signal and also an A.C. voltmeter or corresponding device to measure the output from the set.

It will be clear that if a steady input is provided, the H.F. being modulated with a pure audio-frequency note, any errors due to the possible fading of the transmission from a broadcasting station, and due to variation in the audio-modulation is completely avoided. First, then, it is necessary to consider what type of equipment is required. A completely calibrated modulated oscillator is an expensive instrument, but its purchase is justified if the user is taking up service or research work seriously.

It is, however, possible to obtain a moderately priced instrument, made by a reputable firm, for less than £10 if an extremely wide band of frequencies is not considered essential. A modulated oscillator of this type is quite good enough for most requirements. Many prospective engineers will prefer to build most of their own gear, and this is possible, especially if it is possible to borrow a "standard" instrument.

A Radiola all-wave oscillator which can be used for testing down to 10 metres. The batteries are contained in the small case.

A typical valve tester—one of the Westone range of service instruments.

for calibration purposes. This is not the place to give full constructional details, but the necessary information has previously been given in these pages and in books published from the offices of Practical Wireless.

Method of Connection

With most types of modulated oscillator it is necessary only to connect the output between the aerial and earth terminals (after disconnecting the aerial lead), or between the grid and earth of the first I.F. valve. Alternatively, connection can be made to the mode of the frequency-changer and the earth line, so that the modulated signal is passed through both windings of each I.F. transformer. It is generally found most satisfactory to line-up the intermediate-frequency transformers first, and then to deal with the signal-frequency input circuits.

It should be made quite clear that there is no point in attempting to re-align a receiver unless there is good reason to suppose that the original setting has been lost, due to the fitting of a new valve or other component in the tuning circuits. At the same time, there are occasions on which the alignment has been disturbed due to the receiver having been dropped or tampered with by the owner.

A.V.C. Disconnection

Before starting to align and track a receiver with A.V.C. it is generally best to put this out of action first, for otherwise false settings might be made, especially if an output meter is being used. This is because the sensitivity of the controlled stages increases as the tuning is moved away from the resonant point. In most instances the A.V.C. can be disconnected most effectively by breaking the lead between the A.V.C. feed or decoupling resistor and the A.V.C. load resistor, and connecting it to the earth line. In other words, by returning the grid of the controlled valve (or the grids if there is more than one) to the earth line. In doing this, care should be taken that no other wiring is modified so that the constants of the circuit are changed.

Practical Points

When adjusting I.F. trimmers take care that the coil cans are not disturbed or moved so that they fail to make perfect contact with the chassis. Also remember that if the trimming screw is in contact with the H.T.-t line, a short-circuit will occur if the trimming tool or screwdriver touches the adjusting screw and the side of the hole in the screening can at the same time.

(Continued on next page.)
RADIO AS A CAREER
(Continued from previous page)

Once the I.F. stages have been brought into line, the input tuning and oscillator tuning circuits can be dealt with, if necessary. In doing this it is generally best to concentrate on the oscillator circuit, the tuning of which is sharper than that of the other tuned circuits. When the condenser is provided with a wavelength or station-calibrated scale it is important

that the pointer should read accurately, and this must have a bearing on the setting of the condensers. There should not be much difficulty if care was taken in adjusting the I.F. transformers to the exact frequency at which they were intended to operate by the set manufacturer. It should not be forgotten that in many instances there is provision for moving the tuning scale itself over a small range; when the tuning settings do not "hold" as between stations at the top and bottom of the scale the need for movement is usually indicated.

Especially care is required in dealing with a condenser having a split end vane, because each sector requires individual attention. Only very slight movement is permissible if the parts of the vane are not to touch that adjacent to it. A pair of very fine, flat-nosed pliers is often found useful for dealing with these split vanes, but the possibility of hand capacities must not be overlooked.

When separate padding condensers are used they require special attention, this being governed largely by the particular circuit arrangement. For this reason it is important to make a careful study of the circuit (which will be supplied by the manufacturers to recognised service men or accredited dealers).

After setting the trimmers always cover the adjusting screw heads with a spot of sealing wax; this not only prevents the screws from moving, but also discourages an over-enthusiastic owner from tampering with them and undoing your work.

A Simpler Oscillator

Those who wish to avoid, for the time being, the expense of a modulated signal generator will find that a simple neon oscillator known as an I.F. liner and made by Bulgin in numerous require-ments. It can be fed from any D.C. supply having a voltage of 200 to 250 and generates a signal at 468 or 110 kcs (according to the model used), modulated by a note of approximately 1,000 cycles. These liners are sufficiently accurate for all purposes, provided that the I.F. stages of the set operate at one of the frequencies mentioned. The liner is used in the same manner as a signal generator, and in most cases the input can be taken directly from the H.T. supply to the set, whether this is external or from a power pack built into the receiver.

Checking Output

Measurements of output can be made only with a reliable—and rather expen-sive—output meter. Constructional details of such a meter have been given in back numbers of PRACTICAL WIRELESS for those who propose to make their own, whilst meters are available from various instru-ment makers. Actually, it is seldom that there is any need to measure the

output, for all that is required is a means of comparison, so that the trimmers can be set until the maximum output is obtained. In that case use can be made of a neon output unit, which consists of a miniature neon tube behind a viewing window, a small transformer and a potentiometer which serves as an attenuator. The output from the neon tube is filtered across the neon tube, through the potentiometer. Conse-quentially, the tube glows when the output is sufficient. The method of use is, therefore, to set the attenuator until the glow just disappears, and then attempt to trim until the light just reappears. Next the atten-uator should be turned down again and further adjustment made. This process can be repeated indefinitely.

When using an output meter the procedure is, of course, to trim until the highest

possible reading is obtained, while the input remains constant. If the output is checked by ear, using the loudspeaker, it is generally found most satisfactory to adjust the input device until the note can only just be heard when trimming commences. As the work proceeds and the output is increased, the input should gradually be reduced. By following this procedure the aural judgment of output is considerably simplified and rendered more accurate.

It's a fact!

—THAT high-frequency currents travel on the surface of a conductor and therefore the largest possible surface should be provided.

—THAT a reflector used in conjunction with a dipole or short-wave aerial increases the signal-noise ratio.

—THAT the magnetic field round an energised speaker can introduce trouble and therefore care should be taken in placing such a speaker in a self-contained receiver.

—THAT an ordinary pocket compass may be used for testing inductive components such as H.F. chokes and coils.

—THAT the grid bias battery often needs replacement when an H.T. battery is replaced and therefore its output should be checked at this time.
The Position of the Clubs

Many of the wireless clubs will be in exactly the same position as other clubs, namely, their membership will be depleted by the requirements of the Army and the war. Club officials should, therefore, assure the continuity of the club's activities by delegating their duties to those under or over military age for the period of hostilities. This will avoid disbanding the club and the difficulty of getting the members together again when the war ends.

It appears that many social events have been abandoned, although some of the clubs are, as far as possible, endeavouring to carry on. The conflagration of all amateur transmitting sets will seriously affect the R.S.G.B. The hope of all is that in spite of the Cabinet's announcement the war may be of short duration. I shall be glad to receive letters from readers on war service. I shall reply to each.

The Doctor Johnson Broadcast

I have always looked upon Doctor Johnson, who compiled the first English dictionary, as a self-opinionated, glutinous, and disgustingly fat old man, undeserving of the fame which has been accorded to him. He was as a man the earliest example of the literary poseur. Wherever he was he wished to dominate the conversation, and to use it to get in a few cracks about everything — usually meaningless cracks. He must have been the earliest example of the jack of all trades, for his dictionary was not a good dictionary, and his definitions were not good definitions. It was he who defined patriotism as the last refuge of a scoundrel. I have always imagined that when he ate or drank he swilled and puffed like a grampus, and had the most disgusting table manners — even worse than those of Henry the Eighth. He was, in short, a know-all who knew little. I listened in, therefore, the other evening to the Johnson broadcast, to see how far my impressions of the man agreed with those who produced it. I find that my judgment was deadly accurate.

There is one other aspect of Dr. Johnson's life which has always nauseated me, and that is the association with that barnacle like sycophant Boswell, who wrote the life of Dr. Johnson. Apparently he made it his life's work. He came to London, fastened himself on to Johnson, and resided at the same house. He was a little hero worshipper, and the broadcast demonstrated that most aptly. Whatever the Doctor said or did, to Boswell was marvellous. The B.B.C. broadcast conversations between Johnson and Boswell, even to the Scottish accent of Boswell. Johnson was not in my view a great man; he wasted most of his time in pubs, aping the wisdom of the owl. In company he would stroll in and ignore everyone, and either appear to be wrapped in thought, or read a book to give the necessary impression of profundity. Thus, the opinion I formed as a boy, when I was compelled by an ignorant school teacher to learn the life of Dr. Johnson and was expected to worship at his shrine, was confirmed.

I remember as a schoolboy writing an essay on Johnson and Boswell in which I said that, but for the hero worship of the ignorant Boswell who apparently came down South with a desire to be kept at somebody else's expense, we should never have heard of Dr. Johnson. I retain that opinion to-day, and thank the B.B.C. for their broadcast. The person who took the character of Boswell gave a perfect representation of the sycophantic sponger who earns his keep by flattery.

Rush to Buy Radio Sets

One aspect of the war is that the public have been rushing to buy bicycles and radio sets. It is rather amusing that they can buy both from the same stores. An enormous sale has been made in portables, and I can well understand that those wishing to keep in touch with events, and who are separated from the family receiver, would need to have a set which is independent of the mains. We have had a steady demand for blueprints for many of the cheap receivers designed in our famous Leader series. The public have considered the possibility of the mains failing and putting out of action, or current rationing. They realise that the accumulator and battery is a useful standby. Some of the manufacturers have raised the prices of their sets, and some have withdrawn models which are unlikely to be sold during the War. There will obviously be a restricted output in view of the fact that most firms will be on war work. I learn that His Majesty the King purchased Pilot receivers for his use during the War.

One wireless trade paper has been amalgamated with an electrical paper. Stolen from Our Stand

This year the usual number of light-fingered gentry visited the Wireless Show. One of them recognising a good thing purloined our demonstration model of the 1940 All-Wave Three, an instrument of its transparent chassis. We ask any reader who knows of its whereabouts to communicate with us.

Back Issues

One of my readers says that he has time volumes of Practical and Amateur Wireless, and he is prepared to dispose of them free of charge to anyone who pays carriage. If any reader therefore cares to send me a postal order for 3s. 6d. I will see that the issues are sent on to him. I will return stamps to unsuccessful applicants. Application should be made by Thursday morning, September 21st, not later. Mark envelopes “D.”
Radio Emergency Aids

Now that we are in a state of emergency there are a number of points which vitally concern the average listener—as distinct from the real experimenter. Firstly, economy has to be effected in various directions, either on account of the difficulty of getting battery replacements or accumulator charging. Secondly, if the set goes wrong just before a news or special announcement broadcast is to take place, some idea as to the best method of hearing these broadcasts should be previously obtained. Dealing first with the economy idea, the only effect steel scheme is, of course, to cut out one or more stages. Although this will mean a limitation in the number of stations which can be received, it is apparent already that not so much long-distance listening is being done. There are, of course, several foreign news broadcasts being given from time to time, but the news is so contradictory and conflicting that it appears to be desirable to limit the amount of listening in this direction. Even so, it may be possible with many receivers to cut down the L.F. stages without seriously affecting the range of the receiver, and the only effect on long-distance stations will be to limit the volume. This drawback may easily be overcome by using headphones in place of the loudspeaker. Obviously, economy schemes cannot be applied to simple one- or two-valve receivers, and therefore we are concerned with multi-valve sets.

Cutting Out a Stage

If there are two L.F. stages, all that is necessary to cut out one, is to take the anode connection of the detector straight to the output grid circuit, retaining the resistance or transformer coupling already included in the output stage. Figs. 1 and 2 show the arrangements for both forms of coupling, the stage which is cut out being indicated by broken lines. This scheme will only slightly reduce the H.T. consumption but may make an appreciable difference to the L.T. consumption—dependent upon the valve in use and the size of the accumulator which is employed. If the receiver utilises a Class B or Q.P.Q. output stage it may be possible to replace this by a simple triode, the filament consumption then being lower and the total H.T. consumption also being reduced. Such a change would mean fitting a new valve-holder and slightly modifying the wiring.

Economising in Battery Consumption and Rapid Repairs or Makeshift Aids

By W. J. Delaney

If it is desired to cut out H.F. stages all that is necessary is to transfer the aerial lead to the grid of the second H.F. stage or the detector, interposing a fixed or semi-variable condenser having a maximum capacity of 0.001 mfd. This is not a selects the detector circuit—assuming, of course, that an H.F. stage is fitted to the receiver. If signals are still unobtainable, replace the detector valve by one of the remaining valves in the set, preferably by the L.F. valve. If signals are still unobtainable, test the filament of the valve with a battery and meter for continuity. If the filament is intact, then the breakdown is in the detector stage, and the components will have to be checked—preferably by replacement. It will be realised that this will take time, but in most cases the use of the detector stage as already mentioned will enable signals to be received. If the valve is found faulty, the replacement from another stage will provide signals. If the output valve is found faulty the 'phones may be left in the detector stage for the temporary repair.

Makeshift Components

If there is time, and it is found that a transformer has broken down, and it is necessary to replace this to obtain adequate volume, remember that it is generally only the primary winding which will fail. Therefore, the secondary may be retained as an L.F. choke and connected in either the anode or grid circuit, converting the coupling by the addition of a resistance and condensers as shown in Fig. 3. In one...
Putting Overseas Radio to the Test

An Interesting Account of the Various Tests which are Given to G.E.C. Receivers Destined for Use Abroad

It is the envy of nations throughout the world that this country can radiate from its Empire Station at Daventry, programmes that are technically perfect in production and transmission. From the tomfooleries of Dick Bentley and George Moore in "Lucky Dip," to the sweet tones of soprano Isabel Baillie, an amazingly wide variety of radio entertainment is available, and by virtue of the fact that the most progressive minds of the B.B.C. have been enrolled in organisation and many thousands of pounds expended on equipment, every facility for perfect long-distance listening has been provided.

Manufacturers have realised for some time that Overseas markets, especially those provided by the countries of the Empire, are an increasingly important source of good business. But to maintain this advantage they have realised also how necessary it is that the receivers they send abroad shall function as efficiently and reliably in foreign climates as they do at home.

To ensure such a standard, it is necessary to carry out exhaustive tests, reproducing the conditions prevailing in the countries to which the set is to be exported.

Fig. 1.—An insulation material testing cabinet installed by the G.E.C. for making sure that their sets function properly in foreign climes.

Fig. 2.—The perishability of rubber insulation is quickly gauged by accelerated life test to which it is subjected in the chamber of this humidity cabinet.

In the G.E.C. workshops and laboratories at Coventry, for instance, tests are first made on raw materials; then on components; next on the chassis; and finally on the finished receiver.

The illustration (Fig. 1) shows the chamber in which insulating material used in a wave-change switch is tested. In this cabinet, which is sealed by a glass-panelled door for observation purposes, the exact conditions of humidity and heat obtaining in any part of the world can be reproduced by suitable manipulation of the controls. Wet and dry thermometers...
PUTTING OVERSEAS RADIO TO THE TEST

(Continued from previous page)

made in air-conditioned rooms. Even the breath of the worker is shielded from the material by masks, which are handled with tweezers. The assembly platform is also warmed as an extra precaution.

The mechanical tests applied are typified by the operation shown in Fig. 5. Here

Fig. 6.—Testing the humidity of wood used for overseas radio cabinets.

a multi-contact switch is undergoing a life trial of a minimum of 25,000 efficient operations.

There is even apparatus (Fig. 6) for checking the humidity of wood for the cabinets. Smart appearance and finish are no less sought after in Malaya than in Mayfair, and wood warping has obvious dangers.

One of the most ingenious machines invented, the "Robot tester," quickly runs over thirty to forty routine circuit tests. Motor-driven selector switches pass current through every wired connection, and any fault is immediately identified by a numbered signal flag.

This test prepares the way for the more discriminating checks, which are electrical

tests made on the interlock principle; that is, no tester can complete his analyses until the previous man has correctly executed his part. A fourth operator has a roving commission enabling him to go over any part of the chassis for a double check.

Before the final customer tests are made, sets from each production batch are subjected to a life test trial. The current is switched on and off continuously for varied periods of use and rest, the number of operations being automatically recorded. One interesting point is that reproduction volume can also be checked during any desired period of the test.

And so on to final "customer" test, which is a soundproof room with the G.P.C. Coventry aerials 2,000 feet away. Tests are carefully carried out to discover just how the set will perform in the listener's home.

A last "hump" test follows in which the chassis is subjected to a far more arduous shacking-up than it will receive on its voyage to its destination, and the set is passed finally for dispatch.

Some Constructor Pitfalls

Do Not Attempt to Improve on Published Designs, or Fit Improvements Unless You Appreciate the Full Extent of the Alterations

When you see a design published in a technical paper, or purchase a commercial receiver you may take it for granted that all points of design have been considered before the receiver has been released to the public. If, therefore, you find, when trying either of the receivers above mentioned, that results are not up to standard or what is expected from the circuit, it is very tempting to attempt to trace the cause of the trouble and fit what might be thought to be an improvement.

Such a course may bring disappointment, not only from the point of view of actual damage to a component due to wrong use, but from loss of signal strength, loss of stability, or some other drawback. An example will probably make the point clear. Suppose, for instance, that a receiver has been built from a published design and proves unstable when put into use. The first thing an amateur might do in such a case is to assume that the screening is insufficient. If the receiver employs an H.F. stage the simplest modification that an amateur could carry out would be to screen the anode lead, and in most commercial receivers such a scheme is, of course, adopted in practically every case.

Capacity Losses

Now such screening is perfectly legitimate, but always a right and a wrong way of carrying out such screening. The lead from the anode is carrying H.F. currents and it is the desire of the user of such apparatus

WIRELESS

September 23rd, 1939

THE "HOME SERVICE" TWO

(Continued from page 32)

...as a point in your interest, which is, that the left-hand control, or reed condenser. This will sharpen tuning, although for normal purposes a high degree of selectivity is not required. The aerial may be of any type, either indoor or outdoor, the locality in which the receiver is used governing the need or otherwise of an outdoor aerial. In most places the set will give adequate volume (on 'phones) with a simple indoor aerial, but if, of course, loudspeaker signals are desired, then as good an aerial as possible should be erected and a really good earth connection obtained. It is quite possible that in some parts a simple indoor aerial will permit loudspeaker reception to be obtained, but this will only be in close proximity to the actual transmitters.

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(Continued from page 32)

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A Simple Flywheel Tuning Movement

Using a condenser having an in-corporated slow-motion drive, I decided that by modifying the drive to include a reasonably heavy flywheel, I should then be able to dispense with the two-knob control which normally provided coarse and fine tuning, the fine tuning ratio being only about 10:1 and anything but free of backlash.

A post sectional view of a simple flywheel tuning movement.

I was puzzled as to the type, weight and coupling of the flywheel to use, and after weighing up the pros and cons of various arrangements, I hit upon the idea of making a flywheel by welding some thick solder in a suitably sized tin lid.

First of all, I drilled a 1½ in. hole in the exact centre, then fitted a 1½ in. bore brass bush as shown in accompanying sketch. I next turned thoroughly the inside of the lid and, after fixing it in a vise, proceeded to weld the solder with a blow lamp until I had an evenly distributed and balanced filling. The inset sketch gives details of the construction.

Fortunately the location of the components behind the front panel did not prohibit the chain drive assembly deemed upon. But instead of the usual tuning scale, I soldered a brass pulley to the main condenser shaft (see inset) after re-drilling the pulley fixing hole to 1½ in. diameter.

A cord was then passed round this pulley twice and round a simple indicator pulley, to the shaft of which I soldered a pointer. An instrument dial plate fixed to the front panel completed the dial assembly. The essential principles of the flywheel movement and cord drive only are shown, and are self-explanatory so far as the mounting is concerned.—G. I. LONGMAITH (Edmonton).

THAT DODGE OF YOURS!

Every Reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £10-0-0 for the best hint submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us (addressed to the Editor, "PRACTICAL WIRELESS," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2). Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Practical Hints." DO NOT enclose Questions with your hints.

SPECIAL NOTICE

All hints must be accompanied by the coupon cut from page 111 of cover.

A Calibrating and Checking Dial Jig

When designing a new short-wave recently, I found that quite an appreciable error resulted if the vernier dial movement was not accurately centred, due both to inconsistency of comparison between the plate of the vernier indicator which makes reading difficult, and also the variation in extreme settings.

For obtaining fine movement in any future designs, and also as a check between the periphery of the dial plate and vernier or hair-line indicator, I decided to make up the jig illustrated.

It also occurred to me that I could obtain further advantage from this jig by marking out a secondary vernier indicator on an adjustable brass plate located at the zero side of the dial, as depicted, thus with a scribbling tool, an existing dial or a new aluminium dial plate could be quite accurately and easily calibrated or remarked.

Four 2BA setting screws are used for alignment on either the jig or receiver panel, these being fitted into tapped holes and stabilised with spring washers. The whole assembly, unless otherwise indicated, is made with Hunslet plain aluminium.—L E SMITH (East Ham).

Simplified Connections

I am interested in experimental work, and find that the continued removing and replacing of battery cords leads not only to delays but sometimes to poor results due to frayed leads, etc. I therefore built up the following simple but effective arrangement. At the back of the work bench I fitted a raised step to which a length of ebonite fitted with sockets was attached. These are permanently joined to tappings on the H.T. supply and to the L.T. and aerial earth. When I rig up a receiver or other apparatus I provide at the back of it a strip of ebonite to which plugs are fitted, and it will therefore be seen that all that is necessary is to push the apparatus to the back of the bench when the plugs will go into the sockets and the various connections will be made instantly. Rapid changes and tests may be carried out by using this device.—L. WALDE (Hendon).

Drilling Glass

Some constructors may like to employ a glass panel or even a glass cabinet for their well-built receiver, and it should be remembered that glass may be drilled just as easily as ebonite, provided the right drill and lubricant are employed. The broken-off point of a triangular file makes a very good drill, and it should be turned slowly, without undue pressure, and at the same time lubricated with copious supplies of ordinary turpentine. When through, the panel can be easily cleaned.

A novel jig for calibrating and checking dials.
AN ALL-PURPOSE

Complete Constructional Details of the Experimenters are Given in

It must be appreciated, and it would appear from the many letters received that the point is not fully understood, that a unit having a high voltage and current output can always be used in conjunction with circuits requiring much lower values by employing suitable networks of resistances. These can be formed from simple series resistances or fixed or variable potentiometers across the output of the unit or other parts of the H.T. supply. This procedure will be described in detail at a later date.

The rated output of this unit is 350 volts at 120 m.A., a value which, while not being too costly to obtain, does provide a handy supply for practically all experimental work likely to be considered by the average amateur.

To obtain these values, a Varley mains transformer, Type E.P. 40, is used in conjunction with a Csor rectifying valve of the indirectly-heated class, namely, their 481.U.

An indirectly-heated valve was selected owing to the fact that it does help to prevent those very undesirable voltage surges produced when the valves in the apparatus being fed from the unit are reaching their operating temperatures.

In addition to the windings supplying 350-0-350 volts and 4 volts 2.5 amps. for the rectifying valve, three other windings are incorporated in the transformer.

These are wound to give 4 volts at 1 amp., (twice) and 4 volts at 4 amps., all windings being centre tapped.

This combination should provide adequate L.T. supply for all normal purposes, together with the advantage that separate windings are available for feeding two valves of the 1 amp. heater type in push-pull, thus allowing individual control to be obtained as regards biasing.

As it was intended to make this unit as universal as possible, and owing to the fact that many constructors now make use of valves having American ratings, it was

Fig. 1.—A good idea of the general layout can be obtained from this photo. Note platform for smoothing condensers and rectifying valve.

Fig. 2.—Theoretical circuit diagram of the All-Purpose A.C. Power Pack.

E.VERY enthusiastic experimenter who is fortunate enough to have an A.C. mains supply available, desires, sooner or later, an efficient power pack capable of being used in a universal sense so far as experimental work is concerned.

While admitting that it is not a difficult matter to design and construct a unit which will satisfy most requirements, there are certain factors, however, which have to be considered; therefore, the apparatus described below is intended to provide a unit which will appeal to the majority of readers who have requested such information.

General Considerations

One of the first things which has to be settled by the constructor when he is considering the construction of a power pack is what A.C. and D.C. output will be most suitable for immediate and future requirements.

It is highly possible that the work or circuits in hand only call for, say, a very modest output of voltage and current and, for example, no A.C. supply for heater circuits. If such demands are not likely to be exceeded, then, of course, a small unit having a very low initial cost will be quite satisfactory, but if the constructor is of the keen experimental class, then it would be wise for him to look ahead and make provision for the future.

It would be very false economy to go to the expense of making an eliminator having, say, an output of 150 volts at 30 m.A.'s, if one is going to find in a few months' time that a much larger unit is required, unless one's activities are going to be seriously restricted.

A unit which appears to enjoy considerable popularity is that which makes use of a valve rectifier of the 350 volts 60 m.A. class from a mains transformer providing also an A.C. I.T. output of, say, 4 volts at 4-5 amps. The I.T. windings can be varied to suit individual requirements if the necessary specification is given to the transformer maker, so for normal receiver experimental work a unit of this type can prove quite useful. If, however, one is likely to be concerned with quality outputs, I.F. amplifiers or energized loudspeakers, then it is far better to lay out the slight additional purchase price involved, and construct a unit similar to the one described below and have available a handy reserve of voltage and current.

Design

The complete theoretical circuit of the all-purpose power pack is shown by Fig. 2. It should be noted that it is a perfectly standard arrangement plus an additional mains transformer for an extra I.T. supply, about which more will be said later. The circuit has been purposely kept as free from elaborations as possible, as at this stage it is only intended to be the means of supplying well smoothed D.C. at a moderately high voltage, and several sources of A.C. I.T. to make it as universal as possible.

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A.C. POWER PACK

is of a Unit So Essential to

Article by L. O. SPARKS

decided to embody a supply for those valves
requiring 6.3 volts across their heater
circuits. This supply is provided by a
separate mains transformer having an
output of 6.3 volts at 3 amps. A suitable
component can be obtained from Messrs.
Premier Supply Co., Ltd., and wired in
the unit as shown by the plan drawing.

Switches

It will be noted that three panel mounting
switches of the Q.M.B. type are mounted
on the front panel and these enable the very
critical controls as mentioned below to be
obtained by a flick of a finger. (1) Mains
supply to rectifying circuit on-off. (2)
H.T. (D.C.) output on-off, and (3) mains
supply to 6.3 volt transformer on-off.
This arrangement allows rapid control of all
supply circuits and thus offers a safe
and quicker facility to the operator for
carrying out modifications or tests.

Smoothing

Adequate smoothing is provided by the
two Dubiler dry electrolytic condensers,
together with the L.F. choke in the
positive H.T. supply.

For effective operation it is essential
for the choke to possess an inductance of
at least 25 to 30 henries at the rated
output of the rectifier; therefore,
care must be taken when selecting this
component to see that its specified inductance is
that at 120 m.A.'s. An inferior component
will not only allow a hum ripple to be present
in the D.C. output, but there will also be the
danger of it breaking down due to poor
insulation and the use of wire not capable
of carrying the required current.

If for any particular reason additional
smoothing is required, though this is not
likely, another L.F. choke can be introduced
in series with the one shown, plus another
smoothing condenser, or in series with the
negative lead.

Meter

With a unit of this type it is very
advantageous to provide some means of
indicating the total current flowing in the
output circuit or, in other words, checking
the operation of the rectifier. This can be
quite easily done by inserting a reliable
milliammeter in series with the negative
lead, as shown in Fig. 2. The meter in
question should, of course, not have a lower
maximum reading than 120 m.A.'s, unless a
dual range meter is used with its correct
shunts.

Construction

If the wiring plan (Fig. 4) is examined, it
will be seen that there is little need for any
explanation concerning layout or wiring.
The only item calling for mention is the
metal platform which holds the two
electrolytic condensers.

This is made from a strip of aluminium
which is bent at each end to form supporting
pieces, after two holes have been drilled or
cut in the horizontal strip to hold the con-
densers. Care should be taken to see that
those parts connected to the common
negative side of the circuit have connections
which are electrically perfect. Note that the
twin fuse-holder is connected in each side
of the mains supply, and that the pilot light
can be connected across any of the L.T.
windings of the rectifier mains transformer.
This last item might seem to many to be an
unnecessary fitting, but as there is always a
danger of not knowing whether the unit is
dead or not, unless some visual indication is
provided, it is well worth while employing
a pilot light, if only to avoid finding out
whether the unit is on or off by the rather
annoying method of shocks. A complete
list of the component parts required is given
on this page, and a complete kit may, as
usual, be obtained from Messrs. Peto Scott.

LIST OF COMPONENTS

One mains transformer, Varley E.P.40.
One Cossor rectifier, 45.L.U.
Two Dubiler condensers, 8 mfd. Type 0281.
One L.F. choke, Premier, C150-185.
One L.T. mains transformer, Premier, 6.3 v.
-23A.
One dual fuse-holder and fuses, Bulgin, L.F.11.
One pilot light holder, Bulgin, D.150.
One milliammeter (see text), Premier or Bulgin.
Three switches, Type 80L, Bulgin.
One 3-pin variable holder, Clux.
One 4-pin valve holder, Clux.
One baseboard 12ins. x 10ins.
One panel, 12ins. x 8ins.

Fig. 3.—This illustration shows the location of the
two mains transformers, the small one in the rear
being for 6.3 L.T.

Fig. 4.—The fixed condenser, 0.1—0.1 mfd. across the mains is optional. If any hum is present,
then it should be employed. The Varley E.P.40 has a different terminal panel than that shown.
SHORT-WAVE SECTION

UNCONTROLLED H.F. CURRENTS

Tuned H.F. stages, and the elimination of hand-capacity effects are amongst the subjects dealt with in this article.

To build a short-wave receiver which on test appears to be satisfactory and find later that there still remains room for improvement is an experience common to the short-wave enthusiast. In spite of careful work and attention to detail, little snags appear, which later assume a serious aspect, especially when the application of well-tried preventative methods fails to effect a cure. One of the most common and, from the beginner's point of view, most baffling is the so-called hand-capacity effect: for example, detector and two L.F. sets may be sensitive, fairly selective, and stable when operating above 20 metres, yet below this wave-length each circuit may predominate. Sometimes, even when the most thorough by-passing and decoupling precautions have been taken and an R.C.C. L.F. stage introduced, the symptoms are noticeable.

Before short-wave H.F. chokes and the fitting of an L.F. output choke respectively appear to be of little benefit. In this instance we are dealing with a really bad case, because the L.F. output choke usually effects a complete cure.

It does not follow that the set is really bad, and it is quite possible that hand-capacity and threshold-bowl effects will be experienced. Instances of this nature are not uncommon, and taking the broad view, we may assume that the set will prove to be a good proposition, provided we can prevent the straying of H.F. currents into the low-frequency circuits.

The H.F. choke, whilst it certainly does choke, does not function in this respect as efficiently as many imagine. The introduction of additional by-pass condensers and filters depends largely upon circuit combinations with respect to their effectiveness. There is, however, one method which is usually successful when others fail, and that is the fitting of grid-stopper resistances and series grid-lead chokes.

Grid Stoppers

Before going into details, the selection of grid-stoppers may be considered. Remembef, in case of doubt, that the most suitable value is that which when fitted prevents the H.F. currents straying, yet does not reduce signal volume to any appreciable extent. Various values between 1 megohm and 1 megohm should be tried and the effects noted.

A grid-stopper may be inserted in series with the grid lead of each L.F. valve, or alternatively, an S.W. type H.F. choke may be used in the second L.F. valve grid-lead. This method is to be recommended, especially if the second L.F. stage is R.C.C.

Check up on the various remedies outlined in turn, and if the trouble still persists, rest assured that nothing short of re-building the set and altering the layout will improve matters. Years ago, the incorporation of a really first-class L.F. transformer meant trouble. Instability was the result, and so cheap transformers were rendered necessary, stability being obtained at the expense of L.F. amplification. Decoupling, and the use of by-pass condensers were unknown. Briefly, the methods of putting the best into S.W. receivers in order. the best results which were not expected. Nowadays it is different, a good L.F. transformer, efficient decoupling and by-passing are to be recommended.

Tuned H.F. Stages

Opinions as to the advantages of tuned high-frequency stages in short-wave receivers are naturally divided.

During the early days of the S.G. valve it was found that little in the way of H.F. amplification was obtainable, and as wavelength decreased, so did H.F. amplification. Whilst the same valve applies today to a lesser degree, it should not be forgotten that the screened-grid valves now available show vast improvement compared with the early types, and quite a useful measure of amplification ahead of the detector is obtainable.

Choice of coupling is left to the individual, but in most instances where tricky operation is experienced, the coupling from the S.G. valve to the detector will be found too tight. Interference and self-oscillation in the H.F. amplifier are also common troubles, more especially when two or more stages of high-frequency and gang control are used.

Whilst sharp-tuning, undamped H.F. stages (within practical limits) are an advantage in broadcast receivers, they are pretty hopeless so far as short-wavers are concerned, and in order to derive any benefit from a tuned H.F. stage it is necessary. By increasing the aerial coupling, effective damping is obtained.

One of the most effective tests is to set the detector oscillating on a code signal and follow this by tuning the H.F. stage. If when this is done the signal pitch changes considerably, the S.G. stage tuning is too sharp. Adjustments should be made relative to the aerial coupling until it is noticed that H.F. tuning increases volume, yet does not change signal pitch.

Trimmer Adjustment

When correct adjustment has been made, it will be found that the H.F. tuning control in single H.F. receivers has the same effect as a volume control when detuned. In multi-stage H.F. receivers two things are done: ganging tuning, and a separate panel-mounted trimmer across the first H.F. section of the gang condenser, a true vernier and selectivity effect will be obtained when the separate variable trimmer is operated, if the ganging is correct.

If it is found that separate trimmer adjustment causes interlocking, denoted by a plonk or burble, pay attention to the second H.F. stage. It is probable that it is out of gang sufficiently to cause self-oscillation when the preceding stage is brought into tune, in which case, lock back the second H.F. section trimmer one quarter turn. Sometimes experimenters, when wiring up H.F. receivers using screened cables with leads passing through the screening cans, add additional insulation the full length of each lead. This should not be done, as the damping noticeable, especially below 20 metres, is most marked. A short piece of extra insulation over existing insulation is all that is necessary in the interests of safety.

In any case fit fuses—not flash-lamp bulbs. The H.F. pentode is undoubtedly the valve of the future relative to the pre-detector amplification and detection in short-wave receivers. It possesses a number of advantages over the screen-grid type, and can do everything the latter is capable of doing with a greater resultant efficiency.
A REVIEW OF THE LATEST GRAMOPHONE RECORDS

CONTINUING their series of Kenneth Alford's own performances of his compositions, H.M.V. have recorded that composer's "The Smithy" which he describes as a pastoral fantasy. This will be a prime favourite with all those who like their military band music plentifully spattered with "effects" and "noises off." On the other side of the disc, "The Two Dons" which features a brilliant xylophone duet by R. Wright and L. Wegs. Both of these Alford compositions are played by the Band of H.M. Royal Marines, Plymouth Division, conducted by Major Ricketts.

Under his pen name of Kenneth Alford, Reginald Foort has found ideal material to show off his giant moller Concert Organ in "The Pilgrim's Chorus" from Tannhauser, and the Introduction to Act 3 of "Lohengrin."—H.M.V. BD 7509

Bolling's has devised two ingenious medleys by the words "moon" and "blue" on H.M.V. BD 712.

It is in "Moonlight Shadows" and "Shades of Blue" that this fine cinema organ recording.

Old Songs Revived

Outstanding vocal successes of this month's list are modern recordings of old songs. Maxine Sullivan, the dusky singer, has in "One Hour" and "Hello Lola," by Red McKenzie and "The Mound City Bliu-Blowers" on H.M.V. B 8953.

Next come two tunes from "The Mikado." These are sung by Kenny Baker, who starred in the film. He gives a good rendering of "A Wandering Minstrel" and "The Sun of Waver's Yoke."—H.M.V. BD 741.

Dorsey and the Canadian Crossties chooses for his latest disc—H.M.V. BD 737—"Girl of My Dreams" and "You've Got Me (Crying Again)." Two records you really must hear are Arthur Askey's "The Wornout," and "Knitting On."—H.M.V. BD 739;

and a new disc from Ethel Waters, "What Goes Up Must Come Down" and "If You Ever Change Your Mind."—H.M.V. BD 749.

Swing Music

Heading the swing releases this month are a pair of discs from Artie Shaw and his orchestra. The new Shaw titles are old favourites. On H.M.V. B 8948 you will find "It Had to be You," coupled with "I Can't Believe That You're in Love with Me." Both of these reveal the orchestra's fine saxophone section at its best.

It is in "Pegasus," which is coupled with Lachar's "Villa" on H.M.V. B 8949, that the remarkable clarinet virtuosity of Artie Shaw himself will be apparent to every listener.

Benny Goodman who says he is all set to build his finest band ever, has recorded "Make Believe" and "I'll Always Be in Love with You."—H.M.V. B 8960.

The second side features a long solo passage by his pianist, Jess Stacy. This solo is a fine example of the logical melodic development shown by the best swing players. Finally, there is a record by Tommy Dorsey and his orchestra. This contains a new composition called "Peckin' with the Penguins," and an old one, "Davenport Blues."—H.M.V. B 8831.

"F. D. R. Jones" coupled with "Sunrise Serenade" has been recorded by Hall Keny, the American band leader who played at London's Café de Paris in 1930. Both of these tunes are the most notable numbers from the musical show "The Little Dog Laughed."—H.M.V. BD 5516.

Both of the tunes recorded by Keny also have been recorded by British leaders. Jack Hylton has coupled "Sunrise Serenade" with the lovely "Stairway to the Stars."—H.M.V. BD 5513. Gersdo has taken "F. D. R. Jones" with another tune from the same show called "On the Outside Looking In."—H.M.V. BD 5510.

On top of these, there are several more grand tunes in the complete list for November which includes "There's Something Wrong with the Weather" done by Harris's orchestra on H.M.V. BD 5512.

Release of a Classic

A jazz classic released this month is "One Hour" and "Hello Lola," by Red McKenzie and "The Mound City Blue Blowers" on H.M.V. B 8952. This record features the great Coleman Hawkins, he plays tenor saxophone, as well as Gene Krupa, the famous drummer, and Pee Wee Russell, the clarinetist.

But there were many difficulties. The record was originally made in 1929 and was so much in advance of its time that it was not a success. It was withdrawn and the negatives lost or destroyed. Years passed and swing became popular and people began to want the record they had at first despaired. It was thought to be too late until a search of the files in America produced two more negatives. These were immediately rushed to Europe with the result that a jazz classic thought to have been lost for ever is once again available.

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By F. J. CAMM.

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Colour and Impressions in Keys

Our Music Critic, Maurice Reeve, Discusses the "Perfect Art Form in Music"

At the time of his death in 1939, Scriabin, the very mystical and abstruse Russian composer, whose works had such a tremendous vogue just after the war, was engaged in the task of uniting sound with colour. By a scientific process, and the enrolment of a new scale, he hoped to unite each ray of the spectrum with its "twin" in sound waves, thus producing what he prophesied would be the perfect art for. Although Wagner, in his gigantic "music dramas," has probably said the last word on the subject of the music of the future, so far as I can see, no sufficient competence to say whether Scriabin's theory was capable of realisation, it does seem to give food for interesting speculation. The evolution of some of his major works, they were performed in front of coloured backdrops that corresponded almost exactly with the moods, or colors, of the works themselves. This device has never been resorted to in London, at least, to my knowledge. Which all which I have been present, so that the argument I used in a previous article in favour of the idea of"plete" to all music as"also, later," probably applies to Scriabin's as much as any.

Individuality

Each key—twelve major and twelve minor—has its own individuality and composers have always been very sensitive to this fact. It is only in the realm of sounds that the music is transposed to suit vocal requirements. But here, as I believe, as the great "lindens" are very rarely sung by any but the voice originally chosen by the composer. We take it as universally agreed that the sharp keys express a greater degree of brightness, gayety and "good nature" than the flat ones, which rather bespeak sadness, melancholy, or pensiveness, in varying degrees. Also that the major keys favor the former types of moods and the minor the latter. Let us recall some famous works and see how far this theory is borne out in practice.

Our thoughts naturally turn to "programme" music where the composer "lays his heart on his sleeve," as it were, and proclaims his intentions just like a painter or a writer. Here are six pieces in major sharps: Mendelssohn's "Spring Song"; Wagner's "Prelude to Act II of Lohengrin"; Part 2 of Liszt's second "Rhapsodie"; Grieg's "Wedding Day" or "Norwegian Bridal Procession"; Tchaikovsky's "Valse des Fleurs," from "Casse-Noisette," and any of Rossini's overtures.

Now for minor pieces—those are the offspring of vivacity, gayety and high spirits. We cannot think of them in any other key, any more than one can imagine a green violet or a blue daffodil.

Contemplative Music

By way of contrast, here are six world-famous compositions of a sad, broody, or contemplative character. Each one of them has been pitchèd in a minor key: Chopin's "Funeral March"; Beethoven's "Funeral March," from the third symphony; Rachmaninoff's "Prelude" (the prelude!); Schubert's "Walse Tristte," Grieg's "Solveig's Song," and part one of the Liszt "Rhapsodie," part two of which was in the major group, an interesting comparison. I would have included Beethoven's "Moonlight Sonata," but for the fact that it comes under the heading of "absolute," and not programme music.

I will form one more group of representative pieces of a tender, wistful or appealing nature, as apart from the grave and sad character of the last one. Each one of these is in a flat major key: Schumann's "Tranenre," Liszt's "Liebestraum," Chopin's "Nocturne in E flat," M. C. à Stradivari's aria from "Madame Butterfly," "One Fine Day," Santa-Beata's aria from "Sonnets and Delights," "Softly Awaken My Heart," and Schubert's song "Thou Art Repose."

Handel and Beethoven

Whilst there is no hard and fast rule, the evidence proves that certain keys mean the same thing to one's preconceived and feelings, to all musicians, one could easily cite exceptions. Handel's "Dead March"footer, for instance, is in the key of G. I have been compelled to omit the, perhaps, most beautiful of all the keys, "C major," because I specified keys with sharps and flats! But a study of works in this key, especially those coming under the heading of "absolute" music, would show that composers evidently consider it expresses an exceptionally wide range of emotion. Beethoven was particularly fond of it and we have works of his ab ab rare apart in feeling as the "Walstein Sonata," the "Arietta," from the last Sonata and the finale of the 5th Symphony pitched in it. It is a key that is frequently used to express triumph and rejoicing. Mendelssohn's "Walking March" and Wagner's "Procession of the Mastersingers," readily come to mind. The finale of the 5th Symphony is also one of the most "triumphal" movements ever penned.

Absolute Music

When we come to "absolute" music we are on dangerous and speculative ground, because the composer has kept his thoughts strictly to himself. Sometimes his secret has been revealed to an intimate through a letter or a fragment of conversation. At others there has been, perhaps, merely the tempo indication at the head of a movement, as in Beethoven's sonata "Les Adieux." Usually there is nothing, as in most of Bach's music. Works like the "Moonlight Sonata" are not absolute, without any foundation, whilst others like the "Appassionata" derive their inspiration, from the tempo indication the head of the first movement, Allegro Appassionata. The "Walstein Sonata" and the "Archduke Variations" have titles in virtue of their respective dedications, Count von Walstein and the Archduke Rudolph. But such titles may be entirely without any indication as to the character of the music. Chopin's "Rainy Day" and "Butterfly," "study," and Bach's "Ave Maria"—so called because Gounod superimposed a melody with words thereon—have been, in all of the 68 preludes—three out of a hundred of examples of which I could cite of absolute music uninteresting given a "programme."

Debusy

A final word can concern the works of an acknowledged master of programme and impressionistic music, Debussy. Amongst his many collections of pieces are twenty-four preludes, each with a title: "Fireworks," "Dances of Delphi," "The Wind on the Plain," etc. and each, when you know what they are meant to portray, life, in its fidelity and reality. But to each one Debussy put the title at the end of the piece purposely so that the listener should place the music first, and make the subject of the picture of secondary consideration.

RADIO EMERGENCY AIDS (Continued from page 32)

RADIO CLUBS & SOCIETIES

GLOSSOP AND DISTRICT RADIO SOCIETY, Acting Secretary, J. A. Morris, 32A, Bank Street, Highfield, Manchester.

The last meeting of the above society a Lecture was given by ZF1I on "Frequency Measurement." Due to the recent outbreak of war, and the calling up of several members, all the meetings have been postponed for the time being. 2DXA has gone to the R.A.F. Wireless Rescue chairman T. W. Morris, the secretary (K. C. Sidebottom). A Taylor and ZF1I have been called up to the Royal Corps of Signals and ZFXI is away with the R.A.F. The H.Q. is at present closed, and communications should be addressed to the acting secretary at the above address.

EASTBOURNE AND DISTRICT RADIO SOCIETY, Hon. Sec.: T. G. R. Dovett, in, Grove Road, Eastbourne, Sussex.

The society's meeting held recently a demonstration of the "Nimbus" through this display was held. The following bands were shown.

What Do You Think?

Sir,—As you express a wish for readers’ letters, what Practical Wireless should contain, I send mine, as follows:

1. For the benefit of new readers a good series of articles on the theory and practice of reception. It should deal with both straight and superhet principles.

2. Articles dealing in fair detail with particular parts and components of receiving circuits, e.g., A.C. systems; beat frequency oscillators; feed-back; methods of detection; valves; loud-speakers, etc.

3. Articles on commercial receivers. How many amateurs on looking at the “works” of a commercial receiver can identify even the various valves and coils? The theoretical circuit of a commercial receiver should be taken, and the whys and wherefores of the various components and of their values fully explained in fair detail. The explanation could be in serial form, covering new circuits in turn.

4. Articles on elementary principles of electricity should be published.

5. When giving details of battery receivers for construction average state the H.T. consumption, Anyhow, I think there are too many battery receivers being described. What about A.C. and universal sets for construction?—J. B. BEINE (Rath).

Correspondent Wanted

Sir,—I have been a regular reader of Practical Wireless for about six months now and would like to correspond with any young reader in any part of the world who is interested in any branch of radio.—J. C. SMITH, 59, Reynolds Street, Barnley, Lancashire.

Curtailed Activities

Sir,—Now that the amateur transmitter cannot carry out his experiments in other parts of England the output from a single transmitter can be taken up. I have lost my transmitter and find that listening alone is very uninteresting. I have plenty of gear and wonder if any other amateur transmitter has discovered any new field which may be explored without necessitating transmitting apparatus, which, of course, is illegal. I must take this opportunity of congratulating you on the new cover and contents, which I think the paper more presentable than it was before—such a thing is possible.—D. GORDON (N.W.D.)

Short-wave Battery Super

Sir,—I believe I have previously seen in your pages a request for a short-wave super for battery operation. I was very interested in your recent Air Hawk, and should like to see a description of a battery set on similar or even more ambitious lines. I have done, and has been done in America, but I should like British. One of the L.F. stages could, perhaps, be cut out in the interests of battery economy, but this does not worry me as I have a wind generator and wet H.T. cells. Can you see into this and let us have a design soon?—E. GRAY (Kenya).

Servicing

Sir,—I note that you are running a new series on Servicing. I wonder if it would be possible to let this series include blueprints of commercial sets and makers data material so that all experimenters could make use of the article. A photo of the inside of the set, showing the disposition of the important parts would also be of use.—L. DRAKE (Gloucester).

[We regret that we are unable to obtain data from all manufacturers to enable us to carry out the idea mentioned, but the makers are usually eager to supply essential data to servicemen upon request.—Ed.]

"Home-Serice" Broadcasting

Sir,—It will probably be news to you that the "Home-Serice" Broadcasting is far from satisfactory. I find in common with many neighbours and the local wireless society, that with efficient sets some form of A.V.C. is essential. The reception varies two or three times every minute from the distorted picture to the blank screen. I find, however, that a simple old 2-valve with plug-in coils, inside some seven years old, was sent to me to be tried out. I have had to use a "Home-Serice" receiver, and, after touching up a little and fitted with a P-215 valve, gives excellent results quite free from the variation and distortion on a W. B. Stentorian speaker.

I think many old sets will come down from the top shelf while the present state of things continues, while the "straight" or "straight" quality sets like mine will be reserved for the Continental markets.—T. H. PEARSON (Chipping Norton).

Page 60

PROBLEM NO. 366

JACKSON had a three-valve battery set on a board-cast and decided to convert it to tubes by the use of the usual convertible, obtaining a set with the same circuit. He did this, making as far as possible a direct replacement of the converted. When he switched on he could obtain no results, and therefore made a stage-by-stage test. Signals were passed at the detector plate, but not at the anode of the last L.F. stage. He followed out the wiring and this was correct. What was the most likely cause of the trouble? Three books will be awarded for the first three correct solutions received. Entries should be addressed to The Editor, PRACUTIC, Wireless World, 17th Floor, 370 New Broadway, New York.

Solution to Problem No. 365

The cause of the last trouble was the coupling condenser used in the parallelised transformer stage. This transformer is in series with the output of the last stage, and the capacity of the coupling condenser must be increased to avoid the trouble.

Please note the following three readers successfully solved Problem No. 364, and books have accordingly been forwarded to them: J. KEES, 58, Alma Avenue, Hornsbirch, London, W. 5, the Editor, Wireless World, 17th Floor, 370 New Broadway, New York, N. Y., J. L. BARTHOLOMEW, 1103, Tillery Street, North Bridge, G. H. MOORE, 165, Backward Road, Brixton, Kent.

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ON many occasions, articles in these columns have stressed the sugges-
tion that the development of high
quality reproduction provided a field for
experiment which is particularly suited to
the radio amateur. It was also stated that,
in general, the amateur had a better chance of
making a good high-fidelity set than the
ordinary listener had of buying one, since
the almost universal cry from the man in
the street was for sets sufficiently sensitive
and selective to give him large numbers of
stations, almost irrespective of the
quality of reproduction. Finally, it was
suggested that the time would come when
the commercial set manufacturer would
find it necessary to pay more attention to
fidelity of reproduction, and to put on the
market a range of products of models
having some claim to realism of tonality.
While we lay no claim to the gift of
prophesy, and are quite content to suggest
that our previous articles were based upon
pure reasoning, we cannot refrain from
pointing out that the state of affairs which
we then forecast has now come about. A
very large proportion of the principal
manufacturers are now advertising receiver
models which are described as "fidelity"
sets, and, from our own observation, these
models do represent a very sub-
stantial advance in reproduction. Not only
so, but the general standard of quality in
all reputable makes has very definitely
advanced.

It may be said at the outset that this
article will exclude all those luxurious
fidelity sets which are sold at prices between
50 and 150 guineas because they are quite
beyond the reach of the average listener,
and, moreover, are usually attempts to
combine high performance by way of the
number of stations receivable with naturalis-
tropic reproduction, and include gramophone
equipment with auto-record changing, and
most elaborate and expensive cabinet work.
We will confine our remarks to ordinary
table models costing, at the most, 20
guineas, and it must be remembered that
even at that price, which includes cabinet
work, cost of assembly and advertising
charges, the design must be such that the
intelligent constructor should be able to
produce as good at lower cost.

The Superhet
There has been a general impression that
really high quality reproduction cannot be
obtained in a superhet, and it therefore
may come as something of a shock to find
that quite a number, in fact the majority,
of sets advertised as of the high-fidelity
type, come under the superhet class. It
will therefore be necessary to describe both
straight and superhet sets in the quality
range.

Analysis of a large number of commercial
sets brings out one point which is common
to practically all makes, and that is that
set makers as a whole have realised what
we have pointed out on so many occasions,
namely, that the loudspeaker is still by far
the weakest chain in the link. It is simply
unimaginable, and perhaps is not done in
an effort to provide circuits of wide frequency
response, to design receivers with nicely
adjusted values and automatic devices for
avoiding overload, and to fit last stage
valves giving a large output of undistorted
power, if the speaker cannot reproduce the
extreme top and bottom frequencies or if it
produces a crop of resonances at all sorts of
places in the musical scale. There was a
time, and that not so very long ago, when
the speakers commonly fitted in commercial
censets were tiny little units of poor performance, which could be made at the
cost of only a very few shillings apiece.
To-day, any set put forward as a quality
receiver will be found to contain a speaker
of generous design and having a really
good performance characteristic. For the
sale of cheapness, energised models are
chiefly used in mains sets, but with the
latest improvements in special magnet
alloys, the permanent magnet models are of
almost identical performance.

The Choice of the Speaker
The lesson which the constructor must
learn from the set maker in this connec-
tion, therefore, is to start designing his
quality set from the output end. Obtain
the best speaker you can afford, and design
your set around it. A speaker of this year's,
design, costing in chassis form from 1½ to
2 guineas, may be taken as fully equiva-
 lent in performance to the speakers em-
ployed in the average commercial fidelity
table model, so that the constructor is not
at disadvantage on the score of the speaker.

Working back from the speaker towards
the aerial, we next come to the output
stage. Two factors have to be considered
here, the actual power output in milliwatts,
and the chief of nominally triode or
tenode and, in the case of battery sets,
whether Class 'A,' Class 'B,' or Q.P.I.
working.

With respect to total output, a last stage
capable of a big undistorted output is
advantageous so that even on the lowest
passages there will be no distortion. Bear-
ing in mind that 50 milliwatts represents the
minimum for reasonable volume for quiet
passages, a 2½-watt output valve gives a
factor of safety which is adequate where
only moderate volume is required, but a
5-watt output stage is generally considered
the minimum for serious high-fidelity work.
There are, however, very few commercial
sets at prices up to 20 guineas giving more
than 3 to 3½ watts undistorted output, and
practical tests show that while such sets do
give really good reproduction so long as
volume is kept within reasonable limits,
there is a tendency to overload if the
volume control is advanced too far. We
therefore repeat our own conviction that
the constructor desiring quality must
exercise his discretion in handling the
volume control if he confines himself to a
2½ to 3-watt output stage, and that he
will be well advised to go one better than
the commercial makers and fit at least a
3½-watt valve.

While there is little question that a
triode output stage has the best possibilities
with respect to total fidelity, and is also
relatively less likely to be easily overloaded, quite a large number of
commercial fidelity sets use pentodes. The
rather greater sensitivity of this type
permits some saving in cost, and manu-
facturers have succumbed to the temptation.
The pentode has a further allure in this
connection, since the higher top-note
response of this type of valve compensates
in part for the attenuation of upper
frequencies brought about by the sharpness
of the tuning.

Comparisons
This brings us to the fundamental
issue between the average commercial
fidelity set and the average amateur fidelity
set. The former is an attempt to combine
a better standard of quality with one of
selectivity which will still give a very
large selection of stations, while the quality
enthusiast who builds his own set is usually
perfectly willing to sacrifice stations for
still better reproduction. As a result, the
commercial quality set is usually crammed
with tone compensating devices calculated
to provide a final output containing a
reasonably balanced quality, but not
necessarily a faithful replica of the original
performance. The set result is certainly
pleasing, and satisfies a very large pro-
portion of listeners, but it lacks the
individuality and naturality which can
undoubtedly be obtained in a simpler and
far less expensive way if only the desire
for wide-world listening can be put aside.
Again we say, stick to the triode—a good
heftly follow or, better still, two in push-pull,
and avoid as far as possible all tone
correction circuits.

(Continued on page 41.)
In addition to the colour codes given
last week there is a code for the small
cartridge fuses used in battery and
mains receivers. The colour is usually
shown by a small strip of coloured paper
inside the tubular container, and the code
is as follows:

<table>
<thead>
<tr>
<th>Code</th>
<th>Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1 A</td>
<td>Black</td>
</tr>
<tr>
<td>0-3 A</td>
<td>Grey</td>
</tr>
<tr>
<td>0-5 A</td>
<td>Red</td>
</tr>
<tr>
<td>0-8 A</td>
<td>Brown</td>
</tr>
<tr>
<td>0-10 A</td>
<td>Yellow</td>
</tr>
<tr>
<td>0-14 A</td>
<td>Green</td>
</tr>
</tbody>
</table>

Many modern receivers include a multiple
condenser block, and some of these are of
the cardboard carton type, flexible leads
being brought out for the appropriate
sections. These have a code, and where
the condenser is of the simple type con-
sisting of only one unit the leads will be
red and black, indicating positive and
negative—assuming, of course, that the
condenser is an electrolytic component.
Ordinary paper condensers will not have
any marking as there is no need to observe
polarity. Where two capacities are equal,
the higher voltage shall be given the higher
colour in the code table. In addition to
the colours it is also necessary to mark the
condensers in which two or more complete
units are embodied and the following marks
are therefore adopted:

Common positive junctions shall be
marked +.
Common negative junctions shall be
marked −.
Series connections shall be marked −
From this it will be seen that:
(1) + at one end of the series path, and
− at the other.

Mains Transformers
Mains transformers in commercial rec-
testers are provided with coloured leads
or small tags fastened to the leads. The
primary has a black lead for the connection
usually marked O (one side of the primary)
and the remaining tapping are a combina-
tion of black and another colour. Usually
the lead is striped and black and red indicates
10 volts, black and yellow 210 volts, black and red 230 volts, and
black and brown 250 volts. If a screen is
interposed between primary and secondary
this is generally a bare wire.

On the secondary side red is employed
for the high voltage, the centre tap being
red and yellow. The rectifier heater winding
is green, with a green and yellow centre
tap, and for the normal heaters the leads
are brown, with brown and yellow centre
tap. Any additional low-tension heater
winding will be blue, with blue and yellow

Battery Leads
Multi battery leads are also colour
coded, and the highest positive voltage is
red, the second yellow, the third green, and
the fourth blue. The L.T. positive is
coloured pink, common negative leads are
black and the G.B. negative leads are
brown for the maximum voltage, grey for the next
and white for the lowest. Any additional
point, such as the fourth greatest G.B.
negative or fifth highest H.T. positive is
violet, and any centre tap is white.

Simple Tests
Dealing now with the simplest form of
test we will take a standard battery
receiver which will give no signals of any
kind. Obviously, the first test is to
ascertain that the H.T. and L.T. voltages
are correct and continuous. The L.T.
may be tested at each valve holder and this
should be done after the battery itself has
been tested to make certain that it is fully
charged. Place the simple test meter,
adjusted to give a suitable reading, across
the valve sockets as shown in Fig. 1, and
it may be necessary to check each holder
to ensure that the L.T. supply is continuous
to all valves. If the test shows that L.T.
is in order, the next test is for H.T., and
it is not sufficient to test each H.T. lead at
the points where it is joined to the receiver
In any standard receiver the H.T. must be
applied to the actual valve anodes or
screens and therefore tests must be made
at the points indicated, for example, in
Fig. 2. The negative lead of the tester

(Continued on next page.)
should be joined to the earth line and then tests made at P1, P2, P3, P4, 6 and 7. Here it is necessary to point out that the meter used must have a very high resistance, preferably greater than 1,000 ohms per volt. If this is not so, the readings will be very much out in some stages. As an example, Fig. 3 shows a normal valve stage with anode resistance and low-current reading. If now a low-resistance meter, as shown in Fig. 4, is joined across the valve there will be a much greater current drop across the anode lead. If a 1,000 ohms-per-volt meter is used the drop will be less, and it will approach the actual

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**PRACTICAL WIRELESS**

September 23rd, 1939

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**Fig. 4.**—How a low-resistance voltmeter will give false readings from the circuit shown in Fig. 3.

figures it will be seen that a 20,000 ohms-per-volt meter is needed, as shown in Fig. 5. Therefore, unless such a meter is used the only effect of the test shown in Fig. 6 is to make certain that H.T. is being applied to the anode and that anode components are in order. They will probably have to be tested separately at a later stage if it is found that all valves are receiving H.T. and I.T.

One quick way of verifying in which stage the breakdown occurs is to touch the grid terminal of the valves, starting from the output valve. A plonk, hum or similar sound should be emitted when the grid is earthed in this manner, and if this occurs with the output valve but not with the next stage it will be known that the break occurs between the two stages. On the H.F. side the first stage may be checked by transferring the aerial to the anode lead of the valve as shown in Fig. 7, and if signals are then obtainable—although different tuning settings will have to be used—it will be obvious that the first stage is at fault. This form of stage by stage-testing is often adopted even by experienced servicemen as a quick first course, and although it will not in many cases locate the trouble, it may often be possible to patch in working order again merely by testing on these lines, without any further test equipment.

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**QUALITY REPRODUCTION**

(Continued from page 42)

In practically every commercial facility the set detector is a diode, and here we are in thorough agreement with the set maker. Usually there is no other L.F. amplification between the diode and the output stage, but in some instances a double-diode-triode combination is employed. It is probable that the degree of amplification obtained in the L.F. stage is obtained a little more cheaply than is possible in the pre-detector stages, but even so, for the amateur builder, an additional L.F. stage is not a very good proposition as it is easily the most prone to introduce hum, and calls for great care in both design and layout. Get all your voltage amplification in the high-frequency stage; it is a good motto for the home constructor.

The H.F. Stage

There is a little to be said about the high-frequency side of those commercial receivers using a straight circuit. In most cases the aerial input is of the band-pass filter type and the interstage couplings high frequency transformers of conventional type. The superhets, on the other hand, have interesting features. The aerial input circuit is again of the band-pass type, but the intermediate frequency transformers, which are, in effect, additional band-pass filters, are so designed that the width of the band accepted is variable. This variable selectivity, as it is termed, is achieved by adjusting the coupling between the two windings, either by variation of the value of one of the coupling components or by adjusting the position of one of the coils with respect to the other. By means of the set can be used as a conventional highly selective superhet for "all stations" listening, or, with the band width increased to maximum, as a less selective set for quality reproduction.

The snag in this arrangement is, of course, that as soon as the selectivity is reduced for quality reception, in case the interfering stations—a difficulty also experienced by constructors who interest themselves with fidelity reproduction. As a result, the commercial quality sets are for the most part so designed that even at minimum selectivity there is a considerable degree of high-noise attenuation, which accounts, no doubt, for the readiness with which tone-compensating devices and similar aids to synthetic "quality" have been adopted.

While, therefore, set makers must be given due credit for their efforts to improve the general standard of reproduction, and while it must be admitted that they have been successful up to a point, it must not be imagined that the fidelity problem has been brought very much closer to solution. The whole problem simply bristles with difficulties, most of which are so far, not with either the manufacturer's or the listener's control, being due to the existence of far too many stations. At the best, a quality set must be a compromise between conflicting conditions. The commercial solution is synthesis—the building up of pleasant quality without too much heed to fidelity of reproduction of the original. This is perhaps unavoidable, since the commercial set must be capable of satisfactory operation under all conditions, anywhere. Whether the home constructor, who has only to cater for his own personal and local conditions, can ever achieve better results, more cheaply, and without too many correcting and compensating circuits.
A Good Effort

THERE is not the slightest doubt that the efforts made by the various committees of the R.M.A. appointed to deal with certain specific matters associated with the organisation of Radiolympan for 1939 were most praiseworthy. No bitches occurred prior to the opening day with the result that the first visitors saw a finished show. As far as the broadcast distribution of sound on a carrier frequency of 850 kilocycles was concerned, the scheme worked out was most satisfactory, and the same applied to the apparatus displayed for vision and sound distribution on carrier frequencies of 45 and 45.6 megacycles.

A determined effort to suppress interference was made this year, and apart from one or two cases of compensation interference from fans, which were quickly traced and appropriately dealt with, and occasional difficulty, the pictures seen on the sets in any part of the Exhibition were of a high quality.

For television signal distribution between four and five miles of high quality coaxial cable was used by the authorities, and the technical officer appointed for duty each day to deal with any complaint was able to handle each matter that arose in a very satisfactory manner.

One of the most interesting television transmissions was the morning "Come and be televised" feature, and although the margin for the signal during this hour of the day seemed a little higher than for any other programme, the versatile nature of the subjects who appeared fully compensated for this.

The amplifier situated in the Alexandra Palace feature worked continuously from 11 a.m. to 10 p.m. and the committee responsible for this side of the work are to be congratulated on their fine effort.

No startling television item was evident, and the performance standard of the two hundred television sets displayed by the various manufacturers was of a very high order. On the H.M.V. and Baird stands high seven-eighths of cinema was shown, and a new television set on show for the first time was featured on the Baird stand. This has been designed for use in clubs, hotels, small halls and schools, and employs a cathode-ray tube for projecting a brilliant picture 6½ by 2½ ft. on to a remote screen.

Known as the M29 model it is very compact and simple to operate, quite being self-contained, and as far as can be ascertained the price is a little below £100.

Cathode-ray Tubes

THE technically minded visitor found much to interest him at this year's radio show, and not the least of these was the various examples of cathode-ray tubes used for both television and oscillographic purposes. It was noticed that in the majority of cases these tubes designed for television picture reconstitution purposes employed electromagnetic focusing and deflection.

Manufacturers had succeeded in reducing the lengths of the tubes, and this enabled the sets to be more compact and even when a 15in. diameter tube screen was employed for direct receiving. There did not appear to be any new effort, however, in developing the wide angle cathode-ray tube.

Better Lighting

In some quarters the opinion was expressed that the slightly inferior quality of the B.R.C. 'Come and be televised' feature at Olympia was due to insufficient lighting. It was staged in a small studio with glass windows on two sides so that members of the public could see exactly what was happening as soon as followed item at five-minute intervals.

There is no doubt that those working in the studio found it rather hot and any additional lighting would certainly have added to the discomfort if ordinary spots or floodlights had been added. On the other hand, it was announced recently that the General Electric television station at Schenectady had produced a new form of lighting which reduced the heat discomfort to the lowest minimum, and if a similar scheme could be adopted in this country there is no doubt that an important television problem, namely adequate light without undue heat, would be solved.

It is understood that these new lights comprise a battery of water-cooled quartz arcs units. The actual lamp is very small, indeed, and is positioned in a large bowl reflector, and the flow of water is adjusted at such a rate that the lamp is not destroyed by the heat generated.

A Loophole

It was announced recently that one major organisation in the United States intended to stop the television of films because of the damage likely to accrue to the cinema industry. This has been quickly followed, however, by the decision of another network to televise one feature film a week during the autumn. The opposition of the distributor was responsible for the former decision, and this follows on similar lines to the refusal of renters to allow the B.R.C. to use films. In the case of the latter, however, the loophole provided by independent sources is being exploited in just the same way, as the B.R.C. is able to obtain films from independent renters who do not conform to the combined recommendations of the K.R.S. and the C.E.A. There is a feeling gradually gaining ground, however, that this state of impasse will be removed, and a satisfactory compromise be worked out by the parties immediately concerned.

Eliminating C.T. Screen Damage

It is well known that a stationary bright spot on the fluorescent screen of a cathode-ray tube at the point of electron impact will burn the screen, and many schemes have been devised to ensure that any failure of the deflecting circuits will not bring about screen damage. In the case of one projection receiver produced on the continent where the anode supply is one of 25,000 volts, the protection is undertaken in a simple but ingenious way.

The voltages generated during the flyback periods are made to operate relays which interrupt the electric mains supply to the primary of the E.H.T. transformer. Should the deflecting circuits fail, therefore, the receiver is brought into action for 0.2 second. The H.T. voltage is discharged through shunt resistances, and this causes the tube to defocus at once. It is believed on many domestic receivers that as soon as the set is switched off the scanning spot becomes stationary, but assumes a very large diameter. This is the same defocusing effect just referred to, but due to the very much higher anode voltage, this was the successful operation of sets using projection cathode-ray tubes, every precaution must be taken to ensure the tube's absolute safety under all conditions.
LATEST PATENT NEWS

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Abstracts Published.

THERMONIC VALVES.—Standard Telephones and Cables, Ltd. No. 507270.

The cathode 16, Fig. 1, has a number of straight or curved emitting surfaces opposite each of which and parallel thereto is a rod-like anode 22. Rod form control electrodes may be interposed between the cathode and anodes; the latter may be independently connected to circuit elements or connected together. The anodes 22, Fig. 2, may be arranged inside the cathode, which as shown has three curved emitting surfaces 25.

NEW PATENTS

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


23761.—Stearl-Magnesia Akt.—Ges.—Tuning devices. August 17.

23762.—Stearl-Magnesia Akt.—Ges.—Tuning devices. August 17.

Specifications Published.

51177.—International Resistance Co. No.—Receiving or transmitting receiving antennas.

51132.—Baird Television, Ltd., and Jones V. A.—Electro-discharge for use in television or like systems.

51133.—Fernweh Akt.—Ges.—Television and like systems.


51158.—London Electric Wire, Co., and Smiths, Ltd., and Starling, J.—Earth ing devices for use with electrical systems. August 17.


51153.—Telefunken Ges. Furf Drahthose Telegraphie.—Tuning arrangement for wireless receivers. (Addition to 500860). August 17.

51159.—Soiffetti, G., and Riechiardi, P. C.—Means for tuning in wireless receiving apparatus to given broadcasting stations.

51156.—M. O Valver, Co., Ltd., and Smiths, H. S.—Tuning and indicating devices for radio and similar carrier-wave signal receiving apparatus. August 17.

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

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The electrode system E, Fig. 3, is supported by leads 13 from ceramic discs 1, 2 which form closures for members of the enveleope 4 surrounding the electrodes. The members 4 may be of ceramic material or consist of a metal glass cylinder 9 with end rings 7, 8 of ceramic material.

The parts are joined and the leads sealed by glass seals 5, 6, 12, 14, 16. Ceramic rods 3 are secured to one disc 1 and are slidable engaged in recesses in the other disc 2 with the interposition of springs 10.

TEHERMONIC VALVES.—Long, E. S., No. 507460.

In order to retain a radio valve 1, Fig. 4, or the like in position in the holder, a flexible resilient retaining band is used. The band is apertured to permit 5 to engage the chassis 3, and is slotted at 8 to accommodate the reduced part of the valve. Alternatively, the central part of the band may be shaped.

RECEIVER SENSITIVITY

It used to be the custom, several years ago, whenever longer range or greater daylight reception was required, to increase the number of high-frequency-amplifying stages. It was not always realised that when more than two or three such stages were used the efficiency of each stage had nearly always to be reduced in some manner or other in order to maintain stability. The writer well remembers building and using for several weeks an eight-valve set with four H.F. stages before discovering that the results were somewhat better after two of these stages were eliminated! The position to-day is rather different due to the vast improvement which has been made in valve design, but it is still true that if more than two H.F. stages are employed the efficiency of each is nearly always impaired.

Even if this were not so there would still be a practical limit to the amount of useful H.F. amplification, because if sensitivity is increased beyond certain limits, background noises become so prominent that reception cannot be enjoyed. The range might be increased, but if "interference" noises are amplified to the same extent as the wanted signals, the result is hardly changed. How can we measure sensitivity? This can be done with great accuracy by measuring the input voltage which must be applied to the aerial and earth terminals in order to produce any given output wاطage at the speaker terminals. The generally accepted method is to determine the number of microvolts which must be applied to the input terminals to produce an output of 50 milliwatts. Using this method of computation it is found that a simple type of superhet or two-H.F. receiver of good design has a sensitivity factor of about 50 microvolts per 50 milliwatts output, whilst a highly efficient superhet of advanced design may provide the standard output with an input of as little as 10 microvolts. Generally speaking, a sensitivity factor in excess of this is neither obtainable nor desirable, for the reason given above.

In making the sensitivity tests the volume control, where fitted, is turned full on, and the input from the aerial to the aerial-earth terminals is applied. By following this system the method holds good, and provides a convenient standard of comparison, regardless of the type of low-frequency amplifier.
Fault Location

"My commercial 6-valve superhet has developed a peculiar fault in the form of erratic tuning settings. I have examined the tuning dial and this is not slipping. The condenser actually turns with the pointer, but the stations do not always come in at the same point. Can you give any indication as to the cause and cure?" - L. E. R. (Birkenhead).

The trouble may be tuning drift due to the effects of heating in a coil or component, or to movement of the turns on one or more of the coils. Only a systematic test will indicate the exact trouble and probably a proper circuit tester will be needed to effect repairs. The full method of testing a circuit of this type will be included in our series of articles on servicing.

Measuring Resistance

"I have a small test meter of unknown make, but the scale in addition to current and volts is marked in ohms. I wish to measure grid leaks of the order of megohms and wonder if you can tell me the best way of doing this without altering the instrument." - A. S. P. (Deal).

Without full details of the instrument exact details cannot be given. It may be possible to include an ordinary H.T. battery of 100 volts in series with the resistance under test and then to read off the values directly, or on the other hand a fixed resistance of 900,000 ohms could be included in series with a battery of 100 volts to leave the resistance under test capable of being read direct on the scale.

Telsen Coil Connections

"I am trying to make up a stand-by receiver and have found in my spares box a Telsen iron core coil Type No. 378. I cannot, however, find the connections and wonder if you could assist me in joining up these. They are in the form of a two-gang unit with self-contained switch." - D. W. (Birmingham).

Both coils are identical and consist of an H.F. transformer with reaction winding. The primary is between terminals 1 and 2 and the secondary between 1 and 3. The reaction winding is between 5 and 3, the latter point being earthed. The reaction condenser must, therefore, be insulated from the panel if an earthed metal panel is used. The high potential end of the primary is No. 4 and the grid is joined to terminal 1. Ignore the reaction winding in the coil which is used in the aerial circuit—in this coil, the primary is joined to terminal 5 in this particular coil. You can also ignore the primary in the second coil and use a parallel tuned anode (or tuned grid) circuit if you so desire.

Modifying a Meter

"I saw in your paper some time ago that a resistance placed across a meter would alter the reading. I have a — meter and will like to increase the range from 18 volts and 24 volts. Will you please advise me what resistance values are necessary to obtain these readings?" - W. G. K. (Swanley).

As we have no details of the actual meter we cannot give you accurate information. You may carry out the conversion, however, in the following manner. Obtain a quantity of paper and paint and join one end to a terminal on the meter. Apply the full six volts, when, of course, the needle will rise to the full-scale indication on the scale. Now take the resistance wire and touch it on the other terminal, when the needle will fall back on the scale. By carrying out one or two tests you will soon find the amount of wire which is necessary to bring the needle to 2 volts, and this quantity may be wound round a suitable former and joined to a switch or other selector to provide the "three times" scale. By then applying 6 volts and connecting a further quantity of wire you may bring the needle down to the 1.5 volt mark on the scale and this will provide the "4 times" reading. Some precautionary measure is advisable to prevent the application of high voltages when the resistances are not in circuit.

Accumulator Connections

"I find some difficulty in obtaining satisfactory connections to my accumulator due to the effects of the acid. The ends of the battery cord have already been cut and joined three times and are now getting too short to reach down to the shelf on which the battery case is placed. The thin copper wires of the flex seems to be eaten away in a very short time and I should like to know whether there is any way of preventing this." - L. C. E. (Morpeth).

There are several ways of overcoming the difficulty you mention. The simplest is to apply lengths of rubber tubing (cable valve rubbers) over the ends of the leads and to smear with Vaseline. A much better plan is to employ rubber tubing to thoroughly clean the terminals and to place on them the special lead-coated connectors sold by C.B. Ltd. The ends of your battery cords are then fitted with bakelite tube connectors which push over the other portion fitted to the terminals and thus give good contact and keep the leads free from the effects of the acid. Make certain that your accumulator terminals are tightened up properly, so as to prevent the acid creeping up and round the terminal base, and a layer of Vaseline here will help to keep the terminal clear of corrosion.

Obtaining Large Output

"I enrol a circuit in my receiver which is S.C., anode-bend detector and output pentode. I have 90 mA at 350 volts H.T. available and should like to know whether the 362 ME25 valve would be fully loaded so as to deliver 9 watts, if I used it in the output stage of this receiver. If not, could you recommend a 4, 5 or 8 watt pentode which would be suitable for me?" - G. S. B. (North Shields).

It is hardly likely that your present arrangement would enable the valve in question to be fully loaded. At least one more stage of L.F. amplification should be employed, and a volume control should be included between the detector and the additional stage. The anode current of the ME25 is only 60 mA, so that your present H.T. supply should prove quite adequate for the amended circuit. The output stage would then provide sufficient volume to obtain your desired results, but for reception over greater distances we would also suggest that you consider the addition of a further H.F. stage, thus making the complete receiver into a 5-valve set. By adopting the variable r.m.s. characteristics in the first two stages the local could be kept under control, and you would then have your full 9 watts on a fair number of stations.

Speaker Volume Control

"I have a well-known speaker to which I want to fit a volume control solely to the speaker. Could you give me type of control and where to fit it?" - R. H. T. (Thornton Heath).

You omit the important details concerning your equipment. Is the speaker used in conjunction with other speaker or speakers, or is it the only speaker with the receiver? In the latter case, of course, it would be preferable to fit the control on the actual receiver circuit to avoid overloading of the output valve. If, however, the speaker in question is used as an extension speaker certain precautions may be necessary to avoid affecting the remaining speakers which may be in use and for avoiding distortion due to mis-matching. In general, a control across the secondary side of the speaker transformer may be adopted, and the value of this will depend upon the value of the speech coil.

Frame Aerial

"I have seen particulars of the £4 Superhet. Four and wonder if it is possible to utilise the same circuit in a portable, using a frame aerial instead of the first H.F. coil. The only likely difficulty that I can see is that there will probably be interaction between the set and the frame aerial, thus setting up instability. Also could tell that it would work satisfactorily as a mains set." - S. D. G. (Leeds).

The use of a frame aerial would not be difficult, but it would probably be necessary to use a separate tuning condenser for this as the inductance would not be satisfactory when wound to match the aerial accordingly and thus permit of tuning with a two-gang condenser. The receiver will function very well as a mains receiver and blueprints are available for A.C. and universal models.
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ROUND THE WORLD OF WIRELESS

Using Spare Parts

There are hundreds of amateurs who have available various pieces of apparatus which are not of modern design or for which they have no immediate use. Owing to the present position there are, however, many interesting little receivers which may be built up from such parts, either to form a stand-by receiver for their own use, or from which they can make a small receiver to present to some not-so-fortunate acquaintance. The sets may be obtained in any style, or in any of the limitation of broadcasting in this country, and last week we described a two-valve, and in the future there is a two-valve, which may be built from such parts. There is no need to give up radio experimenting, although there may be some difficulties may be experienced in obtaining some types of apparatus. As pieces of complete receivers will naturally rise as material shortage makes itself felt, there should be a return to general home-construction and to the days when every listener found pleasure in making a receiver for the general reception of broadcast programmes. Already certain manufacturers have announced a rise in the price of their sets and further rises may take place. We shall describe periodically various types of receiver which may be built from spare parts which are easily obtainable or which are likely to be on hand.

Paris Bans Car Radio

It is announced from France that radio sets on cars or motorcycles are now forbidden under an order issued by the Prefect of Police and at the request of the military authorities. Sets already installed must be removed within forty-eight hours from the publication of the notice of the ban.

Hire Purchase

FIAXIERS announce that hire-purchase agreements for radio apparatus may still be entered into, but an

IMPORTANT NOTICE TO OUR READERS

Elsewhere in this issue you will find a leaflet explaining that owing to the restriction of paper supplies during war-time every reader can help by giving a newsagent or bookstall a regular order for "Practical Wireless." Such an order eliminates waste of surplus copies in the shops, and ensures regular delivery during the war.

Readers who do not give an order NOW may find the greatest difficulty in getting copies in future, and the Editor asks you to help in this way.

Please order "Practical Wireless" now, and use the order form enclosed.

Sealed Radio

A safer safeguard the Postmaster-General announces that in territorial waters of Great Britain and Northern Ireland the use of wireless telegraphy apparatus on board vessels will be subject to rules made by the Admiralty. On entering any port or harbour the WT office will be sealed by the customs officer boarding the vessel.

Clock Sign Attraction

A wireless clock sign was installed some time ago in a city in America, and failed to attract the necessary public attention. After some consultation it was decided to install chimes to mark the quarter hours to attract attention to the clock. This was carried out by installing a chiming clock in front of a microphone feeding speakers behind the sign. This attracted the necessary attention and the sign is now fully effective.

Relays at Wrexham

For the third time the Town Council at Wrexham have rejected the proposal to install a relay system in the town. On this occasion discussion arose on a request from the Home Office that the proposal should receive favourable consideration, but by a large majority the Council decided to adhere to previous decisions.

Television Society

This Television Society announce that as a result of the present situation there will be a temporary suspension of their lecture arrangements and other activities.
ROUND THE WORLD
OF WIRELESS—Continued

Indian Broadcasting

It is expected that the scheme for the centralisation of the news bulletins broadcast by the stations of All-India Radio, will be completed by next April. News broadcast from Delhi will then be relayed by all A.I.R. stations.

The P.M.G.

The war cabinet appointment did not bring about any change in the office of Postmaster-General, which is retained by Major G. O. Tryon, and Assistant P.M.G., which is held by Mr. William Habane, who was appointed in May to succeed Sir Walter Womersley, who is now Minister of Pensions.

Nine Million Wireless Licences

The Post Office issued 387,882 wireless receiving licences during August, showing a net increase of 24,768 in the number of licence holders during the month. The approximate number of licences in force at the end of August was 9,014,100, compared with 8,689,188 at the end of August last year, an increase of 354,912.

Radio Without Static

The National Broadcasting Company of America is planning to build a radio station and research laboratory on top of the Empire State building in New York to test a new type of broadcasting devoid of "atmospheric" static. Major Armstrong, electrical engineering professor at Columbia University, believes that he has solved this problem. Specialised radio receivers, tested during thunderstorms, gave clear reception when operated by Major Armstrong's method of "frequency modulation."

Radio Training in Cincinnati College of Music

One of the most comprehensive courses in radio training in the United States will be offered in Cincinnati this autumn through the Radio Extension Department of the College of Music. Designed to present opportunities in the fundamentals of production, continuity writing, microphone technique, programme building, conducting and music arranging under the guidance of professional instructors, the plan provides for lecture courses combined with laboratory studio work to provide the student experience in radio problems. The new college radio school will be divided into two general classifications, according to Uberto Neely, director of the Radio Extension Department. There are courses pertaining to music, and courses dealing with non-musical aspects of broadcasting.

Among the latter is the course in radio-script writing scheduled by the Evening Division of the University of Cincinnati, under the direction of Arthur Radley, member of the WLV Educational Department. Credit for the course is to be transferable to the College of Music Radio Extension Department and may count, as will credit in all classes at the radio school, toward a bachelor of music degree at the college.

Five Thousand Broadcasts

FIVE THOUSAND BROADCASTS

This is the record which was achieved by Joseph Lewis, one of the B.B.C.'s most popular conductors, when he took charge of an orchestral concert which was broadcast on Saturday, September 16th. Mr. Lewis, whose well-known to listeners, not only in the South and the Midlands, but also in the North, has been associated with the B.B.C. from 1923. Prior to that, he was assistant conductor of the City of Birmingham Orchestra under Sir Adrian Boult.

Few people who have seen Mr. Lewis at work can have realised that each movement of his hands while he is conducting costs him considerable pain, for he is a victim of rheumatism and this necessitates his using the lightest of batons.

Under the will of the late Sir Edward German, Mr. Lewis became the possessor of a gold-mounted baton which had been used by the famous composer. On account of his rheumatism, however, he has never been able to use this baton.

Golf Course Radio

It is reported that wireless was used for the first time recently to keep spectators in touch with what was going on round a golf course when the Natal Golf Championship was played at Kloof.

Generally a crowd collects at the scoreboard and waits anxiously as score after score is registered. In future, spectators will know how players have fared to the halfway mark through a short-wave wireless transmitter which has been installed at the tenth tee.

NOW READY!

MORE MILES PER GALLON!

A new Handbook prepared by F. J. CAMM, explaining how motorists may reduce petrol consumption. The book also deals with petrol substitutes, such as paraffin, gas, etc.

1/- or 1½d by post, from GEO. NEWNES, LTD., Tower House, Southwark St., Strand, W.C.2

Miss Frances Day, the famous actress, recently visited a camp "somewhere in Surrey" and entertained the troops. She received a great ovation, and is here seen joining in the general hilarity.
The A.R.P. One
A Simple Single-valve Receiver for Stand-by or Regular Use—Low in Cost and Simple to Operate

Last week complete constructional details were given of an efficient two-valve battery-operated receiver which was primarily designed for the reception of the Home Service transmissions. Its performance, under widely varying tests, was such that quite good loudspeaker results could be obtained when it was used in conjunction with an aerial having average efficiency, or, if local conditions rendered it impossible to use anything other than a short indoor aerial, most satisfactory headphone reception was assured.

While this design will, no doubt, meet the requirements of many of our readers requiring an emergency set, it would appear that quite a number desire something even more simple, less expensive, and more economical than the Home Service Two; therefore, we have produced a simple single-valve receiver, which may be built from odd parts which you may have on hand or for which you may obtain quite cheaply, either from standard firms or from surplus stores.

Circuit Details
It may thus be placed in a small box and stored away in an odd corner of the dug-out or air-raid shelter so that special announcements may be followed during an air-raid or for the reproduction of any music which may be broadcast at the time. It may also be used as a stand-by receiver in the home, and will, with the necessary batteries, only take up a very small amount of space.

The coil is designed for medium waves only, and may be home-made or obtained from Messrs. T. W. Thompson, by whom it is manufactured. It consists of a tapped grid coil with over-wound reaction winding, and provides adequate selectivity and sensitivity for the purpose for which it is used. The standard grid-leak and condenser arrangement is employed, with a differential reaction condenser control. This condenser, together with the tuning condenser, is of the solid-dielectric type, and these are obtained from Messrs. Polar, Belium, J.B. or similar firms. An on/off switch is placed centrally on the panel, and aerial and Earth connections are made by means of standard Cinx plugs and sockets.

It will thus be seen that components are reduced to a minimum and, accordingly, the entire receiver may be constructed in a very short space of time. Operation is just as simple, and the receiver is also ideal for the beginner who wishes to make up a one-valve receiver for general use.

Constructional Details
The baseboard is cut 5in. by 3in. from any ordinary stout wood or ply, a thickness of 3in. or 3 1/2in. being desirable to enable the front panel to be held firmly by screws driven into the edge of the baseboard. The panel, on the other hand, may be cut from the thinnest ply-wood, and is, as already mentioned, a square—3in. by 3in. The holes for condensers, switch and sockets are drilled as indicated in the panel layout diagram, and these parts may then be mounted and locked into position. The coil is attached to the baseboard by passing a screw through the cross-strap inserted at the lower end of the coil, and the valve holder is then attached by its side. The fixed condenser is attached to the grid terminal of the valveholder, and the grid leak is joined across the grid and positive filament terminals. The remainder of the wiring may be seen from the wiring diagram, and the battery leads are, of course, cut from ordinary single 3in. or 4in. to fit the local stores. Four wanders plugs are attached to the ends of the flex as indicated in the wiring diagram, and when wiring is complete the receiver is ready for test.

As already mentioned, the set will operate even with a simple indoor aerial of quite small dimensions, but obviously, the performance depends upon the locality and the strength of the signals which are available at the listening point. On the other hand, quite a large aerial may be used without any serious difficulty from the selectivity point of view being experienced.

Operating Details
For the L.T. quite a small 2 volt accumulator may be used as the total consumption is only 0.1 of an amp. For the H.T. 60 volts is adequate and provides perfectly smooth operation, so that a small 60 or 60 volt H.T. battery is suitable. The headphones should be of the high-resistance type—2,000 or 4,000 ohms, and should always be inserted into the sockets in the same relative position—keeping the 'positive' tag of the 'phones (usually marked by a red thread running through the cotton covering or by some similar means) in the red or lower 'phone socket. Connect aerial and earth and pull out the switch. The receiver is then ready for tuning, and the best plan is to rotate the right-hand control slightly until a "breathing" sound is heard in the 'phones and then to turn the left-hand control until a station is heard.

The right-hand control strengthens signals, but also increases selectivity so that the station is exactly tuned in it may be found that signal strength appears to weaken as the right-hand control is rotated. A readjustment of the tuning control will, however, result in the desired increase in volume.

(Continued on next page)
THE A.R.P. ONE

(Continued from previous page)

and at the same time an improvement in quality, as maximum quality is only obtained when the circuit is exactly tuned to the frequency of the signal being received.

If the receiver is used in a position where signals are too loud, even with reaction at its minimum, the best way of reducing the signal strength is to lower the value of H.T. applied, going down to 15 volts if necessary. This will not have any deleterious effect on the valve or any other component, but if the low voltage is used very frequently that part of the H.T. battery will become discharged quicker than the rest of the battery, and then when an increase in voltage is made the same difficulty may be experienced due to the increasedistance of the lower section of the battery.

Beyond this, there are no special precautions to be observed, and the receiver may be used with the utmost confidence.

As already mentioned, the coil can be purchased ready wound but, for the benefit of those who would rather experience the thrill of making as much of the receiver as possible, we give below the essential details of its construction.

The former is 1½ in. in diameter and 2½ in. long, and should be made from a piece of ordinary postal cardboard tubing or, better still, a length of paxolin tubing if such is available. If cardboard is used, it is absolutely essential to see that it is perfectly dry; in fact, it is advisable to impregnate the tube after drying it in a slow oven for a few minutes. Ordinary shellac may be used for the impregnation.

The actual winding is carried out with 22-gauge enamelled wire, winding this with 70 turns close wound, that is, each turn lying close up to its neighbour. After 23 turns have been put on a tapping loop has to be made for the aerial, and this is accomplished by doubling a length of the wire and pushing it through a hole in the former. It must be kept taut whilst the rest of the coil is wound. After the winding has been finished a length of paper or Empire Tape, black should be wrapped round the lower end of the winding, its position being about 1½ in. from the lower end of the coil. On this insulation 30 turns of the 34 S.W.G. copper wire are wound, and these must be in the same direction as the first winding. One way of anchoring

WIRING DIAGRAM OF THE A.R.P. ONE

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Fresh Fields For Experimental Work

With the Cancellation of Transmitting Licences Many Enthusiasts are Now at a Loss as to What Subject to Take Up to Replace Their Lost Hobby. The Writer of this Article, therefore, makes Several Useful Suggestions. By L. O. SPARKS

There must be many readers who are echoing the rather pathetic plea voiced by D. Gordon (N.W.9) in his letter which was published last week in the Open to Discussion columns. It is only necessary to quote but a few lines from his pen to express the feelings of many of the real enthusiasts, and the following words extracted from his letter sum up the new problem in a nutshell: "... I have lost my transmitter and find that listening alone is very uninteresting. I have plenty of gear and wonder if any other amateur transmitter has discovered any new field which may be explored without necessitating transmitting which is, of course, now illegal. ..." Well, D. Gordon has the satisfaction of knowing that he is not alone with his problem. It is one of those little things which we have to accept as cheerfully as possible, and instead of blaming our loss, set-to find some new hobby or useful work which will occupy the time previously taken by our interests in transmitting. To avoid any misunderstanding, I would mention that my rack is now but a skeleton; the units which used to fill the now empty space are enjoying—who knows—a well-earned rest in one of the P.M.G.'s stores.

With transmitting, like many other hobbies, one is apt to get so wrapped up in the subject that other spheres of activities are likely to be passed by or ignored. The ordinary radio valve is another valuable source of interest which is so sadly neglected. Quite simple gear is all that is required to prove many theories related with this, including characteristics, detection, rectification and amplification.

Another item is coil and component design. Carry out comparative tests with different designs and make as many of the required parts as possible.

Home Recording

A subject which can be most fascinating is home recording. This possesses the great advantage of creating considerable interest from the rest of the family and the majority of one's friends. Everybody always seems very keen to hear their own voice or talents as others hear them, and this, incidentally, once the equipment is working satisfactorily, can also be a source of income to help defray the cost of one's experiments. Quite good recording apparatus can be purchased (Continued on page 54).

Electricity

Many constructors are inclined to gloss over some of the fundamental laws and theories of electricity and make too much use of coupled tables rather than work things out for themselves and thus get a thorough understanding of the whys and wherefores.

Home recording provides a very interesting field for experiment.
REDUCING THE INDUCTION OF RESISTANCE ELEMENTS

WHEN the resistance elements of a network are required to function over a wide range of frequencies, as to include quite high frequencies, it often happens that steps must be taken to avoid as far as possible the introduction of reactance into the network arising from the self-inductance of the elements. Sometimes the problem can be solved simply by the use of resistances of the conductive layer type, but this method becomes unsuitable if a very high stability of magnitude is needed, as in an accurate attenuator. In such cases, apparatus, also, the residual inductance of non-inductive windings, such as the bifilar and the Ayrton and Perry windings, may be too large to meet the satisfactory operation. One method of surmounting the difficulty which results in a very satisfactory solution is to deliberately increase the self-capacity of the winding; if this is performed to the correct degree, the winding can be made to present a purely resistive impedance over an extremely wide range of frequencies—a winding of 1,000 ohms resistance and 5 microhenries inductance instead of presenting at 5 megacycles per second a reactive component of impedance of about 150 ohms, as it would do normally, be made to present only a matter of a few ohms.

Self-capacity Winding

To achieve the result of the above example it is necessary that the effective self-capacity of the winding should be adjusted to be about 5 microhenries. It is only on this assumption that it may be said that if L is the residual inductance and C the effective self-capacity it is necessary that C should be related to L and to R, the resistance of the winding, according to the formula: \( L = CR^2 \). L, C and R are shown represented in the equivalent network for the winding in the accompanying diagram. The principle underlying the method is quite simple and obvious one of connecting a small condenser for the correct combination of reactance and resistance of the winding. If, as is often the case, the resistance is wound on a tube of insulating material the added capacity can be achieved by a flat metal strip, for example, pushed into the insulating tube; adjustment then consists of altering the distance to which the tube is inserted. Alternatively, thin metal foil can be stuck on the inner surface of the insulating tube and a certain amount can be scraped off until the right capacity is attained; or the foil can be placed on the outside. If the winding is on a network, the tube can be split and a metal plate inserted. For small capacities the metallic element is left floating, but to obtain greater capacities it is simplest to connect the element to the resistance at one end. In some cases it may be possible to obtain the additional capacity by locating the resistance close to a metallic surface, such as a screening surface.

Special Winding

Special measures may require to be adopted when the resistance of the winding is very small, for then, as the formula for the necessary capacity shows, this capacity tends to become rather large unless the residual inductance is made as small as possible in the first place. One arrangement that gives a very small inductance is when the resistance is wound on a form of eight-winding. A U-shaped metal former such as is provided by bending a metal strip into a streamer, or by attaching two metallic plates in close proximity to each other. The metal core has both the effect of reducing the inductance of the already highly non-inductive figure-of-eight winding and of increasing considerably the natural self-capacity of the winding. It must be pointed out that the value of L in the formula already given is, of course, the inductance of the winding in the presence of the metallic core. Other types of non-inductive winding can be used, if preferred, retaining, of course, the principle of a metallic core. In contra-distinction to these precautions, necessary for very small resistance values, a perfectly straightforward type of winding may be used if the resistance is to be of high value.

A method of interest is to wind one that tends itself to simple adjustment in practice, is to design the winding so that it presents inherent reactance equal to the required value without any further addition. A suitable form of winding is one in which the wire is wound in a coil of small diameter and in which this coil is then wound in the form of a larger coil on a former. By a not-too-easy calculation it is possible to relate the various dimensions so that the capacity and inductance of the winding neutralize one another.
The R.S.G.B. to Carry On

I was glad to have a letter from Mr. J. Claricoats, of the R.S.G.B., informing me that it is the Council's intention to carry on the work of the society during the war. They are retaining 53, Victoria Street, London, S. W.1, as a registered address, but the work of the society will be conducted from 16, Ashridge Gardens, Palmers Green, N.13 (telephone, Palmers Green 3555).

Price Increases

The increase in the price of commercial receivers has caused many old constructors to return to the ranks. I understand from our Blueprint Dept. that there has been an enormous demand for blueprints of some of our cheaper receivers. This is all to the good, especially when the component manufacturers confirm that there has been a run on components. I understand that it is the Editor's plan to publish a number of emergency receivers which can be built from parts which the constructor will have in hand. A further sign of the times is that our handbook entitled "Wireless Coils, Chokes and Transformers, and How to Make Them," and "Sixty Tested Wireless Circuits" have enjoyed a boomlet. People seem to be buying books and reading them now that there are few counter attractions in the evenings. This is the time to improve your knowledge and to make homely study your evening entertainment.

The correspondence colleges inform me that they have had a sudden influx of students, which seems to indicate that others are thinking likewise.

This journal intends to carry on, and although I understand that it may not be possible, because of the paper shortage, to give quite the same number of pages, we shall do our very best to give the maximum possible. For the same reason it is now necessary for you to place a regular order for the delivery of this journal. If you rely upon purchasing your copy casually you may find that it has gone to another wise enough to reserve it.

A form which will save you trouble appears in this issue. Will you please fill it up and hand it to your newsagent? You will develop an even closer affection for your periodicals. It may not be possible shortly for your local newsagents to take journals for sale or return, so please do it now. And relating to this matter is the following letter from A. G. F., of Dornansland:

I have just been reading your inspiring article in to-day's "P. W.," and I think that it's really rather fine; your summary of the uses of radio in warfare is really most efficient.

I must congratulate the Editor on his decision to carry on with business as usual.

At the moment I am building the Kestrel S.W. Four, and although it is not yet complete, I have a feeling that it is going to far outshine any other of my sets, and it is my fifth.

I wholeheartedly agree with K. H. of Blackrock, when he says that many constructors have been won by receiving a home-constructed set. I am one of that variety, and I bless the day when I bought a three-valve set, mounted on a baseboard.

I don't know what other readers, except those who have already expressed their excellent opinion, think about the new appearance and name of our journal but I must say that it is absolutely fine, and there's no getting away from it.

Wishing Practical Wireless every success in these times of stress.

I like the spirit of this letter, which is typical of many which I have received from readers.

And, of course, "Torch" wishes to play his part too. This is what he has written:

Hail, ye many thousand readers,
Who find pleasure in my style,
Those who from my rambling raving
Now and then may get a smile;
Those who think that gentle "kidding"
Cannot rightly rank as "sin,
And their fond indulgence granting
Welcome those who make them grin.

Mightier brains than mine are fighting
On the editorial staff,
Solving problems which perplex you,
Mine—to try and make you laugh.

Let the Editor, all-powerful
Radio wisdom still dispense,
And our "Thermion," guide and shepherd,
Gird at bunk and rank pretence.

Humblor far this task before me,
Whilst the Editor permits;
Happy if I make you giggle,
Cachinate and "go in flags,"
And for such as cannot like me
May some comfort still be found;
Grant me this and I'm contented—
Laughter helps the hours "go round."

B.B.C. Plays and Features

It is interesting to note that Val Gielgud, Director of Features and Drama, has now completed his plans for the last week of September and the first week of October. These show that his department is undertaking each week almost as many plays and features as in a month during normal times.

Mr. Gielgud's plans include a series of features which will be specially written for the microphone, and will deal with various aspects of life in this country under the changed conditions of war, as well as other topical subjects. The first of these programmes will be broadcast on September 29th under the title of "The Home Front in Fighting Bitterness." It will be a recorded impression of children in evacuated areas. The second programme, which will be heard by listeners on October 5th, is entitled "The Spirit of Poland," and is being written by Mony McLaren, Assistant Director of Features and Drama, who has travelled throughout that country.

When war was declared the first instalment of A. E. W. Mason's "The Four Feathers" had not been broadcast, although Peter Craigie had been working on the radio adaptation for some time. He will present the first of twelve weekly instalments on September 26th.

A Simplified Automatic Frequency Control Circuit

An Improved Arrangement in which the A.F.C. Potentials Are Applied Directly to the Control Grid of the Local Oscillator

Quite a large number of this year's receivers employ "pull-in" tuning, or automatic frequency correction. In these receivers, which are of the superheterodyne type, the A.F.C. potentials are applied to the local oscillator circuit in such a way as to keep the receiver always exactly in tune. They have the disadvantage that additional components are required in order to effect a change in the local oscillator frequency. Thus, in some receivers an additional A.F.C. control voltage is used which acts as a variable capacity or inductance; other receivers use ironed coils so arranged that a change in the permeability of the cores causes the local oscillator frequency to vary. The following is a description of an improved A.F.C. circuit designed by the Radio Corporation of America, in which no additional components are required.

Referring to the accompanying drawing, here is shown in a schematic manner the various networks of a superheterodyne receiver of the type employing an automatic frequency control circuit. Since such receiving systems are well known at the present time, it is not believed necessary to show the details of any network other than the local oscillator circuit.

"All-wave" System

In general, it may be stated that the present system will be of the broadcast type, or of the "all-wave" type, and will consist of the usual signal collector which feeds one or more stages of radio-frequency amplification. The first detector will be fed with amplified radio-frequency signals, and will feed its I.F. energy output to one or more I.F. amplifiers. The I.F. value may be chosen between 25 to 450 kcs, and the I.F. energy is impressed upon a discriminator network. The audio voltage component of the discriminator output may be used for audio-frequency amplification and then reproduced. However, for the sake of simplicity, the I.F. energy is shown as being fed to a second detector which is independent of the discriminator network. The discriminator network may be of the type in which opposed rectifiers are tuned above and below the assigned I.F. value by the same predetermined frequency amount. In any event, the discriminator network will produce a direct current voltage whose polarity and magnitude depend respectively upon the sense and amount of frequency departure of the I.F. energy from the assigned I.F. value.

In other words, as the receiving system is tuned to a desired signal frequency, the discriminator network will produce a direct current voltage whose polarity and magnitude will depend upon which side of the incoming carrier frequency the receiver is being tuned to.

Local Oscillator

The A.C. voltage is applied to the control grid of the local oscillator valve by means of a lead 1. The local oscillator valve includes a cathode 3, a control grid 4, and plate 5. The plate is connected to a source of approximately positive potential (not shown) through a voltage reduction resistor 6, and the grid 3 may be considered to be at a fixed potential, such as ground. The tank circuit 7 comprises the coil L1 and the variable tuning condenser S3. The high alternating potential side of circuit 7 is connected to the plate 5 through a direct current blocking condenser S4, whereas the low potential side of the circuit 7 is established at ground potential. The control grid 4 is regeneratively coupled to the tank circuit 7 through a path which includes the direct current blocking condenser S10 and the feedback coil L0. The symbol M denotes the mutual conductance which provides reactive coupling between coils L1 and L0, it being pointed out that one end of coil L1 is at ground potential. The A.F.C. lead 1 is connected to control grid 4 through a grid leak resistor R11, and the numeral 12 denotes the internal grid impedance (shown in dotted lines) of the oscillator tube 2. The local oscillations may be impressed upon the first detector through condenser S3. It will be understood that the variable condenser S3 will have its rotor plates adjusted simultaneously with the rotor plates of the tunable signal circuits of the receiving system. The frequency of the tank circuit 7 is maintained at a frequency different at all times with respect to the frequency of the signal circuits by a value which is equal to the assigned I.F. value. If, for example, when the receiving is employed in the broadcast band of 550 to 1,500 kcs, the variable condenser S3 will adjust the tank circuit 7 through a frequency range which is generally higher than the signal frequency range, and differs therefrom at all settings of the tuning device by the assigned I.F. value.

A.F.C. Circuit

The A.F.C. circuit functions to provide a frequency adjustment of tank circuit 7 over a small range on either side of predetermined station settings of the variable condenser S3. As explained previously when the variable condenser S3, and the variable condensers of the signal circuits, is adjusted to a setting such that the I.F. energy is close in frequency to the assigned I.F. value, the discriminator network will produce A.F.C. voltage, which will vary the bias of control grid 4 sufficiently to produce a frequency adjustment of tank circuit 7, which is independent of the frequency adjusting action of the variable condenser S3, so as to maintain the energy at the assigned I.F. value. In the present case this is accomplished by proper choice of the constants of M and L0. That is to say, the mutual inductance between the tank circuit and the feedback coil L0, and the self-inductance of coil L0, are chosen so as to provide a reactive effect in tank circuit 7 and which can be varied in magnitude upon variation of the gain of valve 2. This reactive effect is equivalent to a parallel negative inductance. In other words, the frequency correction of the oscillator tank circuit is secured without adding any auxiliary circuit elements for the function. It will be appreciated that such a simplified A.F.C. circuit is of advantage, particularly in the ease of receivers of the compact type, such as are used in automobiles and aeroplanes.

Tank Voltage

The nature of the electrical reactions which give rise to the production of the simulated reactive effect across the tank circuit 7 may be explained as follows: If the reactive magnitude of feedback coil L0 is made large compared to the magnitude of the internal grid impedance 12, then it can be demonstrated that the result of the current through the grid 4 will depend upon the product of the alternating voltage across tank circuit 7, the ratio of the magnitude of M to L0, and the ratio of the magnitude of impedance 12 to the reactive value of feedback coil L0. In effect this relationship means that there exists a quadrature component in the expression defining the value of the voltage of grid 4. Variation of the bias of grid 4 then causes a frequency variation of tank circuit 7 by virtue of a variation of the reactive effect produced.

Voltage across tank circuit 7 causes lagging current in coil L0. Polarity of M must be such as to make circuit oscillate, so that
A Dual-Action Morse Key
Construcational Details of a Simple Key for the Experimenter

WHEN co-operating with a friend in practising the Morse code, the writer suggested that there may be some advantage in combining the movements of a straight key and a "Buggy," the idea being that the discernibility of new ideas is various speeds could be checked in the immediate duplication by the one key.

A very simple hook-up key was used to see whether or not such a key would be worth designing and constructing as a permanent job, and some interesting notes were made. Finally, from various rough sketches the key illustrated was decided upon and built, and has since proved its utility in many ways.

Construcational Details

The commercial Morse key was fashioned from an odd piece of 14 gauge aluminum, this being more convenient to "weld" than brass. To obtain the combined key actions without elaboration in the design, it was found that by a simple spring governed slot movement as depicted, sufficient rocker and side action could be had, whilst not interfering perceptibly with the free use of the key either way.

Two fluted brass bearing brackets were made up and, from a watch maker, four strong steel springs were obtained, already drilled, for a few coppers. Two l/n. square, and drilled for fitting to the sides of the key base, provided suitable mount for the "Buggy" key contacts "C," the contacts comprising two 2BA headed screws with their ends filed to a point. These screws are then soldered to the ends of the contact strips, as shown.

Contact Assemblies

The front contact assembly constitutes simply a 2BA head brass screw, the head being filed to a comparatively thin circular head, after fitting, whilst the tension spring "Te" was obtained from a cheap key of early pattern which was far too clumsy for serious use.

The rocker contact was in this instance obtained from a contact next taken from an old telephone-type key, thus furnishing a pair of clean platinum contact surfaces. A pig-tail connection is made between the rocker and one slot bracket, one contact being taken from this bracket by soldering the lead to the head of the fixing screw.

The "U" mount is, of course, recessed in the base plate, and a wire is soldered in the alternative a sheet of brass and passed along a groove made in the base, to the contact "S" external connection being made by means of two 2BA screws fitted into tapped holes in this strip, and hidden from sight by locating them under the sheet of brass.

The next point to consider was how to employ a similar scheme to this which would be moth-proof, and the scent of camphor or naphthalene balls was not desired. Various schemes were tried and rejected until finally a very simple arrangement was discovered, which cost absolutely nothing to install, is definitely moth-proof, insect-proof, and which has removed all signs of cologne and enables the maximum output from the equipment to be obtained without any form of apparent resonance or distortion. The scheme is simple to make up and the only material required (apart from some odd pieces of wood) is a quantity of old newspapers.

In my cabinet the size of the bottom shelf is practically the same as one half of a sheet of my daily newspaper, and thus, by folding the paper in half it just covers the shelf. On the side a similar measurement holds for a fair distance up the cabinet (roughly just above the shelf) and so the folded paper be placed on end against each side. The papers were saved from a few weeks and the bottom of the cabinet was covered by a thickness of about one inch with the folded papers and a strip of uncleared wood placed diagonally across them and screws passed through the strip, through the papers and into the cabinet. On the sides the same arrangement and thickness was adopted, but the strips were placed at the bottom and the sloping sides to hold the papers in position—-the centre portion being left free.—D. J.
THE MANUAL CONTROL OF VOLUME

An Explanation of the Usual Forms of Volume Control as Used in Modern Receivers - - - By W. J. DELANEY

It is necessary in a modern receiver to control volume, the reason being that apart from a desire to restrict the output to comfortable proportions, it is also necessary to avoid overloading of one or more valves in the circuit. Most modern receivers now employ what is known as automatic volume control, whereby the signal itself applies some form of bias to the early valves in the receiver and thereby keeps the output to the L.F. stages down to a given maximum. In addition to this form of control, however, there is also a control known as the manual volume control, and primarily its purpose is to enable the listener to keep the volume down to a comfortable level. If, however, it is left in the maximum position distortion will be noted when a local station is tuned in, unless the receiver is of specialised design where the A.V.C. circuit has been so designed that the maximum output of the detector or second detector is such that the output valve cannot be overloaded. The normal manual methods of volume control are applied either to the H.F. or L.F. circuits, the latter being most common. In order to appreciate the function of the forms of control, let us examine their application and the reasons for the different methods.

Early Control

When a receiver is installed close to a high-powered broadcasting station there is a large signal voltage present in the aerial circuit, and the more efficient the aerial circuit, the greater the voltage which will be present between aerial and earth. Now the first valve in a receiver may be an H.F. amplifying valve or a detector valve. In the latter case it may be taken as a general rule that the more powerful the signal the better, and where a diode is employed it is essential to make quite certain that a really strong signal is applied to avoid distortion. In the case of an H.F. amplifying valve, however, we may experience difficulties if a powerful signal is present and we endeavour to tune to another station. Without going into the actual effect we may simply consider the effect as an over-amplification of weak signals which are present as a background to a fairly strong signal which does not receive the same amplification owing to a saturation effect on the valve. Thus, in such a case we must introduce the control over volume in the first stage, and provided the H.F. valve is employed we can adopt either method No. 1 or No. 2. In the latter case, of course, we must employ a variable-mu valve and restrict the amplification of the valve by varying the grid-bias. For the benefit of newcomers the essential parts of such a circuit are shown for battery receivers in Fig. 1 and for mains receivers in Fig. 2.

Aerial Circuit Control

If, however, we wish to use an ordinary valve in this stage and consequently desire to employ control method No. 1 we must provide some means of tapping off only part of the total signal. There are two methods of doing this in this part of the receiver—one by using a resistance across the circuit and the second by using a special balanced condenser method. The latter may be simplified by employing an ordinary differential reaction condenser, and again the essentials only are shown in Figs. 2 and 4. In Fig. 3 the total signal is produced across the ends of the resistance as well as across the tuning coil, and an arm on the resistance is adjustable so that part is short-circuited. This scheme is not much used owing to variation in tuning, and is generally incorporated with the bias potentiometer which is employed for a variable-mu valve to obtain the advantages of both schemes.

In Fig. 4 a somewhat different effect is obtained, as the transferance of the unwanted signal voltages is carried out through the capacity existing between the wires of the condenser, and not direct through the medium of actual contact as in Fig. 3. In this case also, a limiting effect is introduced as it will be seen that the signals in the position of minimum volume pass to earth through the condenser instead of going through the coil.

L.F. Controls

On the L.F. side of the receiver a potentiometer is the only practical means of controlling the volume, and it may be used alone or in conjunction with a transformer. In the first case it will form the grid-look of an ordinary resistance-capacity coupled stage, and in the second case it will be joined across the secondary of the transformer. (It could be placed on the primary side of the transformer, but this is not desirable owing to noises introduced due to the fact that current is flowing through it and its effect is also generally erratic.) Figs. 5 and 6 show the two methods in essentials and it will be seen that in the first case the total signal will be developed only across the control, whilst in the second the transformer winding is also included. Thus in this case the actual response curve of the transformer will be modified, and it is necessary to choose the value of the resistance with a full knowledge of its effect on the inductance of the secondary winding and...
Practical Hints

Tracing a Short in Headphones

A NUMBER of the earlier patterns of headphones employed metal earpiece fittings to the head-band, this metal being in the majority of instances comprising simply a heavy-gauge wire fashioned in such a way as to cleat into the earpiece moulding, which often constituted bakelite or ebonite. A friend using such a pair of headphones recently complained of receiving a severe electric shock when handling the 'phones whilst touching the metal headphones or hinging the earpiece. This happened even when the 'phones were not in use, and it was thought that the metal clip employed to hold the earpiece was the cause of the trouble. However, the clip was made of brass, and since this metal would not have been expected to cause the trouble, the report was made to us for publication.

The case occurred in an unusual manner, and we were somewhat puzzled as to the cause owing to the apparent completeness of the insulation afforded by the bakelite moulding. An investigation brought light to the rather interesting reason. The poles of the earpiece in question were fitted in quite the conventional manner, but the magnet was moulded in the bakelite case, the leads being taken to rivets which on test proved to be effectively insulated in the moulding, so this possible point for a breakdown could be ruled out.

The hinging portions of the wire clip must contact in some way with the H.T. feed, and therefore it was to be assumed that the leakage would be found in one or both of the coils.

This proved to be so, the series connection of the two coils being so tightly pressed against a flimsy strip of insulating paper next to the metal bobbin adjacent to the magnet that break-through ultimately occurred. This, however, did not explain how the clip became 'live,' until examination showed that the tips of the hinging portions had gradually worn the bakelite down, until contacting directly with the magnet which was now at positive potential rubber could be adjusted for wear. The switch is wired in series with the lamp-holder. - S. WIGGERT (Beccles).

A Triple-purpose Plug Modification

BY the simple adaptation illustrated in the accompanying sketches I can now keep a milliammeter or voltmeter permanently and safely connected, ready for either receiver measurements by ordinary jack use, or for 'tip' testing. For ordinary jack purposes, the shorting strip "C," which comprises a springy brass strip soldered to a 'flanged' 3 m. bore brass bush, is removed, whilst for the test plug method of use "C" is moved along...

THAT DODGE OF YOURS!

Every Reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-0-0 for the best hint submitted, and for every other item published on this page we will pay half a guinea. Turn that idea of yours to account by sending it to the Editor, "PRACTICAL WIRELESS," George Newsam, Ltd., Tower House, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Practical Hints." DO NOT enclose Queries with your Hints.

SPECIAL NOTICE

All hints must be accompanied by the coupon cut from page 63.

An Automatic Light Switch

I RECENTLY fitted the device illustrated to a local shopkeeper's door. It switches the light off immediately the door begins to open, and switches it on immediately it closes. The one fitted works extremely well.

The switch is a Bulgin toggle mains on-off type, and it is secured by a brass bracket, drilled with a hole large enough to take the switch bushes. The switch dolly is operated by a piece of ordinary ink rubber, tapered for flexibility and secured to the door by a screw and large washer. I mounted the switch slantwise so that the switch dolly, disengaging with the plug tip, of the connection is made by means of either another test prodd or a crocodile clip lead taken from a plug terminal "T," which is fitted in place of the usual moulding fixing screw.

When not in use, the shorting strip "C" is moved along to engage with the tip of the plug, thus protecting the meter by short circuit. The inset diagram shows the method of wiring, and it will be noticed that the tip is conventionally positive, the terminal being in this case negative.

When soldering the connection from the terminal stem to the sleeve contact, care is necessary to avoid excess solder, so that the other part of the plug case or moulding will not stick down; for this purpose, a reasonably light gauge of tinned copper wire should be used, and where possible a notch can be made in the moulding bush to recess the terminal solder connection, this also serving to cleat the terminal stem.

- T. C. HESSON (Wanshead).

READ "THE CYCLIST"

2d. Every Wednesday.
EMERGENCY RECEIVER INSTALLATION

Some Simple Methods of Providing Radio Reception in the Refuge Room or Garden Air-raid Shelter. Details are Given for Installing an Extension Speaker or an Extra Receiver — By FRANK PRESTON

Despite the various criticisms of the indifferent entertainment programmes put out by the B.B.C. there is no doubt that the frequent news service has been greatly appreciated. It was much appreciated, perhaps, during the few days immediately before and after our entry into the war, but its obvious value in an emergency, such as the appearance of enemy aeroplanes over this country, cannot be over-estimated. Valuable information can be broadcast and while shelter is being taken away area can be sounded by a continuous broadcast of light entertainment.

This leads to the desirability of having radio available in the refuge room or air-raid shelter. Probably many readers have already made a simple receiver especially for this purpose and installed it in the appropriate place. Others perhaps have a portable radio, and some will build the neat little single-valve described on other pages of this issue.

Alternatives

Those who have not yet given the matter full consideration would be advised to do so now, because there might not be any time to make suitable provisions after the sirens have given out their warning note.

Probably the first question to be settled is whether an entirely separate receiver will be installed permanently in the shelter or gas-proofed refuge room or whether an extension speaker will be run there from the normal domestic receiver.

Either arrangement can be made fully satisfactory, although if the home receiver is mains operated there is a chance (but it is not likely, we are informed) that it will be inoperative in some instances due to the disconnection of the supply. Thus, those who are anxious to be doubly sure will prefer to have a separate battery receiver. An ultra-simple one with 'phones only has much to recommend it, but on the other hand the broadcast can be followed by only one of those who are sheltering if a certain amount of distortion is not to occur, can be ignored; it is necessary, therefore, only to run a lead to the extra speaker and to fit a very simple form of volume control to it. A twin-wire extension need not be used, for a simple choke-capacity output filter arrangement can easily be used. All that is required is to connect a fixed condenser of between 3 and 4 mfd. capacity to the anode terminal of the output valve and to run a lead from the second terminal of the condenser to one side of the speaker; the second speaker terminal is taken to any convenient earth connection. In the case of an "Anderson" shelter, the constructed frame will provide an excellent earth return. The volume control can take the form of a 25,000-ohm potentiometer connected as shown in Fig. 1, although if desired the control can be omitted by using the modified connection shown by a broken line.

Protection from Damp

When using this method of connecting the extra speaker, the speaker already fitted

Remote Control

There may be some who wish to be able to switch the remote receiver on and off from the shelter, and this brings in a few small difficulties, especially if the shelter is in the garden and some distance from the receiver. Probably the best method is to use a remote-control relay such as the Bulfin Universal Distant-Control Relay, or the W.B. "Long Arm." This is certainly a refinement, but it might be inconvenient to run a number of wires between the set and the speaker point when there must be of doors. And when a potentiometer volume control is employed, as previously mentioned, this will serve to switch the speaker out of circuit whilst leaving the set on. There will be no harm in this, although it might result in the batteries running down prematurely and thus rendering the set inoperative. Either of the special controls mentioned is easy to install, and full details are supplied by the makers.

Weatherproof Leads

When running either speaker or control wires from the house into the garden special precautions must be taken to see that they are weatherproof. Excellent cable for the job is "black glossy," as used

(Continued on opposite page.)
PRACTICAL WIRELESS

EDGWARE SHORT-WAVE SOCIETY

Headquarters: C. L. G. Hall, 12 Chiswick Road, London, W. 2.

Six months after the Society was formed, the Board of Governors have decided to increase the society's subscription to 3s. 6d. This was due to the large increase in the cost of running the society, and the Board of Governors feel that this is necessary to keep the society going.

KILMARNOCK AND DISTRICT SHORT-WAVE SOCIETY

Headquarters: W. A. Wilson, 11 Cathedral Close, Kilmar-

oo, Robert Street, 2, Forfar, Tain, and Kilmore.

TROPHY PRICE INCREASES

MESSRS. PETO-SCOTT announce that owing to increasing labour, material and transport costs, it has been necessary to increase all list prices for Trophy communication type and short- wave sets by 10 per cent. This applies to all orders invoiced on and after September 11th, and the new list prices are as follows:

- Trophy 8, £13 17s. 6d.
- Trophy 6, £10 16s. 6d.
- A.C. Trophy, £5 18s. 6d.
- P. R. T. 5, £6 6s. 6d.
- Proctor, £7 8s. 6d.

Additional cost of coils for the Trophy 3 for complete coverage of 0.3 to 3.30 metres, 1s. 6d. per metre may be necessary to make further increases in price to a later date.

See Your Dealer NOW about a TROPHY

WHY the IMPORTANCE of the Short-Waves these days demands the use of a specially designed TROPHY Communication Receiver.

Everyone knows that the short-waves are now being used more than ever before, and every transmission has a vital significance. TROPHY Receivers are designed specially for the most reliable short-wave reception from every corner of the globe and at the right time every part of the world has a message to deliver to the world.

The TROPHY receiver used above is an Ideal A.C. Communication Receiver and incorporates essential tuning features for efficient operation. The price of £11 13s., and a specially matched P.M. cabinet speaker is available at an extra cost of 46 s. Further TROPHY models at prices from £6 8s. upwards. Your nearest radio installation firm may have a model to suit your requirements at an extra cost.

TROPHY COMMUNICATION Receiver, obtainable from your local Dealer or all models available against postal instructions or as callers from

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Give increased efficiency to your short-wave receiver — use CLIX Fidel-frequency CERAMIC VALVES and TRIMMERS. The unique design of some permits the condenser to be inserted without the wiring without "sag" and risk of distortion through any movement of connecting leads.

CLIX VALVE-HOLDERS embodying the perfect contact which literally holds CLIX valve built into Fidel-frequency CERAMIC CASE — for all standard valves and all conditions of operation.

CLIX TRIMMERS. The unique design of some permits the condenser to be inserted without the wiring without "sag" and risk of distortion through any movement of connecting leads.

CLIX Radio and Electrical Catalogue, Port Free.

British Mechanical Productions, Ltd., 1, Church Road, Leatherhead, Surrey.
A.R.P.
Emergency RADIOS
For many dealers a limited number of Barumas in complete Receivers and Chassis. You need a large stock for emergency use, so order your stock now and avoid disappointment.

MERCURY ALL-WAVE. Wonderfully rugged, compact and of commercial grade. For p.m. and s.w. with effective range of 14 to 2.000 metres. H.P. Pent. Valve. Supplied complete with 4 valves. Send 2-o5 for prices. Limited stock.

WE DO NOT SELL CHAINS ONLY. Amazing all-wave chains, with 4 tubes. Wavelength 15-150 metres. Sold complete with 4 tubes. Order now. Send 2-05 for prices.


A.C. 4-VALVE CHASSIS. For broadcast only. 500 to 1.000 metres. 2-way output. Ready for Radio or Radioogram replacement purposes. Fully tested, complete with 4 valves. Bargain 11/6. Carriage Paid.

ALL-WAVE A.C. & CHAINS. B.O. Hampson 4-valve sets. Wavelength 12-250 metres. Station tubes. P.U. sockets. Complete with all valves and ready for connection use with mains or spring wound gramophone or telephone. Order now. Send 2-05 for prices. Bargain 7/6. Carriage Paid. We cannot repeat any of these chains at the same low price again.


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PRACTICAL WIRELESS

SCHOOL BROADCASTING IN WAR TIME

THIS service which School Broadcasting might render in war time was discussed by the Central Council for School Broadcasting during the summer of this year. The details of an adjusted programme have since been worked out by officials of the B.B.C. and of the Council in consultation. Their educational aims is approved by the Chairman of the Central Council, and the B.B.C., subject to contingencies, has decided to allot generous time for broadcasts to schools out of its single programme.

The first stage was in the early days of evacuation; an emergency programme, previously prepared, began on September 6th. Almost all the schools that were then open were acting as social centres, and making no attempt at formal teaching, while many children were in the care of hosts who sometimes found it difficult to know what to do with them. School Broadcasting of the ordinary kind was suspended. A programme was therefore designed to meet the occasion and, with modifications, was continued until September 22nd. It has been simpler, and has contained more entertainment than normally. A feature has been the special talks aimed at helping town children who have been transferred to the countryside to understand and respect their environment.

Teachers' Schemes

A question that called for early solution was whether the B.B.C. should continue on these emergency lines, or revert to something which corresponded more nearly to the teachers' schemes of work. It was agreed that a new plan should begin, as from September 25th, when normal School Broadcasting was due to begin.

Another important point is the making of itself and self explanatory and even therefore be useful when the usual classroom facilities are not available.

Normal Programmes

Programmes for schools as from September 25th contain all the main elements of the normal programmes except Modern Languages, which will have the appeal numerically both to the schools and to the general public. The lessons to be learnt from the countryside must continue to have a special place in any scheme of work carried on under conditions of evacuation.

Announcements concerning the programmes will be broadcast each day at 11.0 a.m. and 2.0 p.m.
Station MTYC—Hsinking

Sir,—I point out a slight misprint in the September 9th issue which might prove misleading to readers. "The Voice of Manchukuo," Hsinking, given as MTYC, should be MTYC, the prefix of "N" having been omitted, of course, to the Canal Zone Only.

MTYC appreciate useful reports on their special European transmissions, and now their schedule extends from 22.00 until 22.50 B.S.T. on 11,775 kc/s.

Colombian calls are again short to be shuffled: HJ3CA, 4,845 kc/s to HJCD; HJ3CAH, 4,900 kc/s to HJCH; HJ3CAF, 4,835 kc/s to HJCF.

In the past seven years HJ3CF has been HJK, HJ3ABF, then HJ3CAF, and now HJ3CF.—Peter K. Jackson (Ramsgate).

"Sparcs Box" and Crystal Sets!

Sir,—Your intention to continue publication is as welcome as it is courageous and will, I hope, receive the support it deserves.

May I suggest that with the probable shortage of components and with increased prices fixed, it is a good time to develop the "spares box" type of set. We want sets now that are economical in current and that give us a good reception on the wavebands now in use.

One other suggestion. Crystal sets are very useful just now. Most published designs require a specially wound coil. Will you give us one using a "spares" coil so that it can be easily and quickly made up.

Wishing you success in these difficult days.—H. Edgar Parker (Bitterne).

Exchanging S.W.L. Cards

Sir,—I would like to inform readers of Practical Wireless that S.W.L. cards may be obtained from V. Mandelstam, 738, South Park Avenue, Saggaw, Michigan, U.S.A., and also from H. H. Brown, 9,410, Second Avenue, Silver Spring, Maryland, U.S.A., by sending their cards.—A. V. Oolesby (York).

Sir,—I would be very glad indeed to exchange my Q.S.L. card with any S.W.L., A.A., or full ticket ham, in any part of the world. All cards will be acknowledged by return post.—I. Hudson, 12, Devon Terrace, Pontefract Lane, Leeds, 9, Yorks.

A Four-valve A.C. Short-waver!

Sir,—Being a regular reader of your excellent paper, may I suggest the publication of a 4-valve A.C. short-waver receiver in PRACTICAL WIRELESS? The receiver should have electrical bandspread tuning and plug-in coils. I built your converter-adaptor a while ago, and was very pleased with its performance.

The new PRACTICAL WIRELESS is super and I wish it success.—J. Parke (Hull).

Correspondent Wanted

Sir,—May I add my appreciation of the new PRACTICAL WIRELESS, but I would like to see more short-wave receivers described.

I believe a "Sparcs-box" receiver was published some time ago, and I shall be glad if you will inform me in what issue it appeared.

I would like to correspond with a S.W.L. in U.S.A.—R. Earl, 4, Devon Avenue, Whitton, Middlesex.

An article on the construction of our "Spares-box Three" appeared in the issue for February 4th, 1930.—Ed.

A Twin Aerial

Sir,—The following dodge may be of interest to other listeners of the B. C. Home Service broadcasts.

Severe "blasting" has been spoiling my reception of the North Regional transmitter, and in the hope of stopping this, I have rigged up two aerials. One is fitted to the roof of the house and the other is about halfway down the length of the garden. Total length of both aerials is about 50ft.

My receiver is fitted with two aerial plugs for use with a dipole aerial, but hitherto I have used only one of them.

The twin aerial idea works perfectly. Signals have been quite steady ever since I've tried this arrangement, and the blasting has disappeared.—L. Hall (Bristol).

Problems

PROBLEM No. 367

Martin's three-valve suffered from.ng noise. He replaced the valve, used new condensers, but the hum persisted. He therefore decided to fit a decoupling circuit in the first L.F. stage. He used a condenser in series with one of the valve leads, and finally fitted a block of bakelite to the leads of the condenser, but the noise persisted. What was the likely reason for this? There was no trace of dust or dirt on the valve or the condenser. There were no faults in the supply. The problem was due to the noise being coupled to the supply line from a proximity transformer, which was situated in the immediate vicinity of the valve. The transformer was subsequently removed, and the noise disappeared.

Solution to Problem No. 366

When Jackson removed the valves he found that he had removed the wrong valve. He seduced the grid of the L.F. valve with a piece of tape and found that it was shorted to the cathode. The grid of the L.F. valve was in contact with the chassis and the grid was a short at that point. By connecting these the readers successfully solved Problem No. 365, and books have accordingly been forwarded to them: H. G. Bennett, 6, Church Road, Waterlo, Liverpool 22; E. A. Parker, 5, Chequers Road, Canvey Island; E. A. Sherlock, 11, Woodbridge, Suffolk.

THE WAR

At a time like this we are all vitally interested in the war. Various short-wave broadcasts from Germany have been heard in this country. It is thought that these are being sent as a warning to neutrals to avoid participation in the war. The broadcast was heard in various parts of the country. The broadcast was heard in various parts of the country. The broadcast was heard in various parts of the country. The broadcast was heard in various parts of the country. The broadcast was heard in various parts of the country.
How Many Milliwatts?

A Discussion on the Advantages of High Undistorted Outputs, and Some Simple Facts Concerning a Very Debatable Subject

It is often a difficult matter to decide upon the most suitable type of output stage due to the fact that the actual number of possible combinations is required to feed the loudspeaker is not easy to determine. It is all very well to say that perfect reproduction cannot be obtained unless the output is at least 5 watts, but there are many who are experienced wireless-sets users who would not tolerate a speaker working with such an input—at least, when that speaker was placed in the drawing-room. Besides, there are many who prefer what they call “pleasing” reproduction to absolutely “natural” reproduction.

When it is remembered that the average battery-operated three-valve receiver with triode output valve has a maximum undistorted output of about 150 milliwatts, and that the corresponding figure for a four-valve A.C. superhet is 2,000 watts (yes, two thousand to three thousand watts), the problem of reproduction becomes more complicated than ever. You know that a three-valve battery set used with a modest but good loudspeaker provides quite enough volume for comfortable listening in an averaged-sized room, and you also know that you are by no means denied by the more powerful receiver.

Power Output and Volume

If you were to listen to the two sets on following evenings you might form the impression that one was twice as loud as the other, but you would certainly not imagine that the output of one was something like twenty times as great as that of the other. Where, then, is the catch? Well, in the first place the audible sound is not in proportion to the output expressed in milliwatts—far from it. In the second place, the reproduction provided by the battery set is probably far from perfect, whilst that from the mains set is appreciably better, and good reproduction never sounds as loud as distorted reproduction—if the latter can rightly be called reproduction! An example of this was thrust upon me the other day when I was trying out a 6-watt amplifier. A friend popped in to see me and listened to the usual audibility speaker for some time before remarking that the quality was excellent. I replied, “Of course, it ought to be, since the cost of parts for the amplifier was over ten pounds, and that the output valve alone cost 2½. He was amazed and said that he couldn’t understand why I should go to all that expense for such a modest output. It was my turn to be surprised, for I hardly look on 6 watts as being modest, and I knew the amplifier was working efficiently. On inquiring, exactly what my friend was driving at, he explained that he had a three-valve battery-set which cost him about £7 a few years ago, and that he got “rather less volume” than the amplifier was giving.

After enquiring for full details of his receiver I found that he was using a small power output valve rated to give a maximum of 200 milliwatts output. I could not help but think that the output from his amplifier was only thirty-five times as great as that from his set, and I suggested that he should try a better one. He was most indignant.

Volume and Distortion

There is another kind of person who firmly maintains that an output of more than 200 milliwatts given by the average battery set with headphones must of necessity deafen the listener. This type of person will not allow himself to believe that the volume of sound which reaches his ears when he is in the auditorium of a concert-hall or listening to the symphony orchestra, or when he is standing near the promenade at Folkestone, is at least equivalent to that which he gets from a speaker fed from 5,000 milliwatts and working in receivers as possible, of different output ratings and to decide what output best suits his own requirements. He can then proceed to build his amplifier, or design the output stage of his receiver, accordingly. This is, of course, assuming that he can afford to build an instrument capable of providing the output desired, and also assuming that a mains supply is available. If he is limited to batteries, he must be content with about 15 watts, and if funds are limited he must be satisfied with an output which most nearly approaches that preferred. Whatever the requirements are, there is a Practical Wireless receiver to satisfy them. Incidentally, the highest output from any of these receivers is given by the "Universal Hall-Mark Four," which has an undistorted output of 6 watts, and can be built extremely cheaply.

Frequency Control Circuit

(Continued from page 50)

induced voltage in L1 is 180° out of phase with tank voltage. This voltage flows through L1 and the internal grid resistance of tube 2. If the resistance of L1 is made high compared with the internal grid resistance, current therein will lag induced voltage substantially 90°, i.e., it will lead the tank voltage by approximately 90°. This quadrature voltage applied to the grid causes equivalent quadrature current flow in the plate circuit, i.e., the tank circuit. Making grid 1 positive increases mutual conduction of tube 2, which decreases the negative equivalent inductance across the tank circuit and which in turn causes an increase in the oscillation frequency of the tank circuit. No fixed elements over oscillator circuit are needed, but the proportion of resistance of L1 and internal grid resistance must be such that resistance predominates in order to obtain frequency correction effect.

THE WIRELESS CONSTRUCTOR’S ENCYCLOPAEDIA

By F. J. CAMM

Edition of 1919

5th Edition

Wireless Construction, Terms, and Definitions explained and illustrated in concise, clear language

From all Booksellers in or by post 6/6 from Grove Newsens Ltd., 1, Queen Square Street, Strand, London, W.C.2
One of the first steps when a receiver is sent in for testing is to adopt a systematic method of examination and record entry in a special book kept for the purpose. The receiver should be examined to make certain that all valves are in position and that the book entry should take into account any loose parts or leads which may be noted in this connection. Special numbered labels would be an advantage where there is much work, and there is a likelihood of two or more sets of the same make and type being received, and these will enable the set to be quickly picked out, instead of looking for any special chassis number which the makers may have provided. The preliminary entries and records will do much to facilitate tracing the set, and also be of assistance should the receiver have to be returned at a later date for further servicing.

After this the actual work of testing may be tackled, and the first step will be to make quite certain that the valves are in order. It is obvious that defective valves will result in a receiver giving a poor performance, or in preventing signals from being received, therefore the valves should be checked first. A valve operates by virtue of an emission from the filament or cathode and therefore, after a long period of use the emission may fall off. This will result in inefficiency. At the same time, the emission from the filament or cathode is attracted to an anode and passes through one or more grids. These perform definite functions according to the type of valve, and the performance depends upon the position of these grids apart from potentials which may be applied to them. Therefore, apart from the necessity of ascertaining that the emission is in order, it is also necessary to make certain that the positions of the various electrodes are such that there are no short-circuits between them.

Mutual Conductance

The most effective method of testing the condition of a valve is by means of its mutual conductance. This is sometimes known as the "goodness" of the valve. In some cases, especially in American practice, this is also known as control grid-plate transconductance, or simply transconductance, the abbreviation for which is g_m. This factor combines in one term the amplification factor and the plate resistance, and it is the quotient of the first by the second. It may be more strictly defined as the ratio of a small change in plate current to the small change in the control grid voltage producing it. As an example, if a grid voltage change of 0.3 volt causes a plate current change of 1 mA, then the transconductance is 0.3 (amps) divided by 3. The unit of conductance is the mho, which is the spelling of "ohm" backwards. For normal purposes a milliamp of a mho is the standard, and this is a microhmo. The mutual conductance is also expressed in terms of mV volt.

The simplest valve tester will, therefore, consist of a voltmeter mounted on a baseboard provided with terminals so that L.T., H.T. and G.B. may be applied. Meters will have to be used to ascertain the exact voltages applied and the anode current which is flowing, and this is shown in Fig. 1. The meter in the L.T. circuit may, of course, be dispensed with provided that it is reasonably certain that the L.T. supply is more or less correct. Similarly, the H.T. voltmeter may be omitted if a reliable H.T. source is used, such as a new tapped H.T. battery or mains unit delivering the necessary output. Valves are rated with a given H.T. voltage, and this should be selected when a valve is being tested. Thus, the only essential meters are for measuring the change in the grid-bias supply and for the change in anode current. A single dual-purpose meter could be used, of course, with plugs and jacks or switches to make the necessary change in position in the circuit, and this is one of the methods adopted in certain commercial apparatus. Another method which is often employed is to use only the anode current meter, and to select H.T., L.T. and G.B. voltages from a mains supply unit by means of a switch. The mains are reasonably constant, and the ratio of the voltages required in relation to the mains supply are such that the slight changes in main voltage make very little difference to the secondary voltages, and

(Continued on next page)

Fig. 1.—Theoretical diagram of the basic valve tester. Practical diagram appears on page 66.

Fig. 2.—Base of the modern commercial all-valve tester.
All-purpose Meter

The general design of a good valve tester may therefore be summed up as a small mains supply unit with selector switches for various voltages, and a large-scale milliammeter connected permanently in the anode circuit. In commercial models a series of voltmeters for the control of valves are wired in parallel on the lines indicated in Fig. 2. This is more or less an outline of the idea, without all the details which can be introduced. A further feature of the commercial tester is the marking of the milliammeter dial in three coloured sections, generally marked "Good," "Indifferent," and "Raplace." This enables your customer to see the condition of a valve at a glance and not have to be bothered with figures which may or may not mean anything to him.

THE MANUAL CONTROL OF VOLUME

(Continued from page 58)

the maker's instructions must be followed. The moving iron again is used to select the desired proportion of the signal voltage.

Speaker Control

There is one position left at which control can be exercised, and that is the loudspeaker. Obviously, from what has been said, this control cannot prevent overloading of valves or components in the receiver and is, therefore, only of use where the speaker is being used as a remote listening point and an item is received which is not desired. In this case the signal will be bypassed, which is a reversal of the method No. 2, and it may be accomplished by a potentiometer device across the secondary of the speaker transformer, or by a resistance of such a value that the speech coil is gradually short-circuitcd. In general, it will be preferable to ignore control methods on the primary of the speaker transformer for the same reason as in the case of the L.F. transformer.

In all cases where the signal voltages are present across the control, it is obvious that the change from one point to another must be carried out very gradually or noise will be introduced, or other troubles will be present, due to the sudden jumps from one point to another, and thus the selection of a component for volume control purposes requires some care, and only the best should be obtained.

A COMPLETE LIBRARY OF STANDARD WORKS.

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PRACTICAL WIRELESS SERVICE MANUAL 5/-, by post 5/6.


PRACTICAL MECHANICS HANDBOOK 6/-, by post 6/6.

All obtainable from or through Newspapers or from Geo. Newnes, Ltd., Tower House, Southampton St., Strand, W.C.
Aerial and Interference

"I live in a flat where I am unable to obtain access to the roof. There is very bad interference, and I have been unable to cut this out. Is there nothing I can do to cut out this trouble, as signals are completely ruined at the moment?"—G. L. (W.4.).

The trouble must come from some internal apparatus, and therefore the only satisfactory solution is to erect an aerial well above the roof. A continuous lead-in cable. As you cannot do this, all we can suggest is to fit mains wiring to an aerial with a transformer. Enclose the set in a metal box or line the cabinet with foil earthed, and then try the smallest possible indoor aerial. This should be placed in various parts of your flat until you find a position and direction which gives minimum interference.

Transformer Ratio

"I have seen in a local radio store a transformer with a ratio of 10 to 1. It seemed to me that this is much too high for satisfactory use, and I wonder if it has been designed for some special purpose. Could you tell me if this is a normal component and how it could be used?"—H. H. (Leeds).

There was a component of the type mentioned on the market at one time, and it is, of course, very useful in making a simple one-stage amplifier for use with a crystal or single valve set. It provides a big gain and in the interests of economy it is well worth considering. Ordinary-havers of the number of L.P. stages will have to be kept to a minimum in order to avoid overloading difficulties.

Speaker Transformer

"I have just obtained cheaply a small moving-coil loudspeaker, which has apparently come from a commercial receiver. There are two flexible leads stuck to the cone and these are 'in the air.' It appears that a transformer has been taken off, as there are fixing holes and bolts projecting. Is it safe to assume that this is a low-resistance speaker and that I must use a transformer with it?"—F. T. E. (Co. Sligo).

It should be possible to see the winding of the cone, and if this is not made from very thin wire then it is a low-resistance speech coil and a transformer will have to be used to couple it to the output stage. As you will not know the impedance of the coil winding, you should obtain a multi-ratio speaker transformer and then adjust the output settings to obtain the maximum volume and quality, when you will know that the load is approximately correct.

H.F. Choke

"In building a simple one-valve set I have been told that I can ignore the H.F. choke. My informant says that the headphones themselves will provide all the chocking effect that is necessary, and I should be glad if you would inform me whether or not this is so."—L. S. E. (Eastchurch).

A normal medium or medium-long wave tune-up choke is quite true. You may find, however, that a fixed condenser across the 'phones would be preferable if the choke is omitted. You will see, in this issue, that we have omitted the choke in our A.R.P. One, and reaction is perfectly controllable in spite of this. In a short-wave set, however, the inductance value of the 'phone windings will probably prevent the reaction circuit from functioning properly, and a good short-wave choke should be included in such a set.

RULES

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

(1) Supplyandez diagrams of complete multi-valve receivers.

(2) Suggest alterations or modifications of receivers described in our columns.

(3) Suggest alterations or modifications to commercial receivers.

(4) Answer queries over the telephone.

(5) Grant information free.

A stamped addressed envelope must be enclosed for the reply. All sketches and drawings which are sent to us should bear the name and address of the sender. Requests for blueprints must not be enclosed with queries as they are dealt with by a separate department.

If you have a problem with your receiver, please send your query to the Editor, PRACTICAL WIRELESS, St. Pancras House, Euston, London, W.C.2. The Query must be received with every query.

Multi-contact Switches

"I should like to try out your Kestrel short-wave set, but I already have a rotary multi-contact switch of Swiss manufacture. It has the same number of contacts as your specified component and I should like to know whether it will be safe to use this. We have no direct contacts, but do not specify alternatives, but at the moment cash is short and I should like to use this item."—R. E. R. (N.15).

The rotary type of this disc switch is available in various different patterns, and although it may have the same number of contacts, it may not be of the same type. The switch used in the Kestrel is a three-pole four-way component, and you will have to examine your switch to make certain that it is a similar type.

Colour Code

"I have just got an American set and I notice that the speaker plug, which is a five-point affair, is provided with coloured leads. I assume this follows some standard colour code, and as I wish to try alternative speakers of larger design, I should be glad if you could tell me which is the field winding, etc."—L. W. Q. (Norwich).

Using Headphones

"I recently bought an all-wave superhet, and find that on the short waves many of the stations are hardly of entertainment value on the speaker. I can just hear them by putting my ear close to the speaker and I wonder if it would be feasible to use headphones connected to the extension speaker sockets. The set is operated from A.C. mains and I wonder if this would render the phones dangerous. I should be glad of advice concerning this point."—D.T. (Shrewsbury).

It is quite in use to use headphones for the purpose mentioned, and, in fact, the use of "phones is becoming increasingly popular with all-wave sets on account of the much greater enjoyment which can be obtained on the short waves. There are other advantages in the use of `phones for tuning, etc. You must first ascertain whether the extension speaker sockets in sets are designed for a low or high impedance, and then obtain a low or high-resistance pair of headphones. Alternatively, you can use standard high-resistance "phones, but volume will be reduced unless the output is for high resistance. A step-up transformer may, of course, be used to feed high-resistance "phones from a low-resistance output and vice versa.

REPLIES IN BRIEF

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

A. L. (Warrington). We do not know of any school in the locality, and can only advise one of the Cheshire School of Commerce.

R. J. (Didsen). We cannot recommend individual makers, but if you do not know whom you will have an opportunity of obtaining the particular model mentioned.

W. H. (Bathgate). We have had no experience of a Bloxone gulb, but the Telsm coil will be found in issue dated from 15th, 1938.

J. H. W. (N. Bolton). We are unable to identify the coil from your description.

A. C. P. (W.2). You cannot build the transmitter now, as all licences have been withdrawn.

K. A. S. (Highfield). Blueprints are in each, but we have not published one for the set in question.

K. B. A. (Taunton). The blueprint list is published elsewhere possible.


R. M. (N.E.). We have no details of the coil in question.

N. T. (Deepee). Write to the makers of the set for their recommendation regarding a suitable unit.

R. W. (S.E.16). It is possible to make up a frequency oscillator, but we cannot give details without full details of the various speech coils.

D. A. C. (Werling). Values cannot be given without actual values at the various points in the transmitter.

Tynegol Radio (Newcastle-on-Tyne). We regret that details of the coil in question are not now available.

D. B. (Aitchurch). The coil may be divided from T. H. Thompson, of 171, Greenwich High Road, S.E.10.

The coupon on page 63 must be attached to every query.
Practical Wireless

BLUEPRINT SERVICE

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A.W. Converter-Adapter (1 valve)...

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E. J. Cann's A.C. All-Wave Silver-Valve...

Main Box All-Wave (3 HF, D, LF)...

A.C. 3-valve Silver-Valve 3 (HF Pen, D. Push-Pull)...

A.C. 4-valve Silver-Valve 4 (D, LF, LF)...

All-Waterproof (HF Pen, D. Push-Pull)...

Four-valve: Blueprints, 1s. each.

A.C. 2-valve Silver-Valve 2 (D, LF, LF)...

E. J. Cann's 2-valve Silver-Valve (D, LF)...

Universal Silver-Valve 4 (HF Pen, D. Push-Pull)...

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Sixty "Building" (HF Pen, D, Push-Pull)...

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Universal Half-Mark (HF Pen, D. Push-Pull)...

A.C. All-Wave Canon Four...

These Blueprints are drawn full size. Each copy of a blueprint contains descriptive notes; and some sets can be used in some cases as supplied. The following pages, observe the original condition of each set. This implies, however, does not indicate that the item is out of print.

Unusual Sets, Amateur Wireless.

The latter refers to the Blueprints Numbers include in the preceding pages. E. J. Cann's "The Fleet" appears - thus "P.W." refers to PRICAL WIRELESS. There is a similar condition (if you can examine the conditions of the manuscripts) on PRACTICAL WIRELESS Blueprints. The full-size edition contains the description of the full-size edition of the "Superfect".

Mains Operated.

Two-valve: Blueprints, 1s. each.

E. J. Cann's Two-valve Push-Pull..

Universal 2-valve Superfect (Four-valve)...

F. J. Cann's 2-valve Superfect...

E. J. Cann's Universal All-Wave (4-valver)...

Two-valve: Blueprints, 1s. each.

A.C. 2-valve Superfect (Two-valve)...

Universal 2-valve Superfect (Three-valve)...

F. J. Cann's A.C. 4S Superfect 4...

E. J. Cann's Universal 4-valve Superfect...

"Foot"...

"Universal Four"...

Four-valve: Double-sided Blueprint, 1s. 6d.

Pusty-Botten A.C. "Rear Model"...

PRACTICAL WIRELESS.

September 30th, 1939

These Blueprints are drawn full size. Each copy of a blueprint contains descriptive notes; and some sets can be used in some cases as supplied. The following pages, observe the original condition of each set. This implies, however, does not indicate that the item is out of print.

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E. J. Cann's Universal 4-valve Superfect...

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Pusty-Botten A.C. "Rear Model"...

Mains Operated.

Two-valve: Blueprints, 1s. each.

E. J. Cann's Two-valve Push-Pull..

Universal 2-valve Superfect (Four-valve)...

F. J. Cann's 2-valve Superfect...

E. J. Cann's Universal All-Wave (4-valver)...

Two-valve: Blueprints, 1s. each.

A.C. 2-valve Superfect (Two-valve)...

Universal 2-valve Superfect (Three-valve)...

F. J. Cann's A.C. 4S Superfect 4...

E. J. Cann's Universal 4-valve Superfect...

"Foot"...

"Universal Four"...

Four-valve: Double-sided Blueprint, 1s. 6d.

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