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If you do not wish to get your copy, send a postcard mentioning "Practical Wireless" to above address.
SAFETY FACTOR IN RADIO CONSTRUCTION—See page 283

Deaf Aids

There are various types of hearing aid now available to the partially deaf, the majority consisting of small low-frequency amplifiers with microphone and reproducer. In some types the latter takes the form of a standard telephone earpiece, whilst in others the movements of a diaphragm are transmitted to the bone behind the ear. Unfortunately, deafness can take many forms, and it is often necessary for the deaf person to be examined medically in order that a suitable type of reproducer may be specified. In many homes one member of the family is hard of hearing and as a result it becomes necessary for the radio to be turned up to such a level that it is annoying to other members of the family, and in such cases it will be found very useful in the home, although, we describe an aid of this type which will be found very useful in the home, although.

Philips' New Portable

A new portable has been introduced by Philips which is claimed to set a new standard in portable design. Measuring only 11in. by 10in. by 7½in., this portable incorporates a 4-valve superhet with full-size moving-coil loudspeaker. A.V.C. and other refinements are included at the price of 8½ guineas.

French Television

To popularise television in France it is proposed to install a television transmitter and associated equipment in the Palace of Inventions, which will be re-opened. This Palace was a feature of the Paris International Exhibition of 1937.

Batter-user Aid

An interesting new type of L.T. battery has been placed on the market. This consists of a moulded case accumulator, and in place of the usual terminals a special two-pin plug device is employed. This is free from acid spray and fumes and connection to the leads of the set is made by a non-reversible moulded plug. The advantages will be apparent to the user of the present type of accumulator.

Mount Everest

Whilst another assault is being made on the hitherto unconquered peak of Everest, a feature programme reviewing all past expeditions will be given in the Regional programmes on June 2nd. It is hoped to bring to the microphones surviving members of past expeditions, so that first-hand accounts of some of the adventures which befell them may be recounted. The programme has been prepared and will be produced by Felix Felton.

Ray Noble's Return

On his return from America, Brightborn Ray Noble has been booked by the B.B.C. to give three broadcasts from studios within four days. These will be heard on June 1st, 3rd and 4th, the latter in the Regional programmes and the two former in the National programme. During his stay in America he opened and closed all his programmes with two of his most popular compositions: "The Very Thought of You" and "Good-night, Sweetheart."

Ballet Week in June

A ballet week in television will begin on June 5th, with a performance by the Ballets Joos. This famous company, now touring England, will be engaged on a three weeks' London season at the Old Vic, and their television appearance will contain excerpts from their repertoire at the Old Vic. During the week the VicWells Ballet Company, paying a flying visit to London between provincial tours, will be televised on Whit-Monday evening, in the afternoon and evening programmes, both on Wednesday, June 8th, and the following Friday, and again on Saturday evening, June 11th.

It is hoped to include "Casse Noisette," Act II (Tchaikovsky); "The Gods Go A-Begging" (Handel); Nocturne (Delius); and "Papageno," by William Walton.

Studio Variety

Midland and Regional listeners will, on June 10th, hear a programme of studio variety, featuring the Eastern Sisters and Bob Arnold. The former follow the lines of the Western Brothers, but with a feminine angle. The artists' names are not given; both of them are well-known Midland broadcasters. Bob Arnold's speciality is rustic humour and songs.
ROUND the WORLD of WIRELESS (Continued)

High-power Station for Lithuania
The site chosen for the new 120-kilowatt transmitter which is destined to replace the present Kaunas station is Bobri, situated roughly 15 miles from the Lithuanian capital. Work on the construction of this transmitter is to be started this year.

Brightening Up Turkey
Following a recent broadcast speech to the nation by Kenan Ataturk, the railway authorities in the Ottoman Empire have decided to equip all trains with radio receivers for the benefit of travelling passengers, and to place loudspeakers in all station waiting-rooms.

New B.B.C. Transmitter
It is reported that the B.B.C. is contemplating the erection of a 5-kW transmitter to serve Notts, Lincolnshire and East Anglia generally. The original proposal was to erect a relay station at Norwich, but the projected station will probably be farther inland.

Free Radio in Austria
A Coordinating to a recent report Herr Hitler is determined to increase the number of registered listeners in Austria, now standing at 600,000. He has issued orders that all listeners whose income is below a certain amount shall be exempt from licence fees.

G.E.C. Employees' Long Service
The management of the Telephone and Radio Works of The General Electric Company, Ltd., at Coventry, gave a complimentary dinner the other night to a number of their employees who have completed twenty-one years of service with the Company. More than eighty guests were present, and jointly they represented 2,333 years of service. Amongst them were seven who joined the Company last century, whilst the individual record for long service goes to a member of the staff who recently completed his fiftieth year with the G.E.C., having joined the firm in February, 1888.

New B.B.C. Appointment
We are informed that Mr. V. D. Carse has been appointed to the staff for training as an announcer. Mr. Carse, who was educated at Sherborne School, for training as an announcer, was a square-rig apprentice in the navy before getting a better mike.

G. E. C. Employees' Long Service
Paula Green, one of radio's most popular vocalists, who was recently heard with Michael Flame and his Orchestra, from the May Fair Hotel, London, will be heard over the radio during the summer months.

INTERESTING and TOPICAL NEWS and NOTES

Cricket Commentaries
Pennethorne Hughes will give a commentary on the last quarter-of-an hour's play in the Somerset v. Gloucestershire Cricket Match, at Taunton, on June 6th: this will be preceded by the story of some historic games, called by J. G. Chater. At Shrewsbury will also give an eye-witness account of the day's play on June 7th.

Current Film Music
One of the "General Releasers" programmes of current film music played by the Midland Reviue Orchestra, with Reg. Burstondconducting, will be preceded by Martyn C. Webster, on June 8th. The vocalists will be Marjorie Westbury, the Birmingham soprano, and Fred Forham, who comes from Coalville, in Leicestershire. The programme will be repeated for regional listeners the following afternoon.

SOLVE THIS!

Problem No. 298

To carry out some home-broadcasting, Jones bought a cheap carbon mike on stand, and connected this to his pick-up terminals, with the necessary biasing battery joined to the terminals on the mike box. Results were very good except for background noise, and after noting tests he decided that it would be worth while getting a better mike. He therefore purchased a transverse current component and mounted this in a ring with rubber bands in the usual way, but when joined to his pick-up terminals, he could obtain no results. He returned the mike to the makers, who tested it and reported it O.K. What was wrong?

Three books will be awarded for the first three correct solutions opened. Address your envelopes to The Editor, PRACTICAL AND AMATEUR WIRELESS, 10 Pancras Square, London, N. 1.

Solution to Problem No. 297
When Atkins mounted his calibrated rheostat on the metal chassis, the head of the fixing bolt to the L.T. positive terminal on one valve came in contact with the chassis, and although this did not provide sufficient short-circuit to prevent the valves from working, it provided an extra drain on the accumulator upon which produced the results he experienced. The following three readers received copies of Wireless, Problem No. 296, and books have accordingly been forwarded to them: J. Lye, 16, Byron Street, Upton, Wirral; G. R. Stevens, 40, Maxwell Park Road, Honourfield, Middlesbrough; L. G. Whalley, Upton, Station Road, Crowborough, Sussex.
The Safety Factor in Radio Construction


By FRANK PRESTON

EVERY reader knows that he might receive a nasty shock if he touches the mains leads, but there are probably some who do not realise that a similar " kick " might result from touching the terminals of a condenser after the set has been switched off. This would normally apply only in the case of a high-capacity condenser used in the smoothing or decoupling circuits of a mains receiver. It is not impossible, however, when using a more modest battery-operated set if the condenser is rated at, say, 4 mfd., and one of its terminals touches the back of the hand.

Charged Condensers

The reason for this is, of course, that the condenser connected in parallel with the H.T. supply will " store " a certain amount of electricity. Thus, after the mains leads or battery connections have been disconnected, the condensers are fully charged. In most cases the shock would amount to little more than a sudden " prick " unless one hand were against the chassis while the other came in contact with the positive terminal of the condenser. On the other hand it is possible in certain instances for the earth-return to the body to be completed through the earth lead and the floor.

To ensure that trouble is not experienced in this way, it is a wise procedure to discharge each of the high-capacity condensers before proceeding to handle the set. This is done simply by short-circuiting their terminals. The best method is to use a screwdriver, holding it by its handle and touching the negative condenser terminal with the tip of the blade and then completing the circuit by moving the blade until it is across the two terminals. (See Fig. 1.)

Positive D.C. Earth

When using a D.C. receiver, especial precautions should be taken, particularly when the positive side of the mains is earthed. In that case the earth lead should be joined to the receiver through a fixed condenser between .1 and 1 mfd. The omission of the condenser would result in the mains being short-circuited. This would cause the fuse to blow, but there might be some disturbing signs before the fuse broke the circuit.

It should not be overlooked that even when there is a condenser in series with the earth lead the aerial coil is " live. " If a condenser is not included in the aerial circuit this means that the aerial wire also is live. Consequently, if the lead-in should be touched by somebody standing outside the window (or even inside the house in some cases), a fairly severe shock could result.

Nowadays it is customary to fit an aerial-series condenser inside the set, but the insulation resistance of this might not always be very high. To be on the safe side it is, therefore, wise to fit another condenser of about .1 mfd. and of not less than 250 volts working just inside the set, between the aerial coil and the aerial terminal.

Another possible cause of shock when handling a D.C. set with positive earth is touching a grub screw in one of the control knobs. This is at high potential in respect of the mains earth and can therefore give an unpleasant surprise. (See Fig. 2.) A method of obviating the trouble is to sink the screw and cover it with sealing wax or Chatterton's compound.

The points raised above in connection with D.C. sets are not limited to the case in which the positive mains lead is earthed. Because there is always the chance of inserting the mains plug wrong way round — unless an irreversible connector is employed, this being a convenience anyway — so that the positive lead is joined to earth accidentally. This would soon be discovered due to the failure of the set to operate, but that might be too late.

Two-pole Switches

Similar points apply when using a D.C. eliminator. It is best when doing that to fit an earth terminal on the eliminator, joined to the negative lead through a fixed condenser, and to transfer the normal earth lead from the set to this point.

At this point it is worthy of mention that a two-pole switch should always be used in a D.C. or A.C./D.C. set so that both mains leads are completely isolated from the set when it is switched off. It is an E.F.E. regulation that such a switch should be fitted, but the matter is sometimes overlooked.

Cases have been known where a severe shock has been received due to watering the earth lead in dry weather when the set has not been completely isolated from the mains and the condenser in the earth circuit defective. The circuit from the " live " earth wire was completed through the body of the person concerned by the stream of water from the bucket or watering can.

Extension Speakers

Another possible cause of shock is through the extension speaker leads should these be connected to the H.T. circuit, as they would when using the circuit shown in Fig. 3. If a person is standing, say, on the grass in the garden when the speaker terminals or bared ends of the wire are touched, the H.T. supply would be connected across him. It is unlikely that serious injury would result.

(Continued overleaf)
THE SAFETY FACTOR IN RADIO CONSTRUCTION

Continued from previous page

result—and many people would scarcely feel a shock at all—but to some the sensation might be unpleasant. The proper course is to use choke-capacity output as shown in Fig. 4. Instead of using an actual choke the same result can be obtained by leaving one speaker connected directly to the set in the usual manner and attaching the extension speaker as shown. Observe that the fixed condensers in the positive lead, and that it should be rated at not less than 250 volts working.

Condenser Rating

So much for personal safety. There are various items that should receive attention to ensure safety of the components. Not least of these is that the smoothing condensers in an A.C. receiver or eliminator should have a rated working voltage of at least twice the normal output voltage of the rectifier. This is to ensure that they will not break down in the event of a breakage in the H.T. circuit which would result in "no-load" working. As many readers are aware, the no-load voltage from a rectifier designed to give, say, 250 volts at normal current load might well be assumed that a condenser suitable for 100 volts working would be sufficient in a circuit such as that illustrated. If the valve failed, for instance, or if an open circuit developed in the H.F. choke the voltage-dropping effect of the resistors would be negligible since the voltage drop is dependent upon the current passed. If the current were zero the maximum voltage of the supply would be applied across the condenser, with the result that it would probably fail and short-circuit the H.T. supply.

L.F. Grid Condenser

Another mistake that often occurs in connection with condensers concerns that used in the grid circuit of an L.F. valve, as shown in Fig. 6. It is not difficult to see that the D.C. voltage applied to this condenser is that of the H.T. But there is also the low-frequency A.C. or signal voltage to consider, which, in practice, that the condenser should be rated at not less than twice the H.T. voltage, and preferably several times that. It is most satisfactory to use a mica-dielectric condenser, with a rated A.C. test voltage of not less than 750 volts when the H.T. voltage is up to 250, or at 1,000 volts test when the H.T. voltage is up to 800.

Delay Switching

Special safeguards should be adopted when using indirectly-heated valves with a metal or directly-heated rectifier. The reason is that the rectifier gives its full output almost immediately the set is switched on, whereas the valves take 30 seconds or so to heat up. Until the heaters reach normal working temperature the H.T. current passed is much below the normal current, and therefore a voltage far in excess of the normal figure is applied to the valves and to the pass condensers. The correct procedure, where possible, is to change the rectifier for one of the indirectly-heated type. Where this is impracticable or when using a metal rectifier, it is wise to include a thermal-delay switch in the H.T. circuit. This is designed to switch on the H.T. automatically after the set has been switched on for 30 to 40 seconds; in other words, after the valve heaters have reached their working temperature. The switch is generally connected as shown in Fig. 7, although alternative connections are possible to suit particular cases.

Important Broadcasts of the Week

NATIONAL (261.1 m. and 1,500 m.)
Wednesday, June 1st.—Commentary on 'The Devil', from Epsom.
Thursday, June 2nd.—Tosca, acts 2 and 3, by Pietro Mascagni, from Covent Garden.
Friday, June 3rd.—London Music Festival, 1938, fifth concert, from Queen's Hall, London.
Saturday, June 4th.—Experimental Hour: Matrimonial News, a play by Tyrone Guthrie.

REGIONAL (342.1 m.)
Wednesday, June 1st.—Walkure, act 2, from Covent Garden.
Thursday, June 2nd.—Francis Josef Haydn, a musical biography—3, Storm and Stress (1771-1780).
Saturday, June 4th.—Behind the Lace Curtains, a play by Esther McCracken.

MIDLAND (296.2 m.)
Wednesday, June 1st.—Time Turns Back: The '45 Rebellion, an account.
Thursday, June 2nd.—Francis Josef Haydn, a musical biography—3, Storm and Stress (1771-1780).

WELSH (373.1 m.)
Wednesday, June 1st.—Brand New: a programme by artists broadcasting for the first time.

NORTHERN (449.1 m.)
Wednesday, June 1st.—Walkure, act 2, from Covent Garden, London.
Thursday, June 2nd.—Bridge Hand—3, commentary on the bidding and the play.
Friday, June 3rd.—Under the Cheviots, a story of life in Northumberland.
Saturday, June 4th.—Behind the Lace Curtains, a play by Esther McCracken.

WEST OF ENGLAND (285.7 m.)
Wednesday, June 1st.—G洛cesteshire v. The Australians, 1930, reconstructed by J. G. Coates, followed by an eye-witness account of the first day's play Gloucestershire v. The Australians, 1938.
Thursday, June 2nd.—Variety from the Hippodrome, Southamptpon.
Friday, June 3rd.—The Island of Guernsey.
Saturday, June 4th.—Victorian Vignette.

SCOTTISH (391.1 m.)
Wednesday, June 1st.—Empire Exhibition Visit: The Palace of Engineering, a short description.
Thursday, June 2nd.—Scottish Music of To-day: Orchestral programme.
Friday, June 3rd.—Recital of Scots Folk Songs: Selections.
Saturday, June 4th.—Variety from the King's Theatre, Glasgow.

NORTHERN IRELAND (307.1 m.)
Wednesday, June 1st.—Empire Exhibition Visit: The Palace of Engineering, a short description.
Thursday, June 2nd.—Franz Josef Haydn, a musical biography—3, Storm and Stress (1771-1780).
Friday, June 3rd.—All Kinds of Music: selection of tunes on unusual instruments.
THE service engineer is not so much concerned with absolute measurements as he is with comparative measurements. It is true that where such values as valve voltages and currents, component resistances, etc., are concerned, straight measurements form an ordinary test procedure, but where such factors as receiver sensitivity, selectivity, and quality of reproduction are concerned, the service engineer works in an atmosphere of comparisons.

C.R.O. apparatus enables the service engineer to see instantly and exactly what happens as a result of many possible component changes or adjustments, and removes a great deal of the uncertainty that inevitably overhangs the work of anybody who has to service receivers without the aid of the cathode-ray. The very considerable removal of uncertainty is the outstanding feature of cathode-ray testing technique, and labels the C.R.O. as essentially a time-saver. To appreciate this, it is necessary to understand how this is done. To begin with, one only considers that very common example of a service engineer trying to improve the selectivity of a receiver. Whatever adjustment or component repair that he may make, it is necessary for him to check up to find the extent of the improvement, if any. How will he do this? Suppose we say, by a reception test. This may seem a very proper way to make the checks, but it is going to take time, even if it is only a matter of minutes. Minutes are precious in service work, and it may well happen that a succession of such reception checks are required, in which case the time involved will mount up considerably. With C.R.O. apparatus, however, an H.F. response curve check will give all the information that is wanted, and the occurrence of any change will be instantly apparent, and without the least uncertainty.

C.R.O. apparatus for service testing consists really of two instruments, the oscillograph and the oscillator, the latter being of the special type previously referred to. The oscillograph will contain a time-base and one, or perhaps two, R.C.C. amplifiers, the latter being designed for linear amplification over a wide range of frequencies. For normal service test requirements one amplifier will usually be found to be sufficient, this being used to amplify the Y deflecting voltage in the cases where insufficient deflection would be obtained without amplification.

As regards the controls on the oscillograph that are to be considered as most usual, these are:

- **Sweep frequency control** (generally coarse and fine adjustments are provided).
- **Amplifier gain control.**
- **Synchronising control.**
- **Focusing control.**
- **Sweep amplitude control.**
- **Shift control** (it is very convenient to have means of shifting the screen "picture" up or down, particularly when H.F. response curves are being obtained).

It is to be understood, of course, that the time-base can be switched in or out, as required.

Most receiver servicing tests are carried out with the time-base in action, the Y deflection being controlled by signals picked up at various alternative points in the receiver. The Y deflecting voltages are applied between the "free" X plate and E, or the "free" Y plate and E. Thus, with the time-base switched on for X deflection, the Y deflecting voltage can be picked up from the receiver with the aid of one test prod. The amount of information that can be gathered by a run round with this one test prod is usually a source of surprise to people not previously familiar with cathode-ray testing technique.

![Fig. 10.-Illustrating the effect of A.V.C. on the C.R.O. as an Output Meter.](https://example.com/fig10)

When selecting a receiver, oscillator and C.R.O. are all earthed, all that will be necessary will be to take the Y lead to the anode of the output valve. With push-pull, or class B operation, the Y lead can be taken to either of the two anodes. It will usually be desirable to have the C.R.O.'s amplifier in use between receiver X and Y, and the gain should be adjusted to give maximum sensitivity of indication (consistent with the trace not running off the screen vertically).

If the time-base is switched on, the trace will be that of an A.C. waveform (due to the alternating deflection of the oscillator), the Y deflection being controlled by the potential variations at the output valve anode. Trimming adjustments will have the effect of causing the screen "picture" to expand or contract vertically, and a peak adjustment is indicated by maximum vertical distance between positive and negative peaks. Alternatively, the time-base could be switched out, in which case the Y deflection will produce a simple vertical straight line trace, and trimming may be adjusted to give the minimum length of line.

**Ganging**

As an aid towards the reganging of receivers in general, and of modern type, the C.R.O. and associated oscillator must be regarded as virtually a necessity if speed with certainty is to characterise the work.

In the simple case of a receiver having no pretensions to have means of trimming, and where all trimmer settings will be of the peak type, the C.R.O. may usefully be employed as an output meter, as described above. Perhaps in connection with such a simple case, one could say that simpler gear than C.R.O. apparatus would be quite satisfactory, but it must be remembered that the C.R.O. provides the means of checking up on H.F. response curves. Thus, a valuable attribute, even where a "straight three" receiver is concerned.

In such a case the rise-durable amount of the adjusting will be done with reference to H.F. response curves. The procedure is easy to follow, and such precautions as are necessary are not at all complicated. We will deal with the latter first.

The A.V.C. should be kept cut out while all the trimming is being done. Disconnect A.V.C. feed lines from A.V.C. detector and earth them to chassis. It is important to realise that the action of A.V.C. can lead to false response curves appearing on the screen. The reason for this is that although the trace on the screen represents a graph of detector-output voltage against frequency, the conditions under which any particular response curve is produced are artificial, and different in one important respect from the conditions of actual radio reception. In actual radio reception carrier and sideband frequencies are present simultaneously, but with a very high input to the C.R.O. screen the carrier frequency alone appears on the screen. The method of testing with the C.R.O. is illustrated in Figs. 11 and 12. Refer to Fig. 10 the oscillator will attain the frequency f1 before it reaches the frequency f2. If the H.F. response is correct the oscillograph will commence to rectify. The A.V.C. feed line to the controlled valves has, however, a very high input to the C.R.O. screen. The voltage of the consequent "sluggishness" of the A.V.C. bias variation, it is easy to appreciate that although the H.F. response of the receiver under reception conditions might correspond to a symmetrical curve, such as that of Fig. 11, yet under "wobulation" conditions, the trace shown on the screen could be rendered lop-sided by the effect of A.V.C.

The idea of keeping the test signal well down in amplitude, so that the delay voltage keeps the A.V.C. out of action, may suggest itself to the reader as an alternative to cutting out the A.V.C. by circuit modification, but while this is satisfactory enough for....
TOPICAL NOTES

Educating Television Engineers

At a recent lecture and discussion arranged by the Television Society on the subject of educating prospective television engineers, some very interesting points were raised. First of all it was emphasized that a very sound technical foundation was essential. Very often the student when he engaged or old, felt that many of the subjects included in his curriculum were irrelevant, but experience has shown that this is not the case. Television is a very specialised branch of applied science covering a wide variety of subjects for its complete understanding, and would be recruited for its ranks are well advised to absorb every scrap of technical information that is possible, providing always that the source of this material is reliable. That is where the reader of PRACTICAL AND AMATEUR WIRELESS is able to score. The Editor, with his wide experience and practical knowledge acquired over a period of years, exercises the most scrupulous supervision to ensure that readers are given technical accurate facts in the columns of this journal, and this provides a good grounding for extending knowledge by the study of more specialized and specialized books. It was interesting to find at the same meeting that many speakers advocated the teaching of A.C. work before D.C., or alternatively the introduction of alternating currents at a much earlier stage in a full course of study. There is a lot to be said for this point of view, for nearly all radio and television work, and normal electrical activities for that matter, is associated with alternating or pulsating currents, and the earlier a student becomes familiar with the principles involved, the quicker he will be in a position to understand the more advanced problems. Dealing with frequencies of such a high order, as is essential for television, necessitates a very intimate knowledge of fundamentals, but the future prospects in the television field are so good that the engineer will be rewarded for his efforts in acquiring this technical information.

In Germany

At the moment it is still a matter of conjecture as to the plans of Germany for the Berlin Radio Show, which opens early in August. Ever since 1929 the subject of television has been featured, and each year has found its presentation one of increasing importance, enabling the public to see behind the scenes. It is certain that this year will prove no exception to the rule, and although late in starting, the high-definition television sections for which Germany is sure to prove efficient. To meet a prospective market the manufacturers are engaged in designing good quality instruments, but it is doubtful whether there will be any really new products to compare with the People's Set which found a measure of favour on the sound broadcasting side.
ON YOUR WAVELENGTH

The Licence Figures

I OBSERVE that 18,593 new licences were taken out during April, and that a total of 540,919 paid licences were issued during that month, whilst 521,926 expired. There were approximately 8,560,000 licences in force at that time plus 49,800 free licences, making a total of 8,609,800. These figures show a slight drop for the corresponding period of last year, so I suppose the peak point will hover somewhere between 8 millions and 8½ millions. This seems to indicate that approximately one person in six owns a wireless set.

As the average number in a family is only three, it would seem that half the homes in this country are without wireless.

The Second-hand Receiver

DEALERS all over the country are most concerned at the problem of disposing of receivers which are traded in when the customer buys a new set. Such receivers, I understand, are being sold off at absurd prices, and thus militate against the sale of new receivers. This problem is an old one with which the motor and cycle trades have been wrestling for many years without having found any solution more satisfactory than pricing a car or a bicycle according to the year of its make and irrespective of condition. Now with a wireless set you cannot measure the number of hours it has been in use, and with new receivers being produced every month you cannot measure its value by its age, for six months seems to be a long time in the wireless industry, and a set produced that number of months ago can be out of date. It may be that the wireless manufacturers will agree upon a list of standard allowances for second-hand receivers, but that does not solve the problem because dealers cannot be compelled to honour such arrangements. They will agree to do so, but the smell of an order makes them forget their scruples and they will offer that little bit more which the dealer round the corner has refused. Personally, I think that the whole problem is due to over production and the high-pressure selling methods adopted in the wireless trade. High dividends are the object, and I think that it is a mistake to render a set obsolete by the production of new models every few months. There are too many types of wireless set on the market, and this means that the manufacturers have to resort to the artifice of imaginary selling points in order to effect sales among those who are not so knowledgeable as the readers of this paper. A second-hand set is without guarantee and it can often be an expensive proposition to get it in working order. If it is a discontinued model there is the difficulty of spares and service, and as is so often the case the dealer and his assistants are without specialised knowledge, it is impossible to adapt the wireless trade to scrap all of the sets which are traded in, for the public would then have no alternative but to buy new receivers or to make them.

A Queer Set!

H. R., of Wolverhampton, sends me the following: "While I was looking through a back number of PRACTICAL AND AMATEUR WIRELESS, I read that you wanted drawings of receivers in use in queer places, so with much effort and skill I am sending you mine. The only difficulty I witnessed was the fact that I needed more than one person to operate the controls, but this was easily overcome by getting two local men as helps. I would like to state that I have not as yet patented this novel set, but if any of your readers would like to copy this they may do so."

The Scout's Badge

I HAVE heard from a number of Scouts who ask me to publish a list of replies to the questions that are set for the wireless badge. I shall do this after I have consulted the Editor of The Scout as to whether such a procedure is permitted. After all, such questions are intended to indicate that the applicant for the badge has a background of wireless knowledge, and it does not seem to me that merely learning off a number of stock replies to standard questions will give that indication. Whilst I know very little about the Scouting movement, I suggest that the granting of a badge should not be made too easy, and we all know that there are Scouts whose uniforms are smothered with badges. I know a few of these Scouts and they are most ignorant on the subjects which the badges should indicate they understand. One Scout asks me to publish these answers because "there is a woeful
IT seems
A joke.

A reader tells me that he was
much amused at a friend's
house by the efforts of the latter to
put a straight-three in order. After
an hour's work the owner of the set
admitted that it was louder. The
"friend" said that he had put a
resistance across the speaker, whereas
inspection showed that it was a fixed
decoupling! If this is a joke stop
me and buy two.

Another suggestion for the B.B.C.
In view of the claimed popularity
of the Spelling Bee Contest I
suggest that the B.B.C. should have
its announcers before the microphone
and let them be cross-examined by
such experts as the Editor of PRACTICAL
AND AMATEUR WIRELESS, Thermion,
and others. The results, I am sure,
would be most amusing. We could,
for example, ask Welsh, Irish,
Scottish and English announcers to
pronounce the word "Wurrmmmrrrruld,
" or "Hoose," "Nacht," and so on.
I suggest that the Oxford Dictionary
should be used to judge. I guarantee
that not one of the announcers
would have the correct pronunciation.

The Derby Broadcast
It seems that listeners to the
Derby broadcast from Epsom,
on June 1st, will be able to share not
only the thrills of the crowd on the
actual course, but the anticipatory
excitement of the great Derby
cavalcade as it journeys from London
to Epsom.

A B.B.C. van, complete with trans-
mittter, John Snagge and Richard
North, will be travelling in the stream
of traffic en route for the position
which it hopes to occupy at the
starting-point. Some two or three
hours before the actual race begins,
therefore, listeners will be invited to
join the motley stream of private
cars, motor coaches, coster carts,
cyclists and others, heading for the
Downs.

Commentators Snagge and North
will describe the scene as they pass
along, and will bring to the micro-
phone such sounds and voices typical
of the road as they can collect. If
the van gets through on time, the
actual start of the Derby will be
described by Richard North from
his position directly opposite the
starters. In the event of the van
being just "somewhere in Surrey"
at three o'clock, the start of the race
will be described from the Grand
Stand by Thomas Woodrooffe,
assisted by a race reader. A reception point,
complete with effects microphones,
will be situated by the Southern
Railway's mound stand at Tattenham
Corner. This will pick up the broad-
casts from the van and will feed them
by line to the control point in the
Grand Stand. There will not, this
year, be commentators at Tattenham
Corner itself.

On June 3rd listeners will hear a
straightforward broadcast on the
Oaks, the classic for three-year-old
fillies. The description of the race
will be given by Thomas Woodrooffe,
assisted by a race reader.

London's Blind Visitors
I am informed that over a hundred
blind Esperantists from fifteen
countries will be coming to London
for the thirtieth World Esperanto
Congress to be held at University
College in August. In all there will
be nearly two thousand people from
thirty countries at this great inter-
national meeting. Among blind
persons Esperanto has always had a
large number of adepts; they have
their own Braille magazines in the
language, some of which circulate
cross the world, forming a bond of
friendship and understanding usually
impossible for sightless persons.
In London the Lending Library for
the Blind has a thousand volumes in
Esperanto and one "talking book"
gramophone record. During the
Congress the blind Esperantists will
have their own meetings, though they
will also take part in the general
arrangements, and many Esperanto-
speaking Londoners are looking for-
ward to "showing" them round the
city, for it has been truly said that to
explain the sights of a town to a
blind person is to discover in the most
ordinary of everyday things a wonder
and beauty of detail hitherto un-
suspected.

A Limerick
A. Carswell, of Falkirk,
sends me the following note:
"Here is a little limerick that
may interest you:
'Tis said that at Tristan da Cunha
They shanghaied a man in a schuna
And dropped him at sea,
For the gentleman, he
Showed signs of becoming a crunha."

A COMPLETE LIBRARY OF STANDARD WORKS.

By F. J. C. M.

WIRELESS CONSTRUCTOR'S ENCYCLOPEDIA 5/6, by post 5/6.
EVERYMAN'S WIRELESS BOOK 3/6, by post 3/6.
SIXTY TESTED WIRELESS CIRCUITS 2/6, by post 2/6.
WIRELESS COILS, CHOKES and TRANSFORMERS and HOW TO
MAKE THEM 2/6, by post 2/6.

All obtainable from or through booksellers, or from Geo. Newnes, Ltd., Tower House, Southampton St., Strand, W.C.2.

PRACTICAL AND AMATEUR WIRELESS

June 4th, 1938

Notes from the Test Bench

Trimming I.F. Transformers
It has been found that some listeners
are using ordinary oscillators (un-
calibrated) for lining-up I.F. trans-
formers and results are unsatisfactory
for the following reason. When the primary
and secondary are brought into resonance,
the signal from the oscillator will be heard,
although the frequency adjustment may be
very much out. If the second trans-
former is adjusted in a similar manner
this also may not be in agreement with the
primary transformer. This unsatisfactory
result is achieved by this method of adjustment.
A calibrated oscillator must be used for
this purpose, or one of the special I.F.
liners such as is supplied by Messrs.
Bulgin. It must be remembered that not
only must each primary and secondary be
matched, but also the frequency of each
primary and secondary on all the I.F.
components must be adjusted to that pro-
vided in the oscillator stage.

A Biasing Point
In some I.F. circuits it is possible to
make use of a small biasing cell
connected in series with the grid lead,
the bias required being only of the order
of 1.5 volts. It is important to remember,
however, that owing to the high resistance
of such a cell, if connected in series with a
volume control it may prevent volume
being reduced to zero. To overcome this
difficulty a condenser should be placed
across the cell, and it should have a capacity
of 2 mfd.

Disconnected Metallising
In some cases of instability it is often
found that it is due to the fact that
the metallised surface of a valve becomes
disconnected from the cathode or filament
leg. This can sometimes arise from mis-
handling, the glass bulb becoming loose in
the valve base and the continuity thus
broken. In some types of valve a short
thin wire is anchored to the valve base and
This wire may become broken
when plugging-in or removing a
valve.

This will pick up the broad-
casts from the van and will feed them
by line to the control point in the
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assisted by a race reader.
By using a "differential" reaction control condenser the reaction control capacity can be made to increase, and the by-pass condenser capacity made to decrease at the same time (and vice versa). A differential reaction condenser contains two sets of fixed plates and one set of moving plates and its action will be understood by reference to Fig. 44.

To deal with the general effects of reaction it must be understood that if the reaction control condenser capacity is increased from minimum value a greater feed-back voltage is induced into the grid circuit, and the amplitude of the oscillations correspondingly increases. This regenerative amplification cannot be raised without limit, and the limit is marked by the valve jumping into continuous oscillation.

Reaction necessarily involves a feeding back of H.F. energy from the anode circuit to the grid circuit. Energy is dissipated in the grid circuit in various H.F. losses and the latter, as we know, have a close and important connection with selectivity. If the grid circuit receives a supply of energy from the anode circuit it stands to reason that the effects of the grid circuit losses will be less pronounced, and this implies that the selectivity will be raised. When indifference between stations is being experienced with the simpler type of "straight" receiver, employing reaction, it will often be found that a little careful juggling with the volume and reaction controls will improve matters.

The fact, already mentioned, that increasing reaction above a certain point causes the valve to go into continuous oscillation brings us to a consideration of the nature of the valve oscillator.

In the ordinary tuned radio-frequency ("straight") receiver each tuned H.F. circuit works at the carrier frequency of the signal being received. If, for example, a 300-metre, or 1,000 kc/sec., signal is operating in the aerial circuit the oscillations will remain at 1,000 kc/sec. in every circuit right up to the detector.

It will, of course, be necessary for every H.F. circuit in the receiver to be variably tuned, to allow for reception of signals of various different carrier frequencies. In the superhet receiver, however, only a certain number of the tuned H.F. circuits are variably tuned and work at the carrier frequency of the signal, and those circuits (there may be only one, however) come first, counting from the aerial. The remaining H.F. circuits are fixed-tuned to a particular frequency which is independent of the signal carrier frequency, and is known as the "intermediate" frequency.

It is pointed out that whatever adjacent channel selectivity and H.F. amplification that a superhet may show is mainly to be attributed to its intermediate frequency stages.

As there are two high-frequency values, the signal carrier and the intermediate frequencies, involved in superhet reception it follows that a frequency conversion process must be an essential feature of the system. In brief, the signal comes at its carrier frequency, and carrying its modulations, through a system of fixed tuned H.F. circuits. Then a change of frequency is made, and the signal comes through the rest of the H.F. circuits with the carrier frequency changed to the intermediate value, although the modulation frequencies are unaffected.

Before considering how all this is brought about we will first look into the question as to what advantages are to be gained by employing such an apparently complicated system of reception.

Matching

The fact that the intermediate frequency circuits are fixed-tuned gives more than a clue as to the position. First of all, it implies that the number of sections of the ganged condenser will not need to equal the number of tuned circuits. A typical superhet receiver containing eight tuned H.F. circuits, excluding the oscillator circuit, has only three sections in the ganged condenser, and this is only one of the intermediate frequency stages. A little thought given to the idea of making a "straight" receiver with eight tuned circuits, and employing a ganged condenser with eight sections, should soon convince anybody that there is something to be said for the superhet. Quite apart from the formidable character of an eight-section ganged condenser, there is the problem of getting accurate matching between eight circuits to be considered, and remember, too, that each of the eight circuits will need wave-switching.

The foregoing, important though it may appear to be, does not by any means exhaust the argument in favour of the superhet. The fact that the intermediate frequency does not vary with changes of signal carrier frequency, greatly simplifies the problem of the designer when it comes to a matter of making one or more H.F. stages have amplification and selectivity characteristics that will remain constant, and not vary with the tuning of the receiver. In earlier articles of this series we considered combinations that arise with a variably-tuned circuit that has to be adjustable over a wide range of frequencies, and how changes of L/C ratio and H.F.

Fig. 44.—How a differential reaction condenser is employed in a detector stage.

Fig. 45 and 46.—Basic oscillators, showing the tuned circuits on grid and anode sides.

Fig. 47—Illustrating the application of two different e.m.f.'s in a closed circuit.

Fig. 48.—The first detector circuit, using an H.F. pentode.
I. TECHNICAL FUNDAMENTALS

(Continued from previous page)

The fact that we have stepped from the idea of amplification to oscillations does not free the designer from the responsibility of making the oscillograms, and this brings the functional consideration to the point that the anode current can be made to be maintained if an oscillating circuit is on the anode side of the valve. This requires that the frequency of oscillations in LC must be maintained if an oscillating circuit is on the grid side of the valve. In this case the oscillations start in the first place is simply answered. We have had no previous occasion in this series of articles to mention the self-oscillatory properties of a tuned H.F. circuit, but the fact is that a circuit containing inductance and capacity will (provided that the H.F. resistance is not too high) oscillate at its natural frequency when excited by a single impulse, even though the latter may be only a momentary "kick." In connection there is a good analogy with the pendulum. A pendulum needs only a tap to start it swinging at its natural frequency. In each of the oscillations of the pendulum (the mechanical) a single impulse will set up oscillations that are of the "damped" variety, i.e., the oscillations commence with a certain amplitude, but the peaks decrease with each successive alternation until zero is reached.

The case of the actual process of oscillation involves a transfer and retransfer of energy between the inductance and capacity of the circuit. Referring to Fig. 5, suppose an initial impulse puts a charge in C. This will discharge through L., and the current will create a magnetic field around the coil. The magnetic field will then collapse on the coil, setting up an e.m.f. of self-induction which will recharge the condenser. The latter will then reverse charge again (reverse direction of current), and so on.

Once oscillations do start in LC, they will not be damped out for the reaction will take place in a circuit, and it is to be particularly noted that the anode current can be made to be maintained if an oscillating circuit is on the anode side of the valve. This brings the functional consideration to the point that the anode current can be made to be maintained if an oscillating circuit is on the anode side of the valve.

II. PRACTICAL AND AMATEUR WIRELESS

June 4th, 1938

Superhet Frequency Changing

The frequency changing process involves the "mixing" of the signal oscillations and locally generated oscillations so that at first the effects produced by combining together two continuous oscillations of different frequencies are considered.

Suppose that there are applied to the circuit LC of Fig. 47 two continuous H.F. e.m.f.'s of frequencies F1 and F2, respectively, F1 being the higher frequency. What is going to happen in LC? As the two e.m.f.'s operating in LC have different frequency values, no simple statement can be made that they are in phase, or that they are out of phase. Actually, the phase relationship between them will vary. The two e.m.f.'s will drift into phase, drift out of phase (to 180 degrees), come into phase again, and so on, and this will occur in a certain regular manner. The definite fact is that the two e.m.f.'s will come into phase at a rate exactly equal to the difference between the two frequencies. As far as the resultant of the two e.m.f.'s is concerned, this will reach maximum peak value every time the two component e.m.f.'s get into phase, and will drop to minimum value every time they get 180 degrees out of phase. It is to be said that the resultant of the two components of e.m.f.'s is "beating" at the frequency F1 - F2.

If we could get this F1 - F2 frequency filtered out from the two component frequencies, we would have a definite case of frequency "changing," but as the arrangements of Fig. 47 stand, there would be no hope of doing so. It must be remembered that the F1 - F2 frequency is no more than the amplitude variation of the resultant of the two components, e.m.f., having nothing to do with the phase of the oscillations that are present and that the latter are actively present. It would be quite impossible, assuming that the "beats," frequency is the one we were after, to pick it out by a coupled tuned filter.

It becomes a different story, however, if we apply the resultant voltage developed across L.C. to a detector. Then the output of the detector will contain an F1 - F2 component that can easily be filtered out from the complete process by the intermediate frequency filter.

The output current of the detector should contain an F1 - F2 component, and this is not so. If the H.T. supply represents the "beat" frequency, it would be incorrect to suppose that the output current of the detector could be made to be maintained if an oscillating circuit is on the anode side of the valve. This requires that the frequency of oscillations in LC must be maintained if an oscillating circuit is on the grid side of the valve.

The question as to how the oscillations start in the first place is simply answered. We have had no previous occasion in this series of articles to mention the selfoscillatory properties of a tuned H.F. circuit, but the fact is that a circuit containing inductance and capacity will (provided that the H.F. resistance is not too high) oscillate at its natural frequency when excited by a single impulse, even though the latter may be only a momentary "kick." In connection there is a good analogy with the pendulum. A pendulum needs only a tap to start it swinging at its natural frequency. In each of the oscillations of the pendulum (the mechanical) a single impulse will set up oscillations that are of the "damped" variety, i.e., the oscillations commence with a certain amplitude, but the peaks decrease with each successive alternation until zero is reached.

The case of the actual process of oscillation involves a transfer and retransfer of energy between the inductance and capacity of the circuit. Referring to Fig. 5, suppose an initial impulse puts a charge in C. This will discharge through L., and the current will create a magnetic field around the coil. The magnetic field will then collapse on the coil, setting up an e.m.f. of self-induction which will recharge the condenser. The latter will then reverse charge again (reverse direction of current), and so on.

Once oscillations do start in LC, they will not be damped out for the reaction will take place in a circuit, and it is to be particularly noted that the anode current can be made to be maintained if an oscillating circuit is on the anode side of the valve. This brings the functional consideration to the point that the anode current can be made to be maintained if an oscillating circuit is on the anode side of the valve.

III. FREQUENCY CHANGER VALVES

The Heptode

Fig. 49 diagrammatically indicates the electrode assembly of the heptode type of frequency changer (indirectly heated for the variety). There are five electrodes of grid construction, two of these being bonded together. Counting up from the cathode, the first and second grid conducted electrodes form the grid and anode, respectively, of a triode oscillator, and Fig. 50 shows the equivalent circuit for the receiver itself by a valve oscillator. By suitable adjustment of the local oscillator frequency the value of F1 - F2 can be made exactly equal to the highest audio frequency. That the intermediate frequency is well above audio frequency is emphasised by the full title of the system, which is "supersonic heterodyne."

The "First Detector"

To employ detection as part of the frequency changing process is not so essential as the foregoing may suggest, for there happens to be an alternativo (and a better one), but we will deal with the latter presently.

When a detector is used for frequency changing it is referred to as the "first detector." Obviously, there could be another detector (the second detector) to do the normal detection work necessary (in any type of receiver) to obtain the audio frequency, corresponding to intermediate modulation, and necessary for the output stage of the receiver. It should be clear that the IF section of the receiver begins with a stage of the first detector, and the input circuit of the second detector, respectively.

Fig. 48 shows an example of the first detector circuit using an H.F. pentode for both detection and the generation of oscillations.
Ultra-short-wave Coil Mounts

I HAVE devised the simple method, shown in the sketch, of mounting ultra-short-wave coils. Four wander plugs and a length of 14- or 16-gauge wire are required. The caps and lock-nuts are removed and the plug-parts of two of the wander plugs are sawn off, the coil being wound and soldered on to the two whole plugs. The other two parts are soldered on to the condenser terminals, as shown in the sketch.—F. SWEEN (Lenton, Nottingham).

A Weatherproof Lead-in Cover

A SIMPLE method of mounting ultra-short-wave coils.

An empty oil-can, with the pourer and cap from another, together with four rubber washers, made the neat rainproof lead-in cover. The extra pourer was soldered over a small extra hole having been drilled in the top of the can to match the rubber washers and terminals, clearance holes having been drilled in the screw caps.—L. BATTON (Stockton-on-Tees).

Connecting Small Resistors

ANY home constructors, no doubt, find that the wire ends on small resistors and tubular condensers are not quite long enough to make contact between the rubber washers and terminals, clearance holes being cut away. The corners were snipped to the existing outlet, the bottom of the can hole drilled in the top of the can to match the rubber washers and terminals, clearance holes having been drilled in the screw caps.—L. BATTON (Stockton-on-Tees).

Re-aligning P.M. Moving-coil Speaker

I OFTEN clean out my speaker and have overcome the difficulty of centralising the pole-piece by carefully making a magnet mount in the manner shown in the accompanying sketch. It took some time to attain the correct air-gap, but eventually by trial and error, and with the use of two heavy-gauge pieces of brass and teak end blocks, the exact re-assembly became a simple operation after each cleaning. To retain the exactitude of the mounting, it became necessary to fit the assembly to the bench, but the end blocks were first of all secured in position by countersunk wood screws let into the base of each block of wood, the screw holes shown at the end of each block being for the fitment of the whole unit to the bench; corresponding holes were drilled in the aluminium base plate.

SPECIAL NOTICE

All wrinkles in future must be accompanied by the coupon cut from page iii of cover.

A useful dodge for connecting small resistors.

A device for re-aligning the pole-piece of a P.M. moving-coil speaker.

A Novel Short-wave Dial

TO make this useful dial take a celluloid protractor to any photographic dealer and have prints made from the number required, at 2d. each. The result is a black and white photo of the protractor. Cut this part out of the print, and glue it on to the front of panel. It makes a good finish to the receiver front, and can be toned.

A photographic print made from a celluloid protractor forms this novel short-wave dial.
Many listeners are unable to hear the normal programmes owing to defects in their ears, and if the volume of the receiver is turned up sufficient for them it becomes objectionable for the remaining members of the household. Similarly, normal conversation in the home has to be carried out at excessive volume in order that speech becomes intelligible, and thus there is need for some form of amplifier which may be used by those who suffer from this inconvenience. There are many forms of hearing aid now available, but in the majority of cases a simple two-stage amplifier of good gain, in conjunction with a reliable microphone and earpiece, will provide the necessary amplification to enable the majority of deaf people to take part in normal conversation. It must be emphasised, however, that deafness can take many forms and consequently it is impossible to guarantee that this, or any other form of hearing aid, will be suitable in every case. There are no high-note boosters or other devices of a similar nature in the aid to be described, which is purely a miniature two-stage unit, making use of miniature components and valves, but the gain is very high and in most cases it will be found quite sufficient for the purpose for which it has been designed.

The Circuit

The arrangement incorporated is shown in Fig. 6, whilst the photographic illustrations show the neatness of the design. No handle or other carrying device was fitted to the model, as it was intended merely to be used in the home and stood upon a table. It may, of course, easily be carried under the arm, or if intended for outdoor use a carrying handle may be attached quite simply to the top of the case. The microphone is provided with a 1.5 volt energising cell, and this is permanently wired. It is a simple matter to replace this when needed. The output from the mike is fed to the first valve through a special miniature mike transformer, and coupling between the first and second valves is by a similar type of component designed for inter-valve use. The bias for the second valve is obtained automatically by means of a half-watt resistance and small bypass condenser in the usual circuit arrangement, and the earphones are plugged into a small jack when required. A volume control combined with an on-off switch is provided so that the level of the output volume may easily be adjusted, and both H.T. and L.T. batteries, although of the miniature type, are provided with terminals or sockets so that connection may more easily be made. The entire apparatus fits into a small box measuring 6in. by 4in. by 3in. (internal dimensions), and the sample illustrated was made from thin plywood covered with leatherette paper. The valves are the special miniature components designed for deaf-aid apparatus by the Mullard company, and it should be noted that those illustrated are provided with metal screening covers. The makers inform us, however, that stocks of these are limited, and when disposed of the
June 4th, 1938

PRACTICAL AND AMATEUR WIRELESS

"DEAF-AID"

Two-stage Amplifier for Domestic Use for

IOWARD of Hearing

By W. J. DELANEY

newer types will be of plain glass. This
will not affect the working in any way and
it is quite in order if you obtain them
when ordering your components at a later
date.

Fig. 5.-Wiring plan, to be used in conjunction with Fig. 4.

The amplifier is built on a small aluminium
chassis, dimensions of which are given in
Fig. 2. Two small holes are required for
the valveholders, and holes are also required
for the attachment of the transformers and
through which certain leads are passed. Detais of these are clearly given in the
wiring diagram. Care should be taken to
specify the correct type of valveholder for
the valves, noting carefully the type
number given in the list of parts, as there
are similar in design to those made for the
Hivac midget valves, but the two are not
interchangeable, the valve leg spacing
being slightly different. One fixing bolt
for the valveholders is used as a common
anchoring point for the L.T. negative lead,
whilst in other cases the original wires are
used as fitted to the transformers, con-
denser, and resistance. When the valve-
holders are mounted the wiring to the
filament legs should be carried out before
attaching the transformers, as the latter
will cover the valveholders and prevent
connection. Note, also, that the valve-
holder sockets must be carefully bent down
towards the chassis to clear the transformer,
and care must be taken not to permit the
bent-over tags to come into contact with
the chassis.

The Cabinet

The cabinet, or containing box may, of
course, be built from metal if desired, but
the wood is quite simple to work and cover.
Dimensions are given in Fig. 3, and the

Fig. 6.—Theoretical circuit of the complete Hearing Aid.

connection to the large ring of the mike and
this also has to be soldered. Connection
to the remaining side of the mike is by
means of an ordinary small battery plug,
attached to the remaining blue-lead on the
mike transformer primary, the yellow lead
being cut off short or rolled up carefully
out of the way. A second wire is then
soldered to the case of a cell (or attached
at the same time as the transformer lead)
for subsequent connection to the L.T.
negative terminal. The yellow lead from
the second transformer is pulled out and
will just reach to the jack whilst still
permitting the H.T. battery to be inserted,
and when soldering this to the lug on the
jack a second short wire should be attached
to the same position for subsequent con-
nection to the H.T. positive socket. The
flexible lead attached to the second anode
lug should be taken up to the other side of
the jack and a small nick is made in the
edge of the chassis to clear this as shown in

(Continued overleaf)
the wiring diagram. The L.T. positive lead, which is brought up at the opposite edge of the chassis, is attached to one of the lugs on the on-off switch, whilst a further flexible lead is attached to another lug on the chassis for subsequent connection to the L.T. positive terminal. A plug should then be attached to the H.T. negative lead which is brought through the chassis as indicated and joined to the H.T. negative socket on the miniature H.T. battery.

Using the Device

Plug in the valves and attach the Bulgin plug to the leads to the earpiece. The apparatus is now ready for use and by turning the rear knob in a clockwise

\[ V/\text{Dia.} \quad 3/4 \text{ DIA.} \quad 2^1/8^1/4^1/2^1/2^1/8^2^1/2^1/8^2^1/4^2^1/8 \]

\[ 1/8\text{ SHEET RUBBER} \]

Fig. 7.—Details of the rubber mike support.

direction the apparatus is switched on and volume will be at a minimum. As the control is rotated further the gain will be increased and will build up to maximum.

If, of course, the earpiece is left uncovered a microphone bowl may be set up due to feed-back between mike and earpiece and thus the two should not be allowed to face each other. The control and jack are fitted to the rear of the case as it is considered that this is most logical when the case is standing on a table. The user will naturally be sitting behind it and it will be directed toward the person who is speaking, or toward the radio. A single earpiece is employed in the design illustrated and was intended to be held when the apparatus is required for use, but special earpieces are available with clips or headband, or alternatively a complete headset may be used. This will necessitate a larger case to enable the additional earpiece and headband to be accommodated above the battery, but the case will thus be able to accommodate the rods in various ways. A drilled pillar enables three rods to be accommodated and thus a ’V’ or straight arrangement may be utilised. A lead-in wire is fitted, and the cost of the complete kit is 22s. 6d. Supplies may be obtained from Wireless Supplies Unlimited, of 278, High Street, Stratford, E.15.

A-L.T Car Aerial

The illustration below shows the parts employed in the A-L.T. car aerial, which is suitable for both closed and sun-shine-roof type cars. It is supplied with large rubber suction cups and a tube of special cement which enables these cups to be firmly attached to the body of the car. The insulating pillars upon which the metal rods are mounted are of the type having a long leakage path and it is possible to erect the rods in various ways. A drilled pillar enables three rods to be accommodated and thus a ’V’ or straight arrangement may be utilised. A lead-in wire is fitted, and the cost of the complete kit is 22s. 6d. Supplies may be obtained from Wireless Supplies Unlimited, of 278, High Street, Stratford, E.15.

High-quality Programmes

With reference to the recently introduced high-quality sound programmes broadcast on the television wave by the B.C.C. it is interesting to note that all Bossor console television receivers, right from the time when they were first introduced, are provided with an extra position on the waveband switch permitting television sound to be received (without re-tuning), while the entire vision deck, including, of course, the cathode-ray tube, is switched off. This scheme was incorporated as Messrs. Bossor always believed that the B.C.C. would sooner or later decide to utilise the 41.5 me/s band for high-fidelity sound transmissions.

Mazda Thyatron

A NEW thyatron is now available in the Mazda range, and is known as type T.41. This is of the type having a heater rated at 4 volts 1.5 amps., and the control ratio is 20 and the voltage drop 40. The anode to cathode voltage should not be allowed to exceed 400, whilst the maximum peak to peak scanning voltage should be about 120 volts. The peak discharge current should be limited to 300 mA. The valve is designed for line and frame time bases, and is similar to type T.31, except that the anode is brought out to the base and thus renders it suitable for magnetic scanning. The price is 10s. 6d.

Dials for ‘Acme’ Receiver

Some difficulty has been experienced by certain readers in obtaining accurate dial settings on models of the Acme receiver. Messrs. Peto-Scott now inform us that they are able to supply celluloïd-covered paper printed scales which will simplify the lining up of station indications in this particular receiver, and these dials will be available at 8d. each.

Rawlplug Soldering Iron

A NEW iron, known as the ‘De Luxe,’ is being introduced by Messrs. Rawlplug, and is shown below. The bit in this particular model is a fixture, and cannot be replaced by the purchaser, and the element is of a similar type. The makers claim that this has been done as, in the past, it has been found that inexperienced replacement of the bit or element often leads to complaints. The voltage ranges of the iron have been increased so that the iron is more suited to the particular voltage available. Thus, the iron may now be obtained suitable for 100 to 110: 200 to 210; 220 to 230; or 240 to 250 volts. This eliminates the possibility of the element burning out. The makers state that this iron is as nearly perfect as it is possible to produce and each iron carries a guarantee for six months. The main details of the iron are shown below and the price is 9s. 6d.

LIST OF COMPONENTS.

One microphone transformer, type: L.F.3, Bulgin.
One Midget L.F. transformer, type: F.33, Bulgin.
Two Midget valveholders, type: V.F.33, Bulgin.
One combined 500,000 volume control and on-off switch, type: Erie.
One Midget miniature, type: J.6, Bulgin.
One 1,500 ohm half-watt resistor, type: Erie.
One 25 mfd. mica condenser, type: F.C.C.
One 1,5 volt biasing cell (See Text).
One type D.A.1 Midget valve, Mallard.
One type D.A.2 Midget valve, Mallard.
One type X.325B Midget dry battery, Exide.
One type PRASS L.T. accumulator, Exide.
One Midget jack, type J.6, Bulgin.
One Midget valveholder, type V.H.33, Bulgin.
One fiat plug, and is shown below.

The A-L.T. car top aerial, and the fixing device which is employed.
Power Amplifier Considerations are Dealt with in this Article

By L. Ormond Sparks

The oscillator, or oscillator and doubler stages in a transmitter do not always provide the required power, therefore, in such cases it becomes necessary to provide additional amplification between the exciting source and the aerial system. Bearing in mind that is a question of amplifying at radio frequency, particular care has to be taken in the design, layout, and adjustment of such stages, as any trace of instability will ruin the transmission.

The section involved in this particular work is usually known as the Power Amplifier, or, more briefly, the P.A., but one must not confute it with power amplifiers of the L.F. type.

Once an A.A. station owner has become well versed in the handling of the various types of oscillators and the adjustment and use of frequency doublers, he should commence experiments with P.A. stages as his ultimate rig will, undoubtedly, embody such arrangements.

Power amplifiers can be considered under two headings, namely, those using simple triode valves, and those using modern pentodes. Both types have certain advantages, but the beginner cannot do better than start with a pentode, although, if the subject is to be covered thoroughly, experiments should be carried out with triode circuits.

Circuit Considerations

The fundamental circuit is shown in Fig. 1. There are several variations, but we are not concerned with them at the present. It will be noted that the grid and anode circuits are tuned and, as both circuits are tuned to the same frequency, it will be appreciated that care is required, otherwise oscillations will be generated by the feed-back introduced by the capacity coupling between the electrodes of the valve, plus any external coupling which might be provided by inefficient layout. The most simple and usual way of eliminating this undesirable possibility is by the process of " neutralising," which, strangely enough, does not seek to cure the trouble by stopping the feed-back, but by actually providing another path for the transference of energy from plate to grid.

This may sound very confusing, therefore the following points should be noted. When the P.A. stage employs a valve of a typical L.F. type.

In the P.A. case, however, this harmonic output will not only consist of the input frequency, but there will also be present a certain proportion of harmonics of the signal frequency, which, from the reproduction point of view, is not required. In the P.A. case, however, harm content does not cause any worry, as they will have little or no effect on the anode tank circuit, which, as mentioned above, is

Operation of the P.A.

Many beginners get confused over the operating conditions under which the P.A. works. The amplification of such high bias voltages usually misses the exact cloud, so let's see what actually happens.

With an ordinary low-frequency amplifier, certain very definite operating conditions have to be observed if pure reproduction is required. This will be more readily understood by reference to Fig. 2, which shows the grid volts/anode current curve of a typical L.F. valve.

The input signal is represented by the curve "a" while the anode output is shown by "a'". It will be noted that the operation takes place on the straight portion of the curve and, so long as it remains within those limits, the anode output will be an identical amplified version of the grid input.

If, however, the input signal is too large, it is possible for the grid curve to be driven into the positive portion, in which case grid current would be set up, distortion introduced, and the input reduced.

With a P.A. stage the requirements are almost opposite to the above. Consider the curves shown in Fig. 3, where it will be seen that the valve has been biased to the point of "cut-off," and the drive so adjusted that it is operating right down on the bend of the curve.

An examination of the anode output curve reveals that it is no longer an amplified version of the input, but rather a series of peaks and pulses and, when these are applied to the anode load, they will set up oscillatory voltages across it, causing an oscillating current to flow therein.

Anode Load

The anode load will not take the form of a pure resistance, but of a coil and condenser combination, usually called the "tank" circuit. It must be remembered that when a parallel tuned circuit is in a state of resonance with an applied signal it will act as a high resistance, thus producing the valve's requirements for efficient operation.

With the L.F. circuit, as soon as the distortion mentioned is introduced, the (Continued on page 297)
Short Wave Section
CONSTRUCTIONAL HINTS FOR THE SHORT-WAVE EXPERIMENTER

Amongst the Subjects Dealt With in this Article are Baseboard, Chassis and Cabinet Construction, and Decoupling.

The amateur whose experience has been confined to home-constructed experimental receivers incorporating components to suit hand, is usually impressed, when the opportunity arrives, to try out a sponsored or commercially designed short-wave receiver, by the ease of operation, and particularly with the stability of the instrument, even when receiving very weak signals. It follows, therefore, that when building a new experimental receiver, or rebuilding an existing one, he will endeavour to obtain, amongst other desirable features, an equal degree of stability by adopting the constructional methods as favoured by the professional designers. In adopting such methods of procedure he is wise, but before going ahead will be wiser in carefully studying matters, formulating and planning down to the last detail, because by so doing the possibilities of snagging will be removed to a considerable extent.

Baseboard Disadvantages

For example, the recognised method of short-wave receiver construction during the early days was the baseboard method. Now this method has several disadvantages, which will not be apparent to present-day constructors whose experience centres on baseboard arrangements incorporating modern and specially designed short-wave components.

We do not need to discuss the disadvantages in detail in this article, but to confine our attention to one fact which is common to many present-day experimentally designed and constructed receivers, namely, a lack of stability, which prevents the best being obtained so far as performance is concerned, even though specially designed components are used.

Metal Chassis

Generally speaking, receivers built on the metal chassis and panel basis are stable in operation if the application of this form of construction is correct. In many instances it is not correctly applied, with the result that instead of acting as a preventive of instability, metal construction in its mis-application is the root cause of instability.

Decoupling

One common cause of failure is that of sacrificing efficiency in order to reduce the initial expense. For example, we admit that it is possible to build an efficient short-wave receiver which does not incorporate either decoupling, or L.F. choke output, but such an arrangement will not provide the maximum of all-round efficiency from a given number of valves, and it is almost certain that even the most carefully built receiver will not entirely be free from instability on weak signals.

No matter what the type of receiver used, the writer believes in the incorporation of decoupling, grid stoppers, and L.F. choke output arrangements. With reference to metal chassis, panels, and cabinets. In the early days we made our own metal chassis and cabinets and screening boxes, and cut our own panels. Taking into consideration the fact that metal chassis, panel and cabinet assemblies are available commercially, the experimenter is in a position to make up a permanent receiver at a cost competitively low.

If it is desired to follow this procedure, the experimenter is advised to write to the manufacturers of these assemblies, obtain the dimensions of standard chassis and panels, get out the drawing board, and arrange the panel and chassis layout of his existing components to suit the dimensions given. By following this procedure, unnecessary expense and mistakes, also poor performance due to cramping of components, will be avoided.

Wooden Cabinets

In some instances wooden cabinets are preferred, the experimenter making and polishing one to suit his own taste and requirements. Fig. 1 shows a suitable arrangement for housing an untuned H.F. detector and pentode type receiver incorporating wave-band switching, bandspread tuning, three-valve headphones output, and loudspeaker output on four-valves. This cabinet is simply a plain oak box. The loudspeaker baffle is screwed to the front panel, a metal sub-panel being fitted to the set chassis and screwed to the front panel. A solidly built cabinet of this description made of polished oak will have quite a professional appearance.

Fig. 2 shows the general arrangement of panel components when a metal cabinet or screening box of standard dimensions is used, and is a very suitable panel layout for a regenerative two-valve receiver.

Opinions are divided relative to separate and built-in loudspeakers. There are, no doubt, some who, like the writer, prefer separate loudspeakers. The first difficulty is apt to centre on the most suitable dimensions for the speaker cabinet. It should not be too small on the one hand, or too big on the other, and should be as free as possible from box resonance, with a fret of suitable design which, whilst pleasing to the eye, will not impede the sound waves emitted by the loudspeaker.

Fig. 3 shows a loudspeaker cabinet made and used by the writer. Solid oak, 1in. thick, is used, and a 6in. moving-coil speaker is mounted on a five-ply baffle. (Continued on opposite page)
leads of abnormal length are necessary, delivering a considerable output, the special multi-stage superhet capable of delivering outputs of from one to six valves. In the case of the A.C. mains-operated wave receivers of from one to six valves. It is usual to use solid connecting wire in this issue.

TRANSMITTING TOPICS

transmissions are obtainable in both screened and unscreened form. H.F. chokes may be taken as an example. If a new H.F. choke is required, by all means choose the screened type and in addition, get to know the minimum and maximum limits at which it will function efficiently. With reference to dual and triple range tuner units, various types both screened and unscreened are available.

If screening is desired, it is advisable to purchase the specially designed screened tuner unit which covers a definite range of wavelengths, rather than attempt later to screen an existing tuner of the unscreened type, as in doing so the maximum tuning range will be considerably reduced by screening. The same remarks also apply to plug-in coils.

THE ELECTRICAL ENGINEER POCKET BOOK

is tuned to the signal frequency and would, therefore, not offer a high resistance path to the harmonics, so that it is in the truest sense of the word a pocket book. The book is very useful when dealing with the possibilities of box resonance is reduced. The Book Itself: The Pocket Book is strongly bound in durable art-leather, rich red, delicately embossed in gold. The book measures approximately 6 1/4 inches, and has rounded corners.

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I.C.S. are the creative pioneers of vocational training by the postal method. Under I.C.S. direction, you study when and where you like. Nearly half a century of unrivalled experience is at the back of this work. The Radio Industry is short of trained men. You may still be an untrained man or hold up the driving power.

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Write for our free "Radio" booklet, stating your subject—or use the coupon below if you wish.
Olympia attempt to fall in with this point of view, and this year's plans for
concerned in the industry. It is known that
realise this the better it will be for everyone
no doubt that ultimately they will merge
irrevocably linked together, and there is

Present day wireless valves bear little
in every sense of the word. The reason for adopting this policy
would seem to lend itself to undue con-
hall. This may be a much more convenient
Restrictions, and the changes proposed are certainly
large television studio with a stage
 expérience with a view to ascertaining how ultra-short wave transmitters which work
on a carrier frequency of 46.5 megacycles for vision, and 49.75 megacycles for
sound. At the moment the aerial design
is of such a character that good reception
is practically limited to one direction,
owing to the surrounding tall steel buildings
producing reflected signals with a slight
-time lag from the main picture, with
the result that the receiver screen has a
series of "ghosts". Real entertaining pro-
grames comparable with those in this
country do not appear to have materialised,
and film transmissions together with stills
consist of a large proportion of the fare
seen by the selected viewing points. How
long it will be before America puts into
operation a real live service is still a very
most point, for although they may be
achieving good results with their
machines in the laboratory, the real criterion is what
can be done under proper field conditions.
and this is still problematical.

For some time now the Russian author-
ities have been carrying out very searching
investigations into the various forms of
television transmission and reception, but
no cut-and-dried scheme has yet been
made public. It is learned, however, that
in Moscow there is every hope that experi-
mental transmissions will start in a few
weeks' time, but the method to be employed
on the standard of frequencies to be used
is as yet unknown. Largely as a result of
the communal form of life existing in that
country experiments are being undertaken
to develop a satisfactory system for the
distribution over a limited area. A special
type of set is being produced for this
purpose so that subscribers to the scheme
can receive pictures of a quality and
strength comparable to individual aerial
connection to separate sets to be made
in residential areas and political centres in Moscow itself,
receiving sets have been installed with the
idea of securing reports on the results of any
experimental transmissions. Last autumn there is every hope that some form
of service will be inaugurated.

This Reshuffle

The details of the wavelength changes
which were decided upon at the
recent Cairo conference were given in detail
in the issue of Practical and Amateur Wireless dated May 14th. From the television angle the greatest interest is centered on the ultra-short-wave allocation, which for the first time received the most careful consideration in view of the national and international developments in the television field. The four separate bands which have been allocated provide for eleven broadcasting stations by taking into account the present frequency band of the television picture signal as used by the B.B.C. station at Alexandra Palace.

What is going to happen when the degree of picture definition is improved is not known, but perhaps this is left to future conferences when it is remembered that as far as this country is concerned no alteration of frequencies need be made before 1940. Although there is provision for only eleven stations, it must not be inferred that development will be restricted because the capacity of signals is not so large as with medium- and long-wave broadcast stations. The degree of overlap will depend on planning of position, and there is nothing to prevent this country from going right ahead with its projected chain of television stations, as envisaged by the Government committee set up to inquire into this question some time ago. It is still a mystery why this country outside London and the Home Counties must continue to wait for television facilities other than the experimental time reception, which will be kept on being recorded from time to time. The final answer rests with the Government's advisory committee, and every time question is raised in Parliament it is stated that a longer period of experiment must be given to the London station. Surely there is plenty of air the long-wave band for real qualitative data to be collated, and it would mean a big thing for the industry if one definite statement could be made before radio's autumn season becomes an actuality. One thing that is welcomed is the use of ultra-short waves for real quality transmission by the B.B.C. in connection with some of their concerts. Perhaps this will be very much extended, and so give people with sets capable of tuning down to these low wavelengths an opportunity of appreciating the type of fare now radiated by the B.B.C. television station.

Good Camera Work

The engineers responsible for handling the electron camera used by the B.B.C. for either studio or outside broadcast work have, as a result of long practice, become very skilled. The use of the correct lenses to suit the occasion, coupled with excellent panning, has done much to improve the method of presentation of the individual items constituting a complete programme. When seated on the camera “dolly” the operators see a replica of the scene focused on the electronic mosaic, which is exactly the same size as that electrically synthesised. By keeping the subject within the limited area, the operator is certain that his picture fulfils requirements. It is rather curious, however, that the cameras must take time to become familiar with this fact.

Whether this has been arranged by design or accident is not known, but it certainly tends to prevent the camera man from becoming too interested in what is being televised and makes it difficult for attention to wander.

Leaves from a Short-wave Log

From Britain’s Oldest Colony

 Signals have been heard from the new transmitter which the Caribbean Broadcasting Service has installed on the island of St. Christopher. The wavelength used is 47.02 m. (6.38 mc/s), but the power is not mentioned. A programme is given daily between G.M.T. 20.00-21.00. St. Christopher was first discovered by Columbus who gave his name to the island in 1493; it was later captured from Spaniards, and ranks as the oldest British colony.

Franco Station in Amateur Band

EBAH, Tetuan (Spanish Morocco), a Nationalist station which may be heard nightly relaying war news bulletins from Radio Malaga (Spain), now works regularly on 21.36 m. (14.05 mc/s). Radio Malaga also possesses its own short-wave channel, namely 20.77 m. (14.445 mc/s).

In Memory of Marconi

The anniversary of the late Marchese Marconi’s birth, November 25th, has now been declared an annual national holiday in Italy, as a tribute to his memory.

Chilean Wavelengths and Call-signs

According to the latest official list, certain alterations have been made in the wavelengths and call-signs of the principal Chilean short-wave stations. The 250-watt transmitter at Valdivia is now C1190, and works on 25.31 m. (11.9 mc/s). It was recently announced that as far as this country is concerned no alteration of frequencies need be made before radio’s autumn season becomes a reality. One thing that is welcomed is the use of ultra-short waves for real quality transmission by the B.B.C. in connection with some of their concerts. Perhaps this will be very much extended, and so give people with sets capable of tuning down to these low wavelengths an opportunity of appreciating the type of fare now radiated by the B.B.C. television station.

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Vera Lynn

A Brief Biography

Miss Vera Lynn appeared with a juvenile group at Dagsham when eleven years old, playing charity shows... continued with the troops for four years. Howard Biber, the well-known band leader, then spotted Vera, and engaged her for several weeks. Next went with Billy Cotton to Manchester for a fortnight. Met Joe Loss at the age of eighteen and broadcast with the famous Astoria manuscript on two occasions. Bumped over of her career happened when Ambrose contracted her to broadcast with his orchestra. Has been with him for over twelve months, and records solo for Decca. Has also recorded with Jay Wilbur, Prima Scala, Maurice Winnick, Rosina, Joe Loss, Charlie Kunz, Joe Orlando, and Ronnie Munro and Felix Mendelssohn. Vera, who is twenty-one, was born at East Ham; her parents encouraged her in every possible way; ran her own dancing school at fifteen; is tall and slim. Vera is one of the most likeable young ladies it is possible to meet. Made a host of friends everywhere; has own fan club with 150 members; possesses own microphone equipment; constantly practising. Ambition is to take a bigger star, and to sing on the American airwaves.

Vera drives a car, and her chief hobbies are painting, tennis and riding; has appeared in television, Empire broadcasts, and B.B.C. shows. Always ready to lend a helping hand for charity shows, particularly for the School for the Blind.
Band-pass Tuning

The circuit familiarly referred to as band-pass input tuning may be arranged in many different ways, and it still causes confusion to readers whose only recognition of a band-pass circuit is that incorporating what is known as a link winding. In many cases existing dual-range coils may be adapted for such purposes by making use of the existing reaction winding. This is especially the case where the reaction winding is "split," part being wound near the medium-wave coil and part near the long-wave coil. Obviously such a circuit or use of the coils will prevent reaction from being used, but the coils may then be employed for an H.F. stage and a standard coil used for the detector stage in the usual way. The accompanying circuit shows a band-pass circuit of the type referred to and also introduces an interesting detail in the aerial coupling. It will be seen that the aerial is transferred with the wave-change switch so that a correct coupling may be obtained on the long-wave band. It is often found that the aerial is left connected to a point on the medium-wave winding which, while giving optimum results on medium waves, still leaves something to be desired on the long waves, and the transfer tapping enables maximum results to be obtained on both wavebands.

Interference

Some peculiar forms of interference are reported from time to time, and although certain freak cases do arise it is still found that peculiarities are more or less common to certain combinations of circumstances. For instance, when two powerful stations are situated in a direct line and at equal distances from a receiver, it is possible for the carriers to so mix as to cause background interference which, if the wavelengths are related, may easily result in modulation of one of the signals. Other similar details are reported from time to time, but do not answer to any standard rules or theories. Similarly, at the present time we are receiving many reports of the reception in the South of England of a well-known commercial European transmitter on a short wavelength, but although the wavelength corresponds approximately to a harmonic of that station it is contrary to regulations to permit the strength of radiation on that harmonic which is obviously being used. The only inference is that they are not using good harmonic suppression or that some peculiar effect is coming into play which is as yet untraced. Many similar experiences are reported from time to time, and each listener must therefore be prepared to devote a little time to tracing out the details in his particular case.

Chassis Materials

We are still receiving inquiries regarding the choice of materials for chassises, and it can again state that for normal purposes it is obviously being used. The only inference is that they are not using good harmonic suppression or that some peculiar effect is coming into play which is as yet untraced. Many similar experiences are reported from time to time, and each listener must therefore be prepared to devote a little time to tracing out the details in his particular case.

AERIAL

Circuit employing band-pass aerial tuning, and with a transfer aerial tapping.

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

Station VR6AY

Sir,—It may interest other readers to know that I have just received a QSL card from VR6AY. I heard this station on the 7th, the day after the station began its transmissions, and despatched the report the same day. The top of the card is occupied with a photograph of the equipment, including a wind-driven generator, and a Sargent communications receiver, while at the bottom is a map of the Pacific Ocean with a small inset map of Pitcairn Island. A point of interest is that the Y of the call-sign has been filled in with red ink instead of being printed, owing to the official call-sign not being known until after the station had commenced its transmissions. On the back of the card is a short description of the founding of the island and its topography. A New Zealand stamp has been used, and has been postmarked “Pitcairn Island, N.Z. Agency.” No mention is made of the power. —M. Evans (Blandford, Dorset).

Sir,—I dare say that the following bit of news will interest some of your readers.

Pitcairn Island has supplied me with a verification card for my report sent in April, which has been postmarked “Pitcairn Island, N.Z. Agency.” No mention is made of the power.—M. Evans (Blandford, Dorset).

Sir,—I have been very interested in this correspondence, and on reading the letter from Mr. C. Wilson, of Chieveley, I wrote to him for further detailed particulars which he has kindly given me.

Cut This Out Each Week.

--- THAT miniature cathode-ray tubes are available for the construction of test equipment.
--- THAT the efficiency of an H.F. choke is increased if the winding is rectangular.
--- THAT the high- and low-frequency transmitters will be improved if a resistance is shunted across the secondary.
--- THAT by enclosing a receiver in a metal box (earthed) direct pick-up on the wiring will be avoided and selectivity thus improved.
--- THAT the same colour code is employed for fixed condensers as it is used for fixed resistances.
--- THAT the unit for fixed cathode-ray condensers is the micro- microfarad.

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

The Editor will not re-read the whole of the correspondence, but if he agrees with me rightly, one correspondent reported that the audio-frequency output from the relay system was tuned out by the receiver, and that it was tuned out by him with coils which were tuned to radio frequency.

Mr. Wilson reports that the interference in his case, and which was identical with that experienced by J. W., of Wigan, was cured by adding a capacity in series with the aerial, consisting of a small piece of flex, the interference was eliminated —but when the "series condenser" is shorted out, the interference immediately returns.

It will be noted that when the coil was withdrawn from the short-wave set the aerial was still connected to the grid of the valve, and had a path to earth via the electrodes of the valve, and the current path through resonating circuits by the electron stream. I understand also that J. W., of Wigan, cured his interference by replacing a faulty aerial condenser in a relay set by adding a capacity in series with the aerial as Mr. Wilson did.

Sir,—I have been bringing the new theory of detection and loudspeaker reproduction into this discussion, but it helps to offer an explanation. With regard to the radiation interference from the relay system which was tuned out at radio frequency —this is explained by the fact that it has been proved by the new experiments that the loudspeaker output from any wireless set can be tuned out and rendered inaudible at radio frequency. The output consists of a composite radio-frequency wave which is literally a "carrier" wave for the audio-frequency modulations to which the loudspeaker responds.

With regard to the interference which cannot be from the relay system—it will be remembered that a powerful signal will "break through" into a circuit with which it is not in resonance, by reason of its strength, and the probable source of the interference in this case have "broken through" the resonance of the aerial and earth systems. I noticed in the article on Outdoor Radio that a resistance of 1 megohm can be placed in series with the medium-wave winding to load it to tune to the longer wavelengths. It is quite possible that the faulty series aerial condenser developed a high resistance and loaded the aerial circuit, and allowed powerful signals to "break through." Weak signals are naturally selective.

Mr. Wilson seems certain that the detection of the interfering signals took place in his aerial-valve earth system. To explain how wireless signals were detected would require more investigation—but it will be remembered that in this new theory that any device which allows more current in one direction than in the other will act as a detector of wireless signals, so that the amplitude of the positive half-cycles become greater than the negative.

If any reader has a better explanation, please let us have it. —D’ArCY Foid (Eksel).
Mixer Circuit

"I wish to use with my amplifier a pick-up and a mike which needs an input transformer. I wish to fit volume controls to both mike and transformer in such a way that I can control the input, and I should be glad if you would tell me the best way of doing this. Should the mike control be across the mike or across the transformer secondary?"—H. W. S. (Stoke, Newington).

A VOLUME control suitable for the pick-up must be obtained, and a control for the secondary of the mike transformer. Probably 250,000 or 500,000 ohms will be found suitable. The two controls must be joined in parallel with pick-up and with transformer secondary, and the end of the pick-up control should be connected to the arm of the mike control. The lower end of the latter should be joined to the earth line (or bias), whilst the arm of the remaining control should be joined to grid, that is, to the remaining input terminal. This will enable both components to be controlled and mixed in any desired degree.

The Vitesse

"I have now completed the Vitesse receiver but there is lack of volume and a weakness in modulation. I have tried repeatedly to trim the I.F. transformers, but do not seem to arrive at a correct setting. Can you suggest what might be wrong with the set—it is wired exactly to specification and all specified parts are used?"—M. C. (Dublin).

THERE would appear to be some difficulty which is preventing the transformers from being correctly aligned and which results in loss of signal strength. There are two schemes which we have found effective in such cases and they are as follows: Firstly, remove the second I.F. transformer and disconnect the leads joined to the tags underneath the base. Drill four holes in the chassis and take these leads straight down, thus avoiding the risk of instability due to the close proximity of the terminals on the two transformers. The other scheme is merely to screen the diode lead which runs from the valve to the coil unit. The diode lead which runs from the valve to the coil is a standard H.F. transformer with reaction and may, therefore, be used in a simple detector-2 L.F. circuit. The primary winding has one red lead, which is the low-potential (or earthy) end, and the aerial end is the top of the coil. The secondary winding is between the white lead and the fixing bracket, the latter being, of course, earthed. The two-point on-off switch for wave-changing should be joined between earth and the yellow lead. The reaction winding is between the blue and green leads, the blue being joined to the anode and the green to earth through the reaction condenser.

Interference Suppressor

"I believe there is a suppressor made for the mains leads which will make a factory new equipment cleaner or similar apparatus. Could you tell me how this type of suppressor is connected, whether one or two are needed to make one at home?"—G. T. (Hendon, N.W.9).

THE component in question is manufactured by Messrs. Belling and Lee. There are two types, one for use with two-pin mains plugs and one for the three-wire system. The circuit employed consists of fixed condensers between each mains lead and earth and a high-inductance choke in series with one mains lead. In the component referred to the choke has an inductance of 2,000 μH and the condensers are .01 and .1 μfd.

Smooth Reaction

"I am in difficulty regarding the reaction circuit in my short-wave receiver. I have tried differential and ordinary condensers, have tried an S.G. valve with reaction connected by the screen-grid voltage through a potentiometer, but cannot obtain a nice smooth build up. Can you suggest the best way of overcoming this difficulty of trying?"—S. F. (Chelsford).

IN view of the ideas you have already tried, it is possible that your circuit is badly designed or defective in some way. The only scheme not mentioned by you in which has been found to give quiet and good results in certain receivers is one which consists of the inclusion of a variable resistance in series with the reaction circuit. The anode is joined to a choke in the usual way and to the anode one end of a variable resistance (value about 2,500 ohms) is joined. The arm of the resistance is then joined to the reaction winding which is earthed through a reaction condenser in the usual way. By adjusting both condenser and resistance it is often possible to obtain a very smooth effect over the entire range, and the resistance gives better control than the condenser.

Visual Tuning Indication

"I believe you published some time ago a scheme for using an ordinary flash-lamp bulb as a visual tuning indicator. I cannot trace the article, and wonder if you can refresh my memory concerning the scheme."—R. S. (Bridgehead).

THERE are two schemes indicated, one of which has the bulb joined in the radio receiver circuit, and the other in which the bulb is included in the heater circuit of a controlled valve. The former scheme is difficult to adjust, and the latter has the disadvantage that two valves instead of a common transformer are required. It gives the better results, however, and the lamp is wired in series with one choke winding which is in turn in one of the heater leads to the controlled valve. The other choke winding is in series with the i.f. transformer primary on the H.T. side. In the no-signal condition the lamp glows at maximum brilliance and the signal decreases the glow. The correct tuning is indicated when the lamp is partially or entirely extinguished.
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Colour Coding

EVERY constructor is now familiar with the colour method of indicating values of fixed resistors, although many are not aware that many other components are provided with coloured indications as to value or purpose. Whether or not the idea is desirable, the majority of manufacturers now adopt some scheme of the kind. The Radio Component Manufacturers Federation have drawn up recommendations for various components, and in this issue we give all the present codes covering resistances, condensers, transformers, etc. Many constructors complain that the codes are difficult to remember and consequently they have to spend much time when constructing a receiver looking up reference tables in order to identify the various component values. All of the tables are included on one page in this issue and this should be cut out and kept on the workbench or fixed to the wall so that it will always be handy. If any further tables or recommendations are made at a later date these will be given and may be added to the data included in this issue.

Paris Push-buttons

At the recent Paris Spring Radio Exhibition a large number of receivers were seen fitted with push-buttons. It would appear that this feature is receiving great publicity in France at the moment.

Gibraltar

On June 13th Regional listeners will hear a radio picture in sound and narration of the story of Great Britain's smallest dependency. From its first occupation by the Moors in A.D. 711 up to the present time, when it stands as the British key to the Western Mediterranean, the story of the famous rock will be described.

B.B.C. at Empire Exhibition

The B.B.C. Symphony Orchestra of 119 players will visit the Empire Exhibition on June 13th, to play in the Concert Hall. The first part of the concert will be broadcast in the Scottish and the main Regional programmes. The orchestra will be under the baton of Sir Adrian Boult, who recently returned from the United States.

Bristol Radio Exhibition

Special attention is being given to the variety show, which is a main feature of the Bristol Radio Exhibition, to be held in September. We understand that nearly all available stand space has been taken and the exhibition promises to be the best which has yet been held in the West.

Tests Match Broadcasts

A departure from the usual practice of breaking in on the advertised programmes for the purpose of Test Match commentary will be a feature of the broadcast in connection with the present series, starting at Nottingham on June 10th. Commentaries are to be given this season at fixed periods during the matches. Seven such periods will be included in the programmes on the first day of each match, and six fixed periods on each of the subsequent days. The periods will be either of ten or fifteen minutes' duration.

Detectives in Fiction

The last of the present Detectives in Fiction series is to be broadcast during the present quarter on June 10th. This will be a dramatised version of one of Dorothy M. Sayers' stories featuring Lord Peter Wimsey. The story selected is "The Awakened Adventure of the Dragon's Head." Producer Leslie Stokes hopes that further programmes on these lines may be broadcast during the autumn.

Richmond Horse Show

The London season provides few functions more delightful and informal than the annual Horse Show held in the Old Deer Park at Richmond. A popular feature of this Show is the competition for the Fournival's Cup, in which children's jumping ponies compete. On June 10th, B.B.C. commentators and miles will be present so that a phase of this popular occasion may be described to those who are not able to be present. Thomas Woodroffe will introduce the event, whilst the commentary will be by Major G. Phipps-Horbury.

Police Cycle Radio

The Aberdeen Police Force now have a number of cycles fitted with radio. A miniature set is housed in a bag behind the saddle and a small local receiver is attached to the handlebars. This is in a clip so that it may be removed quickly in the event of difficulty in hearing due to traffic noises. It is then used as an earphone. A medium-short wave is employed and headquarters can keep in touch with members of the force in outlying districts. Two-way systems are at present being experimented with by Sergeant Smith, who is responsible for the radio work in this case, and some of the apparatus will be displayed at the police inspection this month.

Bebe Daniels and Ben Lyon

In the "Silent Melody," a new musical comedy to be heard in the Regional programme on June 8th, the well-known film stars Bebe Daniels and Ben Lyon will star. The B.B.C. Variety Producer says that the show has been waiting to be cast for more than a year.

Band Boomerang

The next Band Boomerang will include Max Schonherr and his Band in Vienna and Peter Yorks and his Orchestra in London. The programme will be heard on June 9th, and it is interesting to note that apart from a twenty-minute conversation between the two studios no opportunity occurs for rehearsals.
ROUND the WORLD of WIRELESS (Continued)

Bombay's New Station
THE Governor of Bombay, His Excellency Sir Roger Lumley, recently opened the new 10-kW station at Bombay. This station, the call-sign of which is VUD, will transmit on 90.8 metres after dark and on 49.3 metres during daylight.

Honolulu “In Town To-night”
THE B.B.C. Variety Department should feel flattered about the recent news from Honolulu, where “In Town To-night” is announced as a new regular feature.

Violin Recital
ALFRED CAVE, leader of the B.B.C. Midland Orchestra and the City of Birmingham Orchestra, will give a violin recital on June 15th. His programme will include works by Gibbs and Dohunuy.

The Columbia Broadcasting System's new West Coast Headquarters after its opening on April 30th. The building also is the home of station KNX.

Polish Radio Activity
It is reported that the Polish Broadcasting Authorities are very active in the provincial towns, recruiting new subscribers. They are also organising special training classes for broadcasting pioneers, collecting gifts of receiving sets for the poorer elementary schools, organising popular entertainments to arouse interest in broadcasting in the small towns and villages, and giving free information on technical questions.

Theatre Variety
MIDLAND and Regional listeners will hear on June 17th a variety programme from the stage of the Hippodrome Theatre, Aston. There have been numerous broadcasts from this theatre, which is a “sister-theatre” to the Coventry Hippodrome. The details of the bill for the broadcast have not yet been arranged.

Louis Levy to Conduct Variety Programmes
WE are informed that by arrangement with the Gaumont-British Picture Corporation, Ltd., Mr. Louis Levy has been offered a part-time contract to conduct certain programmes in the Variety Department for a period of twelve months from July 4th next.

Interesting and Topical News and Notes

“Swift Serenade’s” Au Revoir
WHEN “Swift Serenade” is broadcast in the Regional programme on June 14th, the Swift Serenade Concert Orchestra, with their arrangers, Ralph Bruce and Ray Terry, will say au revoir until the autumn. The speaker will again be David Porter, who produces this light entertainment feature.

Sir John Reith on Broadcasting in 1937
MORE than £3,000 was raised last year as a result of appeals broadcast during the Children’s Hour, according to Sir John Reith, writing in the new “Britannia Book of the Year,” which has just been published under the auspices of the Encyclopaedia Britannica. By the end of 1937 there were 7,751 schools with sets installed to receive school broadcasts, 2,000 more than at the end of 1936. Altogether about £160,000 was raised as a result of the broadcasting of charity appeals last year.

There were 1,213 S.O.S. and police messages broadcast from all transmitters during the year.

Dance Cabaret from Newquay
DANCE Cabaret will be broadcast from the Headland Hotel, Newquay, on June 16th. The artists will be: The Radio Revellers, “Kings of Syncopation”; Tessa Deane, “The Popular Singer”; Shirley Waldron and his Dominno’s Dance Band. The programme will be compered by Eric Barker.

Gilbert and Sullivan Music
REGINALD BURSTON will conduct the B.B.C. Midland Orchestra in a programme of music from the Gilbert and Sullivan operas. He will include selections from six popular favourites.

Solve This!

Problem No. 299

HAWKINS had made up an experimental amplifier and as he needed a volume control he looked through his collection of apparatus and found a knob which was suitable. When he fitted this, however, he found that although it controlled volume from minimum to maximum, it gave very little control over the majority of its movement, and then suddenly came into effect and gave a rapid adjustment. Why was this? Three books will be awarded for the first three correct solutions opened.

Address your envelopes to the Editor, Practical and Amateur Wireless, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 299 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, June 15th, 1938.

Solution to Problem No. 298

Jones overlooked the fact that the carbon mike on stand included an input transformer in its base, and thus, when he obtained the new mike he also needed a transformer in order to match the input circuit. Only one reader succeeded in solving correctly Problem No. 297, and a book is accordingly being forwarded by P. Cook, “Aston,” Mutton Road, Chepstow, Mon.

Clifton String Orchestra
A STRING Orchestra programme from a West of England studio on June 13th will include the Glazounov Saxophone Concerto, with Monte Stanford as soloist. The Clifton String Orchestra will be led by Joan Allen and conducted by Reginald Redman, and the programme will also include the Theme and Derivations by Becket Williams, the West Country composer.
COLOUR CODES EXPLAINED

Details of all the Special Codes Now Employed to Identify the Values of Components and Their Use in Modern Circuits

EVERY constructor is now aware of the fact that modern fixed resistors are coloured to indicate the value—this being regarded as a much more satisfactory method than affixing a label which might at some future date become lost or defaced and thus prevent the value of the component from being ascertained. In addition to resistors, however, condensers are also provided with such a code, although this is not in such common use in this country. Manufacturers of complete receivers often adopt a code for the wiring of the receiver so that their service engineers may more easily locate certain leads when testing the receiver. By adopting a colour code for standardisation it becomes a simple matter for a service man or experimenter instantly to identify components or other details in any make of receiver, and it has been decided that such items as mains transformers and battery leads shall also be identified in a similar manner. To enable every reader to become acquainted with all these codes we give below those which have so far been standardised, and although there have been given before in various issues they are now collected in a single article so that it may be cut out and kept in the workshop for ready reference.

Resistance Codes

For fixed resistors the code consists of three colours, and although these are sometimes given in the form of three bands or dots on the component, the standard way which is most generally adopted is to colour the entire body of the component for the first colour, one of the tips for the second colour, and to display in the third the form or a dot or band on the centre of the body. This is the order in which the colours are read, and the colour in each case stand for the figures from 0 to 9. The complete reference table is as follows:

<table>
<thead>
<tr>
<th>Colour</th>
<th>Fig.</th>
<th>No. of Noughts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Red</td>
<td>2</td>
<td>00</td>
</tr>
<tr>
<td>Orange</td>
<td>3</td>
<td>000</td>
</tr>
<tr>
<td>Yellow</td>
<td>4</td>
<td>0000</td>
</tr>
<tr>
<td>Blue</td>
<td>5</td>
<td>00000</td>
</tr>
<tr>
<td>Violet</td>
<td>6</td>
<td>000000</td>
</tr>
<tr>
<td>Grey</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

An example will make the scheme quite clear. Suppose we have a resistance with a red body, a black tip and an orange spot or band. Then the value will be 2 (red body) followed by one nought (indicated by the black tip), followed by three noughts, or in other words 20,000 ohms. If it is found that a resistance does not bear a dot or band on the body it indicates that the dot is of the same colour as the body.

Condenser Codes

In the case of fixed condensers the code is exactly similar but the basis, instead of the ohm, is the micro-microfarad. Thus a 0.001 ufd. condenser (which is the same as a 1,000 micro-microfarad) would be indicated by black followed by another black, and by a red dot followed by a red dot. In addition to small fixed condensers, however, a code is drawn up for multiple condenser blocks provided with cable or flexible leads for connection.

The following is the recommended code:

- The highest capacity positive voltage ± Red
- The highest positive voltage ± Blue
- The fourth highest positive voltage ± Violet
- The fifth highest positive voltage ± Black
- Principal negative connection ± Black
- Second negative connection ± Brown
- Centre connection for voltage double condensers ± White

Where a condenser has two terminal wires only, they are red and black (for positive and negative respectively), irrespective of the capacity and voltage rating of the condenser. Where two capacities are equal, the higher voltage shall be given the higher colour in the table. In addition to the colours it is also necessary to mark condensers in which two or more complete units are embodied, and for this purpose the following marks are adopted:

- Common positive junctions shall be marked +
- Common negative junctions shall be marked -
- Series connections shall be marked ±

Unconnected Sections

Thus S-8 denotes 2 sections with a common positive.
S-8 denotes 2 sections with a common negative.
82S denotes a series voltage doubler connection.
S & 8 denotes 2 isolated sections.

Fuses

Fuses for use in battery or mains receivers are also coded to indicate the value, the colour usually being shown by a strip of coloured paper inside the glass tubular container. The code is as follows:

- 60 mA Black 1 amp Dark Blue
- 100 mA Grey 1 amp Light Blue
- 150 mA Red 1 amp Purple
- 250 mA Brown 1 amp White
- 500 mA Yellow 2 amp Black & White
- 750 mA Green 3 amp

Mains Transformers

In the case of modern mains transformers flexible leads are used for connection in place of terminals, and these leads are covered either with coloured cotton or passed through insulated sleeving with the appropriate colour embodied. The primary has a black lead for the 0 connection (one side of the primary), and for the remaining tapping a combination of black and another colour is employed. Usually the lead is striped for this purpose. Black and green indicates 10 volts, black and yellow 210 volts, black and red 230 volts, and black and brown 250 volts. The screen sometimes interposed between primary and secondary is generally a bare wire.

For the secondaries red is employed for the high voltage, the centre tap being red and yellow. The rectifier heater is green, with a brown and yellow centre tap and, for the heaters brown, with a brown and yellow centre tap in addition. Any additional L.T. winding is coloured blue with blue and yellow centre tap. It will thus be seen that centre taps are indicated by a yellow lead bearing a stripe corresponding to the remaining connections to the section which is tapped.

Battery Leads and Plugs

In the case of combination leads for battery voltages, or for the plugs which are fitted to the ends of such leads, the code adopted to indicate the various tapping points is as follows:

- Negative voltage (H.T.) Red
- Second positive voltage (H.T.) Yellow
- Primary voltage (L.T.) Black & Brown
- Secondary voltage (L.T.) Brown & Yellow
- Halfwave rectifiers Brown & Blue
- Fullwave rectifiers Black & Yellow
- Rectifier heater Green & Red
- 2nd Edition
- Additional L.T. winding Blue

Any additional point such as 4th greatest G.B. negative, or 5th greatest H.T. positive, or positive bias is violet, and any centre tap, white.

NEWNES' TELEVISION AND SHORT-WAVE HANDBOOK

PRACTICAL AND AMATEUR WIRELESS

2nd Edition

By F. J. CAMM

Price 3/6 or 45½ by post from the Publishing Dept., George Newnes, Ltd., Tower House, Southamptom St., Strand, London, W.C.2
LISTENERS in London or other big cities, in the case of some of the difficulties which are encountered in country districts, although little has been done in the country of difficulties met with in the case of these B.B.C. stations which operate on a common wave-length. In America, however, people living between Chicago and Lincoln, Nebraska, were annoyed by a barrel-like effect that linked the WBBM and KFAB programmes from either or both stations. They complained to the Columbia Broadcasting System, and set in motion the engineering force. Eventually quite a contraption resulted, and the problem was cleared up. The following data concerning the interesting problem was collected by the Radio News of America.

It took twenty-three thousandths of a second for an electrical current to travel the distance between them, a fifty-six mile strip of territory between the two stations where a telephone conversation was clear. The telephone company, although little has been done regarding equalising frequency extremes from 100 to 5,000 cycles, has made a number of attempts at solving the problem.

The only cure was to get exact time synchronization. This was much more difficult than it sounded, for the delay had to be delayed by the necessary twenty-three thousandths of a second.

Falknor had a section of lead sewer pipe cut to the proper length, and set it up with a loudspeaker at one end and a dynamic micro at the other. He killed echoes in the speaker by installing an exponential matching unit made of aluminium casting. It was designed to match the impedance of the speaker with that of the pipe.

However, there was sound reflected from the pipe. To remove this, he used kerosene and a filter section of lead pipe, and at the other end of the pipe, damping equipment was installed.

Falknor is modest: he says it is all in the day's work. The finished contraption worked as advertised, according to the Radio News of America.

The Electrical System

The electrical delay system that was put in permanent service has an even wider range, equalising frequency extremes from 50 to 6,000 cycles.

It is made up of filter sections having attenuation characteristics similar to ordinary telephone cable. The problems of equalisation and repeating are similar to those encountered with cable.

Each filter section gives the greatest time delay possible while having the ratio of loss between the lowest and highest frequencies such that transmission at the two extremes may be equalised.

The programme is fed to the first filter section. Then it goes to an equaliser, which, of course, reduces total volume, and then to an amplifier. From here it goes to the second filter section, etc., until it has been delayed the correct time interval.

Since the robot timer was put in service, new telephone cable between WBBM and KFAB has increased the time lag to thirty-six thousandths of a second. In the equipment now used it takes twenty filter sections to delay transmission this long, and the programmes radiate from the two stations at exactly the same instant.

Thus, sometimes does the broadcast engineer face and solve problems which are "not in the book" and for which he must use his ingenuity. Falknor is modest: he says it is all in the day's work.

A Robot Timer

Some Interesting Details of a Method Used in America to Overcome Distortion on a Dual-wavelength Programme

The finished contraption worked as advertised, according to the Radio News of America.

Programmes were fed into the loudspeaker at the same time as they left for KFAB. Sound from the speaker went through the matching unit to the lead pipe, and at the end of twenty-three thousandths of a second had reached the pipe. The cloth network eliminated most echoes, but cut the entire volume enough so the microphone output was fed through an amplifier. It then passed through a series of equalisers and amplifiers to eliminate all humps, and then to the transmitter. While all this was happening the identical programme was travelling the wires to Lincoln, and was broadcast from KFAB at the exact instant it left the serial of WBBM. It gave satisfactory results over a tone range from 100 to 6,000 cycles from the day the two stations were synchronised, and was used for several months.

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NOW READY!

WIRELESS COILS, CHOKES

AND TRANSFORMERS, AND

HOW TO MAKE THEM.

Edited by

F. J. CAMM

NOW READY!
Adding Refinements to 

"THE SIMPLEST SHORT-WAVE TWO"

Details of a Few Interesting Modifications which can be made to the Original Receiver Described in PRACTICAL AND AMATEUR WIRELESS, dated April 3rd, 1937.

By FRANK PRESTON.

The very simple two-valve short-wave receiver described in the issue dated April 3rd, 1937, has proved extremely popular, and many readers have written to tell us of the excellent results which they have obtained with it. As the name suggests, the main feature of the set was its real simplicity, which was combined with sane and sound design. It would not be easy to improve the range or reliability of the set without adding to the number of valves, but there are a few refinements which many experimenters might wish to add.

I will make it clear in the first place, however, that the refinements will not make the set more efficient, any more than a small trimmer with a .00016-mfd. condenser (or a component of approximately this value) should be of the midget type, since there is insufficient space on the panel for a larger one. It will also be appreciated that the .0005-mfd. pre-set condenser is no longer required, since the fixed vanes of the two tuning condensers are connected directly to the top of the grid winding on the coil.

The lager of the two new condensers constitutes the "tank," and is used merely to select the required band of frequencies, while the 25-mfd. component is the tuner, or trimmer; this is used for station selection once the required band has been chosen. In consequence of this arrangement, tuning is considerably simplified and greater accuracy is possible.

Those who wish to buy two new condensers could use the special Eddystone bandspread tuning outfit, which comprises a tank condenser with scale graduated in ten steps and with a special "stop" device for these steps, and a small trimmer with slow-motion drive. The trimmer has a maximum capacity of approximately one-tenth that of the tank unit, and therefore fully covers each of the ten bands.

It will be understood that the existing two condensers—.0005-mfd. variable in series with the .0005-mfd. pre-set could be retained as a tank or band selector if the variable condenser were moved to the new position and fitted with a plain knob and pointer or small dial. If the condenser is not of the midget type it will probably be necessary to lower the reaction condenser to make room for the .0005-mfd. component above it.

L.F. Transformer Coupling

Another refinement which is worth while when greater signal strength is desired from the more distant stations consists of replacing the resistance-capacity coupling between the two valves by transformer coupling, as shown in Fig. 2. The transformer should be a small one—the primary has to carry only a small current—so that it can be mounted on the under-side of the chassis between the two valveholders or in another convenient position not too far away from the detector valveholder. The transformer should have a ratio of about 1 to 3, since it has a higher ratio than this instability might become troublesome. In any case, the output pentode will be fully loaded on most stations with a transformer of the ratio needed.

To check any slight tendency toward instability produced by using the transformer it might be found desirable to fit a .001 or .002-mfd. fixed condenser between the anode of the pentode and earth. This, also, is shown in Fig. 2.

H.F. Pentode Detector

H.F. pentodes make very effective detectors and often allow of better reaction...
control, especially in short-wave receivers. It is not difficult to replace the original triode by a pentode by following the circuit and connections shown in Fig. 4. In this case it will be better to retain resistance-capacity interstage coupling, or otherwise to use a resistance-fed transformer. The reason is that the H.F. pentode has a very high impedance and for efficient operation requires a high anode load. Actually, the load resistance should be not less than 250,000 ohms, but this is too high in practice, due of the older-fashioned push-pull type if one is available, or it can be of the more usual toggle type, such as the Bulgin type 8.67. When there is no objection to spending a few extra shillings it is worth while to replace the reaction condenser by one of the special midget slow-motion type. This is generally made in a capacity of .0005 mfd. only, but that will usually be a sufficiently high value. The type of condenser in question has a drive giving a step-down ratio of about 10 to 1, which is ideal for reaction control. The price of the Eddystone component is 6e.

Automatic Grid Bias

The only other refinement that could be recommended is that of automatic grid bias. This simply involves the inclusion of a 500-ohm resistor in place of the previous 50,000-ohm component, while a 20,000-ohm resistor is fitted in place of the 50,000-ohm variable resistor used for controlling the detector anode voltage.

The variable control is retained, however, but is used for feeding the screening grid. A .1-mfd. tubular condenser is also connected between the screening grid and earth to act as an H.F. by-pass. It serves virtually the same purpose as before, and is valuable in “smoothing-out” reaction control, as well as for making final reaction settings to bring a signal up to its maximum strength. The extra components are very small and can thus be easily accommodated. It will be understood that a four-pin H.F. pentode should be used to save the trouble of changing the valveholder and modifying all of the connections. This particular type of valve is, as many readers are aware, obsolescent, but is still obtainable if a spare is not already on hand.

Three-point Switch

Due to fitting the potentiometer for controlling the screening-grid voltage, it becomes necessary to replace the two-point on-off switch by a three-point switch. This is so that both the H.T. and L.T. negative leads can be broken when the set is switched off. If the two-point switch were retained there would be a constant drain of H.T. current through the potentiometer, valve filaments and accumulator, from H.T. to H.T.—. Notice also that the new switch is in the negative instead of the positive L.T. circuit. The switch can be connected between the screening grid and EARTH to act as an H.F. by-pass. A .1-mfd. tubular condenser is also connected for feeding the screening grid.

H.F. Amplifier

Since the original receiver was made, an H.T. unit has been added. This does not greatly extend the range, except when a good aerial is not available. It does, however, improve reaction control when an ordinary broadcast aerial is used; this would normally exert a pronounced damping effect and possibly prevent the detector from oscillating at certain tuning points.

The amplifier consisted of an H.F. pentode valve, with aperiodic grid circuit, comprising a good short-wave H.F. choke. Aerial connection to one end of this was made through a .00005-mfd. fixed condenser. An H.F. choke was inserted in the anode circuit, a lead being taken from the “anode” end to the aerial terminal of the two-valve through a .001-mfd. fixed condenser. It will be understood from this that the circuit was perfectly standard.

![Diagram of H.F. Amplifier](image)
ON YOUR WAVELENGTH

A Black List

C. J. H. of Moreton-in-March, tells me that he and a friend, both members of the B.L.D.L.C., are compiling a black-list of amateurs who do not respond with a QSL card when an International reply coupon is enclosed, or a stamped addressed envelope in the case of English amateurs. I quite agree that this is an annoying remissness on the part of amateurs. If they do not want S.W.L. reports they should say so at the end of their transmissions. Will amateurs please take this friendly hint? How many of them collect unused stamps?

Second-hand Sets

I WROTE a paragraph last week on the problem of disposing of second-hand sets at ridiculous prices by dealers who have not the vision to see the ends of their noses. I listened to the other day to a very interesting discussion on this same subject, and it seemed to be the general view that the problem was created firstly by over-production; secondly by the too-rapid production of new models; thirdly by the methods of some manufacturers of unloading large consignments of their sets at reduced discounts in order to get some ready money, and by the competition of those who cannot really claim to be in the trade. Now if a manufacturer offers sets to dealers at more than the agreed discount, the dealer is rendering him a service, firstly in taking them, and secondly in getting rid of them. A dealer knows that he can only sell, say, a dozen of a particular wireless set in one season. The manufacturer comes along andpresses him to take three dozen at a reduced discount. The dealer, therefore, has no option but to offer them at cut prices in order to clear them. The part-exchange racket is responsible in some measure for price cutting. In the motor trade you could walk along a certain road, buy a second-hand car for four or five pounds, and immediately trade it in at a shop across the road and be allowed forty or fifty pounds for it. Those dealers who have agreed to maintain fixed retail prices often dodge the issue by allowing some fabulous sum for a piece of junk. Another cause of the trouble is the fact that there are too many wireless dealers, or, rather, too many people selling wireless sets. The trade has become so cut up that it does not pay many firms to deal entirely in radio, so you find wireless sets mixed with potatoes, cabbages, bicycles, sewing machines, and what not. If the number of wireless agencies were reduced it would pay those remaining to deal entirely in wireless, and it would be easier to enforce trade agreements. There are so many people dabbling in the business that their methods compel the legitimate dealer to follow suit. The wireless industry is a new one, and it has not yet learned the methods of older industries. It cannot understand slumps, and presumes that trade is bad because it does not remain at the level it did in the boom years. There are far too many gadgets on wireless sets which are not used and not wanted. Push-button tuning is the cry this year. I cannot trace that anyone complains about having to tune to a particular station, so I do not know why the trade should give the public something for which it has not asked. The public does, however, complain about poor quality, lack of selectivity, interference, and so on, and I recommend the trade to concentrate upon improving the radio side of their receivers before toying around with the mechanical side. There are far too many different types of valves, and far too many new types of valves being produced. All of these things inculcate uncertainty in the minds of the public, and they are afraid to buy a new receiver lest it be rendered obsolete the following week, or jabbed off for half the price. Stability is required in the wireless trade, and concentration on a few models rather than the production of a new model because a competitor round the corner is doing the same. Many manufacturers follow one another like flocks of third-rate sheep, but without the mentality of third-rate sheep. They are purely industrialists and financiers, who imagine that you can go on selling wireless sets by a succession of publicity stunts, drawing attention to their imaginary virtues. I hope all that will soon cease.

Radiolympia

I SAW the Editor the other day filling in reams of forms concerning the Practical and Amateur Wireless stand at "Radiolympia." Which reminds me that within a few weeks people will be strolling round the Exhibition asking to see "Thermion," trying to avoid "Thermion," saying that they do not wish to see "Thermion," inquiring who is "Thermion," and telling other people what they think of "Thermion." The pro-croonerites (the whole three of them) will be round as usual trying to convert all and sundry to the merits of "Tin." I really must give this word to the English language, for it is an insult to use a good dictionary word such as rhythm to describe the concatenation of cacophonous tin tinnabulation which goes under the name of swing music. Swing music! How I like that word! How I should like to see every jazz-band leader hanging about.

Song Plugging

A FEW years ago the B.B.C. set its face against song plugging. It informed band leaders that they were not to indulge in the reprehensible practice of receiving "considerations" from music publishers for plugging several times nightly, each day in the week, for the full life of a song (at least a fortnight), the latest parcular number—usually a farstrat. It is true to say that ninety-nine per cent. of the public loathe the tunes. I believe the B.B.C. selected its own songs for dance bands, in an effort to put a stop to such illegal conduct. Now I learn song plugging has broken out again, and the B.B.C. has issued a stern warning about it. I shall be glad if my readers will report to me any occasion on which a song is plugged by any particular
vision on one carrier frequency, the idea may separate carrier wave for each colour. Becoming commercially practical, but separate colour tone modulations so that to this idea is at once obvious, and purposes.

picture on to a screen for viewing ning device for projecting the coloured prism which combines the primary colours and focused on to a special glass prism consisting of a combination of vibrating cells.

The separate modulated sources having the appropriate shock when the fingers were placed on the terminals after a period of two weeks.

Chassis Connections

A DIFFICULTY which is often experienced in some receivers is that instability arises, due to poor earth connections. It is a common practice to make a number of earth points in the form of screws or bolts in the chassis, and these are used to act as earth return points. Where instability is found difficult to cure it is recommended that the bolts be connected together by bare wire, preferably soldering the heads or nuts. An extreme case recently came to hand, however, where, in spite of such earth bonding, the instability persisted, although improved slightly by the inter-connection. It was subsequently found that the chassis was greasy and the bolts and nuts were not making sound contact with the chassis, and this point should be borne in mind. The ideal scheme is, of course, to solder or otherwise anchor all earth leads to the chassis surface.

Ganging Coils

WHERE it is found difficult to gang two or more coils, if the coils and condenser are so close as to be designed to match and gang accurately, the inter-circuit wiring should be suspected. The stray capacitances introduced in this way may in some cases upset tuning but may be balanced by connecting one of the midget padding condensers across the low section. Tests will, of course, have to be made to find which section is low, and a suitable trimmer joined across the tuning condenser—not across the coil.

O/C Condensers

A DIFFICULTY which often arises when testing a defective receiver is the tracing of an open-circuited condenser. Rough tests with phones or meters will not reveal such a fault, and the only effective test is to connect the condenser across a voltage supply, leave it for a short time, and then place it on one side for a fairly long period of time. It should then be joined across a pair of phones or a meter and a click or a flick of the needle should be obtained, indicating that the condenser insulation is good and that the condenser is in good working order. A modern high-voltage oil-dielectric condenser which was recently tested in this way gave an appreciable shock when the fingers were placed on the terminals after a period of two weeks.

PRACTICAL AND AMATEUR WIRELESS

June 11th, 1938

Push-button Tuning

I ASKED readers to let me know if they were interested in a push-button receiver; I have received only one postcard, and I hope that this will be a lesson to the radio trade that the public is not really interested in push-button tuning.

Pictures with Colour

WITH an eye to the future many inventors are flirting with various ideas which they hope will bring to fruition the perfect colour television scheme. This is, of course, quite a natural idea, for there is no doubt that as time passes every television service will be capable of furnishing high quality pictures complete with colour tones and stereoscopic effects. At the moment every scheme propounded adds considerably to the complication of the transmitting and receiving equipment in no small measure, and until material simplification can take place we shall have to be content with monochromatic pictures. Even so, each new colour television proposal should be examined with care to see if it lends itself to commercial application. One idea which has just been propounded employs a mechanical scanner consisting of a combination of vibrating mirrors or prisms which serve as the scanner for the optical image re-flected from the scene being televised. This beam is then projected and focused on to a special glass prism which breaks the light up into its spectra colours in the usual way. Each of the primary colours it is desired to incorporate in the picture is made separately to activate photoelectric cells highly responsive to their own particular colours. From each individual cell the output is amplified and fed as a modulation to separate carrier waves. At the receiving end the various carrier waves feed their own signals to light-modulated sources having the appropriate colour filters. The separate beams then pass through another prism which combines the effects prior to being thrown on to a scanning device for projecting the coloured picture on to a screen for viewing purposes. One inherent drawback to this idea is at once obvious, and that is the necessity for using a separate carrier wave for each colour.

Agitation

i AM informed that the province are beginning to display marked agitation in their demands for television facilities comparable with those now enjoyed by London and the Home Counties. Every time the question is raised the reply is to the effect that the delay is not a whim of the B.B.C., but the advice of the Government-appointed television advisory committee. The apparent complacency of this body has already been the subject of Press comment, for since it was formed there have been only two public announcements. It is felt, with some justification, that this country will lose its lead in television unless plans for the service beyond the present single station are proceeded with immediately. Surely enough experience has been obtained by engineering and production staff alike, while the co-axial cable could provide instant facilities for tests to be undertaken in at least one other important city of this country. Perhaps the authorities are holding their hand until some psychological moment such as the commencement of the autumn radio season. Television is far less seasonal than aural radio, however, and surely something is due to the public who find the money to provide the broadcasting services.

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The Cyclist

2d. Every Wednesday

"THE CYCLIST,"
A NOVEL TELEVISION PICTURE TRANSMITTER

This Article Describes Equipment Used for Providing Picture Signals Independent of those Radiated by the B.B.C.

A NOVEL TELEVISION PICTURE TRANSMITTER

ALTHOUGH the times during which high-definition television signals are available for normal viewing has of late been extended, as far as the manufacturer of cathode-ray tubes and television receivers is concerned, he is confined to the morning and afternoon transmissions of from two to two and half hours daily. This is quite inadequate for most purposes, and in many cases steps have been taken in some works to provide picture signals through the medium of a local transmitter. This can take one of several forms according to special needs, and one of the most interesting is that designed by the Baird laboratories; details of which have just been released. Subject movement in a picture for test purposes is seldom required and in this particular case a still picture scanner is employed, the equipment having been in use for nearly two years, giving satisfactory and reliable service throughout the whole of the period. The arrangement is wholly electronic in operation, and once switched on and set up according to the standards desired can be left running without constant supervision.

The Picture Tube

The essential feature of the apparatus is a special form of cathode-ray tube which is illustrated in Fig. 2. This is about 2ft. long, and at one end is the standard neck and electrode assembly common to Baird "Cathovisor" cathode-ray tubes, that has an indirectly-heated cathode, modulator electrode, and high potential anode. The tube then "bells" out to a cylindrical section approximately 4ins. in diameter, at the far end of which is mounted at right angles to the tube axis a circular nickel plate, 3½in. diameter. On this has been "printed" a picture 2½in. by 2½in. which resembles in formation the screen mesh blocks used for illustrating this journal, except that the picture is a positive one instead of the negative required for printing purposes.

The picture itself, conforming by measurement to the standard B.B.C. five to four ratio, comprises the head and shoulders of a woman (Madeleine Carroll, so often used for test purposes by the Baird Company from their Crystal Palace station, prior to the fire), dressed in a check blouse, together with lettering and a drawn pattern. Made up in this way the dissected picture signal, is picked up by a collector anode formed by an interior metalizing of the tube wall, as seen clearly in Fig. 2. It has been released by the exposed metallic portions of the picture than by the composition filling the interstices. Naturally, the number of electrons released during the whole scan period will be in accordance with the picture employed, and this varying secondary emission of electrons from the plate. Before being mounted in position inside the tube the plate is treated by filling the block screen with its time-base generator, and that for generating the pulses required for the picture tube. This acts as a monitor, and the picture built up in the usual way on the screen is observed by the operator on a horizontal mirror mounted on a shelf about one foot below. An aperture in the rack panel gives a clear view of this picture, and in this way it is a simple matter for the conveniently placed controls to be adjusted to give the picture standard desired. At the base of the rack are the necessary power packs for feeding the supplies through to the equipment above.

A Second Rack

Used in conjunction with this rack is a second one, which is built to house both the line and frame synchronizing pulse generators. These pulses are then fed to the appropriate sections of the time-base generators of the picture, and monitor tubes, so as to lock them. This is quite unnecessary for normal test purposes, the generated picture signal is made to modulate a special transmitter, fed with 405-line interlaced synchronizing pulses, so that there is available a still picture which simulates in every characteristic that otherwise provided by the present-day B.B.C. standard television transmissions.
A D.C. Light Device

A D.C. light device has been employed, and this also applies to many towns on the south coast of England, even when the distance separating the receiver from the Alexandra Palace is over 100 miles. While a good deal of this work has been devoted to the improved sensitivity of the superheterodyne vision receivers which have been employed, it is certain that aerial investigation has played its part in no small measure. One of the new designs has been called the tilted-wire aerial, and this has unidirectional qualities, thus obviating any of the unpleasant pick-up in the form of reflected radiations from neighbouring metallic structures. Naturally, with any directional television aerial very great care has to be taken in securing the correct bearings, otherwise much of its value would be lost. On the other hand, if sources of electrical interference or reflections come from the same direction as the picture signals, then the scheme is useless. A "horizontal level" of the final signal will be too high to give satisfactory picture quality. An enormous amount of both theoretical and practical research work is now being undertaken on these aerial problems, and quite radical deviations from the usual conventional forms of aerial or dipole with reflector are being tried, both in this country and abroad, in an effort to find one or more solutions to the ingrowing vagaries of ultra-short-wave reception. The fact that the B.B.C. are now radiating exceptionally fine quality sound transmissions on the ultra-short wave-band for television, at times when television signals are not on the air, as a dual sound and vision service, is giving an added incentive to work of this nature. Since this experiment is likely to be extended there is every inducement for readers of this journal to undertake work of their own in this field, even if they are situated well outside what is frequently regarded as the Alexandra Palace service area.

Good News

With a view to being ready for the anticipated programme improvements before the opening of the radio show at Olympia, work on the provision of more studio accommodation at the Alexandra Palace has now started. The large temporary studio is being altered, re-wired and re-equipped, and it is understood that four new cameras of the improved Emitron type will be used as soon as everything is completed. From tests already undertaken, it is known that these cameras are capable of producing pictures having a much clearer definition, greater freedom from mush, and more depth of focus. During the period that this work is being carried out it will be necessary to revert to single studio working for a period of six to eight weeks, and this will mean rather cramped conditions for artists, engineers and officials. To help matters, however, the mobile unit will be in evidence to provide some extremely interesting and very ambitious outside broadcasts. In addition, it is also learned that the large theatre at Alexandra Palace is to be used by the B.B.C. for television purposes so that theatrical productions can be undertaken with an audience. A small number of visitors are nearly always present in the studio when television transmissions are being undertaken, although the number is very strictly limited, but if the proposed scheme materialises then arrangements of a parallel character to those in force at St. George's Hall may come into effect.

Correcting Distortion

If a standard type of cathode-ray tube was scanned in the usual way at the correct line and frame frequencies without any form of correction being applied, then the resultant scanning field seen on the tube's screen would exhibit a form of pinpoint distortion due to the convex nature of the tube end. The glass housing is necessary in order to withstand the high pressures to which the exhausted tube is subjected. By electrically neutralising this distortion, however, it is possible to correct this distortion so that it is almost imperceptible to the human eye. Another proposal put forward to avoid this difficulty is to incorporate a flat plate complete with its fluorescent powder sprayed on the inside of the tube and quite close to the electron beam. With this built-up picture is observed through the flat end in the usual way.

Limiting Modulation Effect

While it is admitted quite readily that the cathode-ray tube is not yet made, it is conceded on every side that the improvements in manufacture over the last twelve months have resulted in the production of really good quality products. One of the theoretical standards which is aimed at by designers is a tube which has a spot of light on the screen completely independent of all effects except picture signal modulation for its changes in brightness. If any modern tube is examined very carefully it will be seen that changes of brightness bring about a corresponding change in spot size. Increased brightness causes increased size and this tends to destroy partially the sharpness and detail of the picture. Since the tracing is usually done in the form of a square with a field of repulsion one with the other, and when increased signal modulation brings about an increase in their number they spread farther apart slightly, and so give a larger spot in spite of the focusing action which is effected either electrostatically or electromagnetically. Several

(Continued on page 320)
A Calibrated Bias Control Indicator

In some new test apparatus I have constructed, the necessity for some form of visible control for logging purposes caused me to devise the rather novel idea of some new test apparatus. I have constructed, the necessity for some form of visible control for logging purposes caused me to devise the rather novel idea of a calibrated bias control.

The sketch consists of a buzzer made from a disused electric bell movement. The armature is coupled to the armature of the P.U., thus the reverberations are transmitted to the P.U. and regenerated, giving a note which, of course, is modulated, when desired, by the adjustment of the buzzer pitch through the back contact, B.

The simplicity of the whole arrangement will no doubt appeal to many interested readers, and its usefulness certainly warrants the little time spent in its construction.

That Dodge of Yours!

Every Reader of "PRACTICAL AND AMATEUR 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 wrinkle 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 AND AMATEUR WIRELESS," George Newnes, Ltd., Tower House, Southampton Street, Second, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Radio Wrinkles." DO NOT enclose Queries with your wrinkles.

A Carrier for a Small Portable Wireless

The accompanying sketch shows how I made a neat and serviceable carrier for my portable radio. A suede jacket (the suede being worn on the outside and the zipp fastening in good condition) was cut and turned right side in to make the carrier. Care is needed, of course, in cutting the lid in the correct position tap lightly with a mallet and then remove. This simple process will leave dents ready for brad-awling, and the screws will then go in the correct positions.—D. K. Powell (Hereford).

A Simple Signal Generator

The simple signal generator shown in the sketch consists of a buzzer made from a disused electric bell movement. The armature is coupled to the armature of the P.U., thus the reverberations are transmitted to the P.U. and regenerated, giving a note which, of course, is modulated, when desired, by the adjustment of the buzzer pitch through the back contact, B.

The simplicity of the whole arrangement will no doubt appeal to many interested readers, and its usefulness certainly warrants the little time spent in its construction.

Continuity tests and stage gain tests in L.F. amplifiers can be made, whilst the only current required for its operation is derived from a 3 to 4.5v. dry battery, which operates the buzzer. One method of mounting the unit is shown in the pictorial sketch, and the circuit diagram shows clearly the wiring connections.—E. A. Collier (Southend).

An easily-made signal generator.
In the case of a dead receiver, with no signal coming through, the common procedure of stage jumping can often be superseded by the process of searching for the "lost" signal with the Y amplifier test with the lead of the C.R.O. time-base switched on.

Within limitations it is even possible to probe around the H.F. section of a receiver and to detect the presence of H.F. oscillations. The actual appearance of the screen "picture" produced by modulated high frequency will depend upon the time-base frequency and the type of oscillograph. With the usual servicing type of oscillograph and a comparatively low time-base frequency the H.F. trace will appear as a blur of light shaped within an outline corresponding to the audio modulation of the H.F. We have used the word limitations in connection with this method of H.F. circuit testing. Obviously, the amplification provided by the Y amplifier will be the deciding factor as to how small an amplitude of H.F. will be the minimum that will show any signs on the C.R.O. screen.

Figs. 13 to 16 reproduce the tracking of a modulated test signal, starting from the anode of the output valve of a superhet and working forward for a certain distance through the receiver. Fig. 13 was obtained from the anode of the output valve, and Fig. 14 from the grid of this valve. For Fig. 15 the Y amplifier lead was taken to the grid of the double-diode-triode which preceded the output valve. The amplitudes of the traces of Figs. 13 and 14 should not be compared with those of Figs. 15 and 16. The gain of the Y amplifier was kept well down for the traces of Figs. 13 and 14, but was brought up for the remainder of the tests. Fig. 16 shows the signal at the signal diode.

Performance over a Waveband

If an overall H.F. response curve of a receiver is taken on a "wobbled" test signal at one end of a waveband and the receiver tuning control is turned, the curve on the screen will shift along towards the edge of the screen (and disappear if the receiver tuning is altered too much). By a corresponding change of test oscillator tuning the "picture" can be pulled back in position. It should be obvious that by appropriate changes of both receiver and test oscillator tuning the H.F. sensitivity and selectivity of the receiver can be studied at every point over the whole waveband. The test oscillator output amplitude should be constant.

Receiver Comparisons

By arranging a convenient form of change-over switching for the test oscillator output and the Y amplifier input leads, the relative performances of two receivers can be very readily determined. The use of overall H.F. response-curve indications will give all the information that is required as regards comparisons between the H.F. sensitivity and selectivity of the two receivers.

To allow for overall sensitivity, the C.R.O. could be used as an output meter. If it becomes necessary to compare L.F. gains only, then an audio test voltage could be applied to the appropriate points of the two receivers.

In Conclusion

It will be noted that readers who have not yet used C.R.O. apparatus will have gathered some idea from the foregoing of the versatility of the C.R.O. from the servicing point of view, even when it is associated with no more than a "wobbled oscillator."

There are many test applications that must suggest themselves to the reader who understands the principles of the C.R.O. Obvious possibilities associated with the waveform obtained on an output meter test will come to mind. Figs. 17, 18 and 19 are given just to emphasise the fact that even when the C.R.O. is acting as an output meter it is still a fault "tell-tale."

The reader will no doubt consider the idea of a study of output waveform giving a clue as to the type of any distortion that may be caused by a fault, although it is to be remembered that the ear of an experienced man will take some beating when it comes to a matter of drawing a quick distinction between one form of distortion and another.

AMERICAN TELEVISION PROGRAMMES

One of the excuses put forward in America for the apparent slow development of television towards the provision of a public service is that of complete standard settlement, so that all the radio networks operating in that country can give programmes comparable in their range of choice to that now existing in sound broadcasting. Channel widths over a definite range have been laid down by co-ordinating committees in the United States, and whereas in England there is one station, and sets can therefore be designed without a tuning range, in America it is proposed to give a selection of programmes. While this may complicate receiver design it is undoubtedly a very sound idea, and should do much towards popularising any service if the proposed scheme materialises.

Experience has shown with the Alexandra Palace station that every good purpose can be served if there was at least one alternative programme for viewers. Already complaints have been made that the excellence of several items included in a week's programme has emphasised the feebleness and poor quality of many supporting items. This is a matter for investigation, and even making allowances for cramped studio conditions there is surely no absence of artist talent to provide consistently good programmes and entertainment quality. This should be a factor demanding careful attention, for the growth of interest, and consequent building up of a fine British industry, hinges almost entirely at the moment on programme quality.
Some of the Causes of Crackling Noises Revealed, and Hints on Locating and Curing the Trouble. By W. J. Delaney

Cutting Out Crackles

One of the commonest troubles met with in receivers is a background of crackles accompanying every programme. It must be realised at the outset that normal atmospheric disturbances can give rise to this trouble, and local electrical apparatus or machinery may also cause crackles, and thus the listener often puts up with the trouble in the mistaken belief that it is beyond his control. Unfortunately, normal atmospheric disturbances of the type mentioned cannot be cured, and the more powerful the receiver the more prominent become these noises. It is a simple matter, however, for the listener to ascertain in a few moments whether the trouble comes from an outside source or is due to a defect in his equipment, and all that is necessary for this purpose is to disconnect both aerial and earth leads. Signals will naturally cease, and if at the source or is due to a defect in his equipment, whether the trouble comes from an outside listener to ascertain in a few moments it is a simple matter, however, for the to ascertain in a few moments the result is a crackle in the loudspeaker to cut out H.F. stages, and detector stage to cut out L.F. stages, and this will, in most cases, enable the stage in which the fault exists to be located. On the other hand, meters will sometimes assist as they will show the source of the crackles by indicating a fluctuating current. It is not always possible, however, to see the results of an intermittent connection on a meter, as in some cases the L.F. circuit may be the source of the trouble, and no current may be present. It must be assumed, however, that in the majority of cases the crackles will only be caused when the intermittent circuit is one in which a current is flowing. The usual procedure was, of course, made good, and the valve was tested without success. The mains section was substituted, and after each component had been replaced, in case of some fault which was not revealed by standard test methods, it was found that it still existed. Obviously, then, it was outside the set, and eventually it was found that an electric-light switch was causing it. The spring arm into which the contact presses was opened, and

Faulty Components

If, as already mentioned, removal of the aerial and earth make no difference to the noises, then the source will be found in the receiver or speaker and they must accordingly be examined stage by stage. It is a simple matter to connect 'phones in the detector stage to cut out L.F. stages, and then carefully examine that lead from one end to the other and search for a defect. Should one of them alone restore the noise, then carefully examine that lead from one end to the other and search for a defect.

Broken Strands

If a stranded wire is used in either position the noises may be caused merely by a single broken strand. If two ends at the break, when vibrated, will make and break, and the result is a crackle in the loudspeaker or headphones. A similar fracture in a battery lead, or in fact, in any flexible lead, will give rise to the same trouble, as will be explained later. If the earth wire is bare, or an insulated covering is bared in the process, it is to disconnect both aerial and earth leads.

It is a simple matter, however, for the listener to ascertain in a few moments whether the trouble comes from an outside source or is due to a defect in his equipment, and all that is necessary for this purpose is to disconnect both aerial and earth leads. Signals will naturally cease, and if at the...
Adjusting and Operating the Tritet Oscillator are Dealt With in this Article by L. ORMOND SPARKS.

To avoid having to turn up the issue for May 28th, the diagram showing the theoretical circuit of the tritet oscillator is given below as reference will be made to the components and their operation.

Before commence any tests, go over all wiring and make quite sure that all connections are perfect and that the coils and valve are pressed securely in their holders.

When this check has been made, the L.T. supply for the 6L6 must be switched on, and a few seconds allowed for the heater to reach its normal working temperature. This operation is followed by completing the H.T. circuit, when the anode and the screening grid should receive their correct voltages. Tests should now be applied, with a high-resistance voltmeter, to verify the exact voltages on these two electrodes, making, if necessary, any adjustments to bring them to the values specified by the valve-makers' details.

With the voltmeter removed, the milliammeter can now be plugged into the anode circuit jack, care being taken to see if shunts are used—that it is adjusted to a suitable scale reading, thus avoiding the chance of a burn out.

It is not possible to give any exact value of the reading to be expected, as it will be governed by factors which might not be identified in all cases and, incidentally, the setting of the variable condensers C1 and C2.

However, we will assume that the reading is the normal standing anode current for the valve concerned in this tritet arrangement, and this will indicate that the circuit is "off tune" or, in other words, that no radio-frequency oscillations are being generated. This point will be made more clear later on. The first tuned circuit to be adjusted is C2 L2, which forms the cathode section. The condenser C2 should be set at maximum capacity, and then very slowly rotated towards minimum until a point is reached when the anode current meter will indicate a sudden change in current value. Actually, the current will drop to a comparatively low value, and as soon as this state is reached, C2 should be left and attention turned to the other variable condenser C1, which with L1 forms the anode tank circuit.

Anode Tank Circuit

If C1 is now rotated from maximum downwards, it will be noted that the meter needle will dip at various settings of the condenser. These dips represent the points at which the anode tank circuit is tuned to the harmonics of the fundamental frequency, and careful observation will be made to ensure that the deflections are not all of the same value. For instance, when the circuit is tuned to the second harmonic the dip will be the greatest, and for each successive harmonic the amount of dip or deflection will decrease indicating, as explained before, that the power falls off as the frequency multiplying is increased.

As these dips may lead to some confusion in tuning the anode circuit to the correct frequency, it is very essential to employ some form of wavemeter to check the output frequency, especially above the second harmonic. The apparatus need not be elaborate; a simple absorption-type wavemeter will be quite sufficient, provided that a few seconds allowed for the heater to reach its normal working temperature. This point will be made more clear later on. The first tuned circuit to be adjusted is C2 L2, which forms the cathode section. The condenser C2 should be set at maximum capacity, and then very slowly rotated towards minimum until a point is reached when the anode current meter will indicate a sudden change in current value. Actually, the current will drop to a comparatively low value, and as soon as this state is reached, C2 should be left and attention turned to the other variable condenser C1, which with L1 forms the anode tank circuit. Reasonable care is taken in its manipulation. It has already been mentioned that care must be taken with the adjustment of C2 to prevent excessive radio-frequency currents being imposed on the crystal, otherwise undue strain and heating will be created. To this end, therefore, C2 should be set as near as possible towards its minimum position "off tune" consistent with, of course, satisfactory output. This is very important, so I would suggest that a beginner sacrifices a little output rather than run the risk of having to replace the crystal through trying to boost up the power.

Coupling to Aerial

When all the above conditions have been satisfied, the circuit is then ready for use; the oscillator is actually generating radio-oscillations, so it is then a question of coupling it to a suitable radiating or artificial aerial according to that's requirements or, shall we say, licence.

For C.W. or Morse work, it will be necessary to arrange for the insertion of a "key" to enable the carrier to be interrupted in the required manner for the code.

Experiments can be carried out with various keying systems, but for the beginner I would strongly advise the use of the screening-grid method. In this arrangement the key is connected in series with the H.T. feed to the screening-grid, together with, of course, a suitable filter circuit to eliminate key interference. If the key is placed in the anode circuit, it must be appreciated that it will be handling a high-humidity current, therefore it must be arranged so that it can have to be taken with the key filter, and as the voltage will be much higher than that of the screen, the power supply and the operator must also be considered. Regarding the components used in the circuit, there is one item I did not stress in the article of May 28th, and that is, all by-pass condensers must be of the mica dielectric type to reduce H.F. losses to a minimum.

Keying Experiments

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A Query

A reader raises the question of voltage control on the anodes of the valves used in the modulating amplifier, as the H.T. positive feed is shown taken straight to the smoothing choke of the mains unit. Under normal conditions, the anode resistances specified will reduce the voltage to the figure shown, but if for any reasons voltages appear to be on the high side the individual resistances can be increased in value to bring about the required values. The same reader also asks which aerial may be of general interest, therefore I give it here. He states that as many operators may wish to change over from a pick-up microphone without going to the trouble of disconnecting the input, it would be advisable to embody a Dublifier "tader" volume control.
Leaves from a Short-wave Log

Good Reception of Quito Broadcast H CJB, La Voz de los Andes, which the north and South America authorities have recently placed an order with the Lorenz Company, in the German capital, for the delivery and installation of a 16-kilowatt short-wave transmitter to be built in the neighbourhood of Batanique. It will be equipped with a beam aerial system for the direction of the transmissions towards North and South America.

To Replace Radio Garata It is reported from Berlin that the Yugoslav broadcasting authorities have recently placed an order with the Lorenz Company, in the German capital, for the delivery and installation of a 16-kilowatt short-wave transmitter to be built in the neighbourhood of Batanique. It will be equipped with a beam aerial system for the direction of the transmissions towards North and South America.

More Broadcasts from Switzerland During the summer months through the Prangins (Geneva) transmitter the League of Nations will broadcast as under: To North America through HBJ (20.04 m. — 14.535 mc/s) and HBO (26.31 m. — 11.405 mc/s) every Tuesday night at 12.00 G.M.T. To Australia, New Zealand and Southern Asia, through the same stations, every first Sunday in the month at G.M.T. 00.00. To the Far East through HBF (16.26 m. — 9.03 mc/s) and HBO, every first Sunday in the month at G.M.T. 12.00. Also to Africa through HBJ and HBO on the same day at G.M.T. 17.00.

A Misleading Call Many of the Cuban stations would appear to alter their calls with a view to fitting the particular sponsored programme broadcast at the time. COJK, Camaguey (Cuba), on 34.62 m. (8.83 mc/s), to which the announcer couples CMJK, the medium-wave station, will often be heard using the new calls of the station. As in broadcast, "3A in Harry, C, Chicago, J, Jones and B as in broadcast," on 33.53 m. (8.83 mc/s), opens its transmissions with a march, Pedro, and punctuates intervals with a signal of four chimes. The station is on the air from G.M.T. 23.00-03.30, or even 04.00.

New Short-wave at Tunis French listeners report having picked up a broadcast from a station calling itself Radio Tunis, Poste Experimental (private experimental transmitter), and operating on 49.12 m. (6.107 mc/s). It was stated to be working to a fairly regular schedule (with, however, possible deviations daily between G.M.T. 13.20-14.00, and from 21.00-22.00). The interval signal used is a commonplace gong.

Second Delhi S.W. Station The new 5-kilowatt short-wave station, which All India Radio will shortly be inaugurating, will work on 31.41 m. (9.55 mc/s) during daylight hours and on 19.62 m. (13.29 mc/s) during the night. The call-sign allotted is VUB.

To Replace Radio Garata It is reported from Berlin that the Yugoslav broadcasting authorities have recently placed an order with the Lorenz Company, in the German capital, for the delivery and installation of a 16-kilowatt short-wave transmitter to be built in the neighbourhood of Batanique. It will be equipped with a beam aerial system for the direction of the transmissions towards North and South America.
An interesting television suggestion.

This is the arrangement described in Patent No. 479305.

A rectangular plane 6 is imaged as a trapezium on a scanning device 8 by two lenses 2, 11, relatively movable along their common axis 7, the distance between object and image also being variable, so that the trapezium can be modified as desired. The lower edges of the object and image are positioned at twice the focal distance of the lens system so that the magnification is unity. As the focal length of the system is varied by the spacing of lenses, the magnification of the upper edge varies to vary the trapezium. As shown, the object area is a film gate movable by a screw 11, while the scanning device is a disc. The image area may be the mosaic screen of an iconoscope. The arrangement is also applied to a cathode-ray receiver, the distance between the trapezium produced by the scanning beam on an inclined fluorescent screen and the rectangular image thus being variable, while the image is maintained at the same size and rectangular.

DIRECTIVE WIRELESS SIGNALLING.
Lorenz Akt.—Ges., C. No. 479300.
In order to offset any lack of uniformity in the electrical characteristics of the earth in the neighbourhood of directional aerials, particularly in an Adcock system, each aerial is mounted in a tripod so that it can be slanted or inclined to the normal. As shown in the figure, the aerial 1 is mounted in a tripod 2 by insulators 3, 4, 5, the two latter of which may be adjusted by screws 6 so as to give the aerial the inclination required.

This is the Lorenz scheme for controlling the aerial.

GERMAN TELEVISION ACTIVITY
In readiness for the initiation of their television service the Germans are busy designing the necessary equipment. One of the most interesting pieces of apparatus they employ is a compact monitor and mixing desk. In one section the person in charge of the programme selects the material to be televised, while a second monitor serves to observe the camera picture which is to be faded into the circuit subsequently. In this way a satisfactory blending and smooth transition between cameras, without any break in the programme, is brought about. The various controls for this purpose are within easy reach of the person seated at the desk, and by carefully positioning the desk in relation to the studios providing the transmissions, it is possible to compare the full scene with its counterpart in miniature on the cathode-ray-tube screen. It is also interesting to note that with this particular design the same unit houses the electrical synchronising pulse generator which is connected either to the 50-cycle A.C. mains or to a rotating-disc pulse generator. In the case of the former the necessary line pulse frequency is produced by harmonic selection and multiplication, whereas the frame pulse is "de-multiplied" from the higher generated frequency. The desk also accommodates the vision and synchronising sub-modulators, and has provision for injecting the line and frame pulses into the picture signal in order that the combined modulation can be sent over a single length of cable to the ultra-short-wave radio transmitter for broadcasting purposes.

TELEVIEWS (Continued from page 314)

In one of these schemes the closed circuit was employed, the current through the focusing coil being increased at the same time that beam intensity was increased. It was claimed that this would nullify spot-spreading. Another proposal was to limit the modulating characteristic of the tube itself, so that beyond a certain predetermined brightness there was a sharp cut-off. This has the effect of preventing the defocusing in the highlights of the picture so that the lines are still sharply defined and the lines are still sharply defined, with the result that in no part of the picture is there a tendency towards blurring.
ERS of short-wave receivers, and especially of all-wave receivers in the United States, have been faced with the close proximity of the stations in small sections of the waveband. Thus, in a modern all-wave set it will be found in most cases that between the stations there are approximately 14 stations, and this means that the dial becomes very confused owing to the close proximity of names and the lines to the various indicating points. It is often found, however, that the latter cannot be given owing to the fact that the settings are so close together. The following idea will be found of value to constructors who are making a dial for such receivers, and it will be seen that the improvement consists in drawing up a list of stations received with an alphabetical reference. These are set out clearly on top of the dial, and then the indicating points on the wave-length scale are merely given the alphabetical reference, in order of reception, from the beginning of the dial. In this way each station may be separately indicated by a very fine line and the dial will thereby be greatly simplified.

Diagram of a short-wave tuning dial marked out in accordance with the idea suggested here.
IMPORTANT BROADCASTS OF THE WEEK

NATIONAL (261.1 m. and 1,500 m.).
Wednesday, June 8th.—Aldershot Tattoo.
Thursday, June 9th.—Old Time Music Hall.
Friday, June 10th.—London Music Festival, 1938, last concert, from Queen’s Hall, London.
Saturday, June 11th.—Palace of Varieties.

REGIONAL (442.1 m.).
Wednesday, June 8th.—Musical Comedy: The Silent Melody.
Friday, June 10th.—A commentary on the First Test Match from Trent Bridge, Nottingham.
Saturday, June 11th.—A Bride for the Unicorn: a play by Denis Johnstone.

MIDLAND (296.2 m.).
Wednesday, June 8th.—General Release: Current Film Music.
Thursday, June 9th.—Franz Josef Haydn: A Musical Biography—Maturity (1781-1791).
Friday, June 10th.—Variety from a studio.
Saturday, June 11th.—Late Night Dance Music from Nottingham.

WEST OF ENGLAND (285.7 m.).
Wednesday, June 8th.—Visit to Quarterly Meeting of Federation of West Country Farmers.
Thursday, June 9th.—Choral programme.
Friday, June 10th.—The House that Came Back: a picture of Barrington Court, Somerset, written and directed by Norah Richardson.
Saturday, June 11th.—Tennis: eye-witness account of West of England Tennis Tournament, from Bristol.

WELSH (373.1 m.).
Wednesday, June 8th.—Beyond the Dyke: Welshmen as Settlers: a talk.
Thursday, June 9th.—Day of Days, a picture of the Welsh League of Youth.
Friday, June 10th.—Cystadleuaeth Gwybodol Cymreig (General Knowledge Competition).
Saturday, June 11th.—National Eisteddfod of the Welsh League of Youth.

NORTHERN IRELAND (307.1 m.).
Wednesday, July 5th.—At the end of Pat Howqua: feature programme (recorded).
Thursday, June 9th.—Instrumental programme.
Friday, June 10th.—Belfast Harbour: feature programme (recorded).
Saturday, June 11th.—Orchestral programme.

COMING TELEVISION PROGRAMMES

Wimbledon Tennis and the Test Match
THE Wimbledon tennis tournaments and the Test Match at Lord’s are both being covered by the B.B.C. mobile television unit.
On June 20th and 21st the television cameras will be installed at the All-England Lawn Tennis Club’s ground to show some of the preliminary matches on the Centre Court on both afternoons. The unit will then go to Lord’s for the second Test Match beginning on Friday, June 24th, and play will be televised daily from 11.30 a.m. to 12.30 p.m., 3.30 to 5 p.m., and 7.30 to 9.30 p.m. It is expected that the whole field will be brought into the picture. Two cameras will be mounted on the main stand at the “Nursery” end, and a third on the “Tavern.” Telephoto lenses should enable viewers to see bowlers and batsmen in close-up.
Following the Test Match the television unit will return to Wimbledon to show the semi-finals and finals on the centre court on June 30th, July 1st and 2nd.

Trooping the Colour
Two television cameras peering down from the Horse Guards building in Whitehall will give commanding views of the Trooping of the Colour ceremony on June 9th. The third camera, installed close to the saluting base, will give close-ups of the King. The television transmission will be accompanied by the National commentary by John Snagge and Major Bourne-May.

Northolt Derby
VIEWERS will spend an hour at Northolt Park racecourse on the afternoon of June 15th to see the Northolt “Derby.” Three cameras will be used. One camera on top of the Members’ Stand will follow the race from start to finish, and another situated close to the puddle of the winning horse and its owner. The third camera in the parade ring will be close to the crowd scenes, the jockeys mounting, and a number of interesting visitors who will be interviewed by Miss Jasmine Bligh, the television announcer.

“Julius Caesar” in Modern Dress
DALLAS BOWER will present “Julius Caesar” in modern dress in the Sunday evening television programme, on June 26th.

IMPRESSIONS ON THE WAX

Dance Records
FILM hits are well represented this month, Roy Fox’s titles are “Always and Always” from the film “Mannequin,” and “Sweet Someone” from the film “Love and Hisses,” on H.M.V. BD 5333, whilst Jack Harris has chosen two attractive numbers from the film “Manhattan Music Box” — “Have you ever been in Heaven,” and “Mama, wanna make Rhythm,” on H.M.V. BD 5336. His second record contains the favourite from Walt Disney’s “Snow White and the Seven Dwarfs,” namely “Some day my Prince will come” (arranged as a fox-trot), coupled with “The One I Love,” from the film “Everybody Sing,” on H.M.V. BD 5357.

Vocalion
ARTIE SHAW and his New Music make a fine recording on Vocalion S 131 of “Sweet Adeline” and “Fee Fi Fo Fam.” “Sweet Adeline” provides an excellent basis for swing interpretation, with the clarinet of Artie Shaw and the tenor saxophone and vocal of Tony Pastor as features. The backing, composed by Shaw and his guitarist, has no vocal and is a particularly catchy composition.

Join Newnes’ Practical Group!

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The leading weekly for every Cyclist, Clubman, Utility Cyclist or Tourist. Join “The Cyclist” Road Club and also take advantage of the FREE Insurance.
2d.—Every Wednesday.
GEORGE ELRICK
A Brief Biography

He's short, robust and a quick talker, with that alert and cheery manner that always results from the alliance of first-rate health and a naturally happy temperament. Wee Georpy, they call him—not because he's much under the normal height, but because he came from Aberdeen. Dance hall, restaurant, night club, recording and broadcasting, singing, teaching, writing, talking and thinking modern music—that has been George Elrick's life for several years past.

Originally he played in a local band at home. There was a band competition—and the judges tipped George as an odds-on chance in the percussionist stakes. He hasn't looked back since. Once George played at a job that started at seven and finished at eleven! The week after this resort closed down, he commenced at a night club where he began at eleven, and occasionally finished at seven.

A useful vocalist with a distinct personality style, and an academy training behind him, his singing has been in extensive demand. For a time he was with the famous Bert Ambrose Rhythm Brothers. Paroona Green is the pleasant quarter of London to which you'll have to penetrate to find George at home. Maybe you'll catch him out walking with Mrs. Elrick, baby Ian enjoying an airing.

Most sports, especially swimming, are George's sport—if only he had more time. Somewhere is that modern flat of his you'll find a set of rusting golf clubs! Practice and work are really his hobbies. He's for ever trying out new song material. During the last few months Elrick has been touring the halls with great success with his own combination known as George Elrick and his Music Makers, and has broadcast with this same band on many occasions.

He has made two sensational discoveries, one Shirley Lenner—his vocalist (younger sister of Judy Shirley and Anne Lenner), who is only thirteen years of age, and who is proving as great a success as her two famous sisters. Number two discovery is Francis Walker who plays the piano, mouth-organ and accordion so brilliantly that it is hard to believe that he is blind.

George Elrick records for Columbia records, and is a frequent broadcaster. First made his name with Henry Hall as a drummer vocalist; since leaving, has been in "Music Hall," "Monkey at Seven," and "Palace of Varieties." Possesses one of the biggest fan mails of any broadcasting star.

GEORGE ELRICK

A UNIQUE chassis is now available from McCarthy Radio, consisting of a dual unit embodying a 5-stage, 4-valve undistorted output incorporating 10 watts of power. The new Cossor Model 397 is a 6-valve A.C. amplifier, the former consists of all the essentials of a modern superhet, with A.V.C. etc., and tunes from 4.5 up to 2,000 metres in 6 wavebands. The amplifier comprises 5 valves and has a phase-reversed high-gain circuit providing 10 watts of undistorted output incorporating 10 per cent, negative feedback. The response is claimed to be flat from 10 to 20,000 cycles, plus or minus 1.5 db. Unit A (the radio section) costs £7 10s. less valves, and Unit B £11 10s. complete with valves. Further details are available from the manufacturers.

New Cossor Receiver

The accompanying illustration shows a new Cossor table receiver fitted with Telelial tuning. This is a 6-valve A.C. model with a performance well above the average. The specification includes variable selectivity, 3-valve controlled A.V.C., 16in. moving-coil loudspeaker and the new automatic dial tuning which enables any one of ten selected stations to be accurately tuned-in in a fraction of a second. Tuning covers three bands, 16 to 62.5, 156 to 560 and 230 to 2,085 metres, the minimum and maximum ranges on the medium and long-waves being rather unusual for modern receivers. Forty four station-names are given on the double-linelex Sunshine, and any ten may be selected by the special dial system. There are six valves, which include an H.F. amplifier which works on all wavebands. The price of this model, No. 397, is £11 guineas, and it is for A.C. mains only.

Beethoven Portable

A new all-occasion portable, Model P-535, is announced by Beethoven Electric Equipment Company. In common with this season's portable receivers this is of very small dimensions, although embodying full-size H.T. and L.T. batteries. The controls are completely hidden from view by means of a hinged lid, and a handle is provided which is detachable so that it may be removed when the receiver is fitted in the home as a standard receiver. A special snap action hinge keeps the lid in position when closed, and a calibrated wavelength scale has the pointer travelling behind a transparent window. The overall dimensions are 5in. by 8in. by 5½in., the speaker is a 6in. permanent magnet, and four full-size valves are employed in the circuit. The price is £6 15s. complete, and a baize-lined carrying case with shoulder-strap may be obtained for 10s. 6d. extra.

Celestion Valveholders

A new valveholder has been completed for the well-known Celestion Company to manufacture in this country. The valveholders are made of American Phenolic Corporation valveholders of Anaphenol. Under agreement with the American Phenolic Corporation these holders, together with other moulded components, will shortly be placed on the market, although at the moment these are available for set manufacturers only. Full details of the complete range will be published when they become available.

Tungsram Transmitting Pentode

A new pentode is announced by Tungsram and is designed for short-wave transmitters. It has a ceramic base and is known as type OS12/500. The heater is rated at 12.6 volts 7 amps, and is of the indirectly-heated type. The maximum anode rating is 500 volts and the screen 200 volts at which the total anode current is already 120 ma. A 7-pin American type base is fitted and the anode is taken to the top cap. The price is 30s.

June 11th, 1938
PRACTICAL AND AMATEUR WIRELESS 323

NEWS FROM THE TRADE
Double Earths

SIR,—I noticed in a recent issue of Practical and Amateur Wireless, under the heading of "Queries and Enquiries," the answer given to J. D. (N.W.6) entitled "Double Earths." In view of this, perhaps an experience of mine about a week ago might prove interesting. I was called in to investigate a mysterious crackling, positively deafening in volume, which emanated from an all-mains set every time a hall door was either opened or shut. My thoughts immediately focused on an iron-clad dis-board in the vicinity, but a test proved that this was not the cause. A switch on the wall by the side of the door was next suspected. Occasionally, a live pair of wires are fed to a switch, and the black joined behind the block before passing on to the light. It did not prove to be the case in this instance. I examined the switch, and a kind of high-frequency sparking, thus enabling the forks to make a partial contact, but failed to find any trouble. The telephone bell was next inspected, and here was the cause of the trouble. The lead-covered conductors feeding this were rubbing against each other. These were bonded by a G.P.O. official and the trouble ceased. Perhaps this experience might prove useful to others.

To turn to another subject. Have you ever conducted any experiments where a Class B valve was used as a frequency changer? There must be quite a number of experimenters with one of these lying about, and they might possibly jump at the chance of using it once more.—Cedric C. Mankham (Bury St. Edmunds).

SIR,—With reference to the query from J. D. (N.W.6) you may be interested to know that I have just had the same trouble with my mains. Having just installed a mains set in an upstairs room, it was annoying to find that severe crackles occurred whenever anybody walked across the room. I examined all switches and bulb fittings, but that didn’t cure it. I even went so far as to check the lighting system for leakage, etc. (Incidentally, it is a good plan for anybody to switch off all light and power points and see if there is any movement on the meter disc. If there is, look for a leak!) I put in some new wiring in place of the faulty lead, but still the crackles and buzzes went on. Eventually, the trouble was cured by two adjacent lead cables vibrating together. I cured the noises by bonding the two cables together with copper wire.

I might suggest that all lead cables are not effectively earthed, especially in old houses, and a kind of high-frequency discharge occurs when two cables or one cable and a metal part come in contact.

Anyway, in our case, the noises were picked up via the aerial, and not through the mains leads.—A. W. Sewell (London, S.W.4).

Correspondent Wanted

SIR,—Very many thanks for sending on the reply coupons, which I have just received. You may be interested to know that I am only 15 years of age. I should be very pleased to get in touch with another reader about my own age who is really interested in 7, 14, and 28 m/c amateur band listening, and who has a good two or three-valve S.W. receiver.—J. Stewart, 37, Dillech Terrace, Bonhill, Alexandria, Dumfriesshire.

SIR,—Referring to the letter in the May 14th issue from T. H. G. (London) he appears to think that 15s. 6d. is a large sum to pay for a meter. Does he realise that he is paying for a skilled instrument-maker’s time and knowledge, and that a good instrument-worker does not work for ls. per hour. T. H. G. has got the idea that all the makers do is just work for ls. per hour. I strongly suspect other faults in T. H. G.’s meter. I have repaired his meter with two bits of wire, “everything worked except for a difference in reading.” That would not do for an instrument-maker. I strongly suspect other faults in T. H. G.’s meter. I have repaired a good many meters of T. H. G.’s type, and believe me, it is not a case of just “two bits of wire,” patience, and about three hours’ work. No, 15s. 6d., in my opinion, is not excessive. I would add that it is a bad plan for anybody to attempt repairs without proper knowledge of the results of their experiments.—V. Bailey (Cheetham, M/c).

Rola Employees’ Annual Holiday

SIR,—Will you please note that our office and factory will be closed on Friday evening the 22nd July, 1938, until Monday morning the 8th August, 1938. We respectfully request our customers to anticipate their requirements for this period as early as possible in order to enable us to make delivery prior to the closure.

Suppliers are requested to deliver goods prior to the 22nd July, as no goods can be accepted during the closure period. —Rola Company, Ltd., Park Royal, London, N.W.10.

Speaker Experiments

SIR,—Some time ago you published an article on speaker experiments and I derived much pleasure from carrying out some of the tests there included. I found that when I turned off the Argon charger, I had been looking for perhaps six months of valuable service from this receiver. As a result of this, I have undertaken an experiment in this direction and could let us have the advantage of the results of their experiments. It would be a good plan, I think, if you ran a suggestion corner in this connection as a means of encouraging us who are interested in experiments and who may be interested in this type of experiment.—H. D. Watts (Hendon, N.W.3).

Echo Effects

SIR,—Many thanks for your article on the Argon charger. I had been looking for a good unit of this type for some time, and as a result of this, I had begun to think that there was no simple way out of my difficulties. I have made it up, and find that this meets my requirements to a nicety. I hope to obtain many months of valuable service from this particular charger.—J. E. Rixos (Har- ringay).
RADIO CLUBS AND SOCIETIES

The EXETER AND DISTRICT WIRELESS SOCIETY

On Sunday, May 22nd, members of the above society, by kind permission of Messrs. Odeon Theatres, Limited, were conducted over the Exeter Odeon, by the Chief Operator, Mr. V. A. W., and the Assistant Engineer, Mr. P. Saunders.

Members were taken to the operating room and shown the B.T.H. machines, each of which works twenty minutes before the other is switched on. Films were threaded through and the machines set in motion. Members also saw the turntables and pick-ups, besides the tubes and other parts, also demonstrated. The amplifiers were provided by the B.T.H. Company, and an interesting feature was the current consumption of each valve to be read. The system of ventilation was thoroughly explained, and the apparatus was set in motion showing how the air is washed, heated, and returned to the theatre.

The next meeting of the society will not be held until September, when the autumn season starts and full details will be published together with the syllabus for the coming season. Interests members should get in touch with Mr. W. J. Ching, 9, Sivell Place, Heavitree, Exeter.

LONDON TRANSMITTING SOCIETY

ALTHOUGH only quite recently formed the above society is in an extremely flourishing condition. On Monday, May 23rd, an interesting lecture was given by Mr. W. G. J. Nixon, of the Osram valve manufacturers. Mr. Nixon, technical director of the G.E.C., who has given much of his time to the study of the dual element and multi-electrode valve. A particularly interesting point was shown depicting the intimate manufacture of a modern Osram valve. Mr. Nixon completed his lecture with a few experiments with photo-electric cells, and by means of a photo-electric cell, in conjunction with a gas-discharge tube, an electric motor was controlled entirely by the light from a small torch. Finally, the application of the photo-electric cell to timing devices was briefly outlined.

The third edition of this book which has been written to facilitate class work has been brought up to date by including some of the later examination papers. The book is intended for students who are preparing for the Higher National Certificates in Electrical Engineering. It includes many problems and examples drawn from past examinations of the City and Guilds of London Institute of Radio Communications, the Institution of Electrical Engineers in Electrical Communication, and the University of London in Telephony and Telegraphy. Forty-three separate subjects are dealt with ranging from capacitance and reactance to television, and all the test questions which are set in each section are referenced with regard to the examination paper from which they are taken. Eleven pages are devoted at the back of the book to solutions to the examples given so that the student can check his answers.

The book will prove invaluable to the student for either class or private study.

BULGIN COMPONENTS

A REPRESENTATIVE selection of Bulgin products is given in the latest developed catalogue issued by Bulgin, Ltd. Indicating dimensions and technical data, particularly useful to manufacturers and home constructors, are given for all the components listed. In addition to chokes, coils, filters, and resistors, there is a very comprehensive range of G.M. switches of the rotary and toggle type. Various television components, trimmers, trimmer capacitors, voltage regulators, vibrators, etc., are also included in this useful list.

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FOR BATTERY OPERATION

The new Cossoor 220 I.P.T. is a special Pentode Detector Valve designed for use in Battery Receivers. Due to its indirectly heated cathode it has remarkable anti-microphonic properties even under very adverse conditions. It is, therefore, particularly suitable for use in Portable Receivers, where high L.F. gain is usually provided. The base used on the 220 I.P.T. is of the 5-pin type with standard H.F. Pentode connections.

Characteristics

- Heater voltage: 2.0
- Heater current (amps.): 0.2
- Max. Anode volts: 150
- Price: 11/-
- Max. Aux. Grid volts: 80
- Slope: 1.9 m A/W

**Practical and Amateur Wireless**

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<th>£3 Superhet (Two-valve)</th>
<th>£2 Superhet (One-valve)</th>
<th>£1 Superhet (One-valve)</th>
<th>£0 Superhet</th>
<th>£4 Superhet (Four-valve)</th>
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**SHORT-WAVE SETS**

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<th>PW73</th>
<th>£2 Superhet (Two-valve)</th>
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<td>10.6.12 PW34</td>
<td>10.1.12 PW33</td>
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<td>Three-valve : Universal Electric Centre (D, Pen)</td>
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<td>PW54</td>
<td>Three-valve : Universal Electric Centre (D, Pen)</td>
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**PORTABLES**

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**PORTABLES**

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Earphone as Mike

"I have an earphone in my 'spares' box, and I wondered if it would be possible to use it as a microphone if I obtained a suitable transformer. Can you also inform me of the address of Evritone Radio Company?" - L. R. P. (Framlingham College).

The earpiece would not need a transformer unless it were of the low-resistance type. A component of this nature, however, has a very rigid diaphragm, and this renders it insensitive for use as a mike. It is possible to convert it by replacing the diaphragm by thin mica or similar material, with a disc of soft iron attached to the centre above the pole pieces. You can experiment with it by cutting various types of diaphragm, but in general we do not recommend the use of an earpiece, and you would find, if cost is a consideration, that a cheap carbon component is much more useful.

The address of the company mentioned is now 2 Southlands Road, Bromley, Kent.

H.F. Pentode and Bias

"I have a variable-mu pentode. Can the bias be applied to the grid through the H.F. channel, which is included in the grid circuit in an untuned stage. Also, if I use the valve in a standard H.F. circuit, but without the bias potentiometer, i.e., disregarding its variable-mu characteristics, will any of the valve's performance be lost?" - O. K. (W.10).

The bias may be applied in the manner you indicate, which is quite standard. With regard to your second point, the variable-mu valve has maximum amplification at minimum bias, and, therefore, if you ignore bias entirely, the valve will be working at maximum efficiency, which means that a small fixed bias would probably be desirable, but this depends upon your circuit design, and, therefore, some experiments should be made with a view to finding the best value for general results if the volume control or bias adjustment is to be removed entirely.

Duplex Coil

"Can you tell me where I can obtain the Duplex coil for the three-valve circuit described in your 'Television and Short-wave Handbook'?" - R. D. (Hiford).

The coil is made and supplied by J. J. Eastick and Sons, of Eelxe House, Bunhill Row, London, E.C.1.

Extension Speaker

"My commercial set has four sockets on the back panel and extras for small letters in pencil on the backset upon which the sockets are mounted. As far as I can make out these letters are G and Ex, which I take it mean gramophone (pick-up) and extension speaker. I have looked carefully but cannot locate a switch or plug which will operate the built-in speaker. How can I do this?" - J. H. C. (Hayes),

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Fitting a Pick-up

"Will you please inform me how to connect a pick-up to an S.G. Three battery set, and what type of volume control I should use?" - S. C. (Tooting).

The pick-up should be joined to the grid of the detector valve, and the other side of the pick-up should be connected to the 1.5 volt tapping on your pick-up battery. The 'key' circuits of the programmes from breaking through you can either detune, or disconnect the grid-leak and condenser from the detector valve. A single-pole change-over switch will enable you to connect the pick-up and cut out the radio, the connections being arm of switch to grid, one side of switch to grid-leak and condenser and other side of switch to pick-up. A 250,000 to 500,000 ohms volume control should be suitable if you find it necessary to use such a component, but with only two stages you will probably find that it is not needed.

Morse Key

I am interested in the purchase of a cheap and efficient morse key complete with buzzer and battery. Also a decent pair of cheap earphones. I wonder if you could let me know where I could obtain these?" - J. L. (R. A. F., Cranwell).

The parts in question may be obtained from Eleetradix Radios, of 218, Upper Thames Street, E.C.4, from the best wholesalers a large supply of such items, and you will, no doubt, find a suitable component at the price you desire.

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POCKET HEADPHONES, W.D. all leather headband, strap and cords, 2½ pair. Wireless type with aluminium headbands, 2/8, 4,000 ohms, 5/9, 1,000 ohms, and 2½ pair. Household and Field Telephones, wall and table, 1½- and 1½-.
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A Flying Hospital—the Red Cross Society's "Monospar," which is equipped as a miniature hospital.

Dramatic picture of Major E. MANNOCK, V.C., being shot down over the German lines.

A page of aerial oddities.
Battery Amplifiers

The battery user is generally restricted as to the power he can deal with, and thus is not in such a fortunate position as those who have mains facilities. We are continually receiving requests for designs of battery amplifiers with 5 and even 10 watts output, and it is, of course, practically impossible to obtain such outputs with ordinary battery apparatus. Super capacity batteries would have to be used, and although this would not be an insurmountable difficulty, the types of valve available provide a serious restriction in the design of the apparatus. A maximum output of about 2½ to 3 watts is all that the normal battery user may obtain, and in this issue we describe a design which will be found simple to build and operate. The push-pull, and the rated output is of the order of 2½ watts. Tone control is provided on the input side, and the amplifier is simple to build and operate. The output is, of course, more than adequate for all ordinary purposes, and when fed to a really good speaker this amplifier will prove of real service to those who are unable to take advantage of mains working.

New Finnish Stations

Three new stations are now working in Finland: Lahti, on 31.85 and 28.47 metres, with a power of 1 kW (to be replaced at a later date by a high-power transmitter); Helsinki, on 197.15 metres, and Jomsuus (wavelength not announced). Further changes are to be made in the near future, but these notes may prove of value to those who keep a careful log of Continental stations.

Television Improvements

Several listeners who live in outlying districts and have television receivers, have had, with the help of the Derby relay, improved results on the Derby relay by an unusual use of a reflector aerial. Interference, which at the distance of reception, caused serious fading and distortion, was completely removed by placing a reflector aerial between the receiving aerial and the source of interference. This reflector was not used in its correct position as a reflector behind the aerial.

For Philatelists

An unusual relay will take place on June 21st, when B.B.C. microphones will be present in Harmer’s Auction Rooms, in New Bond Street. The occasion will be the sale of the Baron de Worms’ Collection of Ceylon stamps, which is one of the most famous in existence. Exceptional bidding and prices are likely.

The Story of the Sundial

On June 24th, in the West of England programme, a broadcast arranged round the sundial will be given. Listeners will hear something of the history of the sundial, and a selection from some of the curious inscriptions which may be seen on them all over the country.

United Services Tournament

Scottish listeners will hear a half-hour’s broadcast from the tournament which is being staged by the Royal Navy, the Army, and the Royal Air Force at Ibrox Park, Glasgow, on June 23rd. This display has been described as being largely an effort of youths, boys, recruits and young men with short periods of service, who will be taking part in the most spectacular of the ten scenes which are packed into the two and a half hours programme. The main theme of the display will be the interpretation of traditional ceremony and traditional efficiency by the younger members of the Services.

The Open Road

In the National programme on June 17th, will be an interesting programme bearing the above title. This is the radio story, not of any one road in particular, but of all roads in general. There will be references to Macadam, father of the modern road, and to the Romans, fathers of all real roads.

French Broadcasting House

Paris is to have a building to coincide with our own B.B.C. Broadcasting House, and a site has been chosen and work begun on the Boulevard des Invalides. The building is expected to be completed by 1941.

Changes at Addis Ababa

The new transmitter at Addis Ababa should be ready in about 12 months, and in the meantime a new announcer has been appointed to the temporary station. She is Signorina Luisa Gasparini, and fills the post of chief announcer. The wavelength at present in use is 31.25 metres, but a change may be introduced when the new station comes on the air.

New Station at Tripoli

The station being erected by the Italian Government on the Oasis of Zanzur is to be officially opened on October 28th. This station has special aerials directional to the east and to the west.

Concert from Nottingham

From the Nottingham studio on June 20th a concert will be broadcast by artists belonging to the county. Mark Mellors, a professional singer who has often broadcast in the last dozen years, will sing two groups of baritone solos; May Cree, the Nottingham pianist who won a piano in a national competition, will play solo; and L. Hartley will conduct the Edwinstowe Choral Society in part-songs.
ROUND the WORLD of WIRELESS (Continued)

Standardising Aerials

As the municipal authorities of Amsterdam (Holland) were of the opinion that the diverse types of aerials used constituted an eyesore in the streets of the city, a decree was recently promulgated to the effect that one standard and recognised pattern of aerial, and mast, is to be employed in future. The same decision has now been taken in Poland, but in addition, the police have decided that in the case of flats and apartment houses a communal aerial must be used by the tenants.

Interesting and TOPICAL News and notes

DICKENS, while another dramatic interlude will take listeners back to a Soho of more stately days when the Duke of Monmouth lived in Soho Square, and the very name of the district was the whispered password of his followers.

A Novel Broadcast

On the occasion of a duel recently fought out by two Paris celebrities, although necessarily of a strictly private character, not only were photographs of the event published in the French press, but both the Radio Clôt and Poste Parisien broadcasting stations were able to transmit a commentary on this heroic display of valour. The commentator's observations were electrically recorded and broadcast to listeners within half an hour of the termination of the duel. Honour has been satisfied!

Radio and Political Unrest

During the month of April, some fourteen thousand persons took out licences in Czechoslovakia; at the utmost in previous years a figure of 5,200 was reached. The Czech broadcasting authorities state that the great increase was doubtless due to the existing political troubles, and that the nation has been given a clear demonstration of the benefits of wireless in times of stress.

Soho

In a feature programme, written by Hugh Ross Williamson and produced by Leslie Stokes, National and Empire listeners will hear the story of Soho from the time it was built in the reign of Charles II up to the present day.

A dramatic adaptation of a scene from Nicholas Nickleby will show the sinister side of the neighbourhood as envisaged by Dickens, while another dramatic interlude will take listeners back to a Soho of more stately days when the Duke of Monmouth lived in Soho Square, and the very name of the district was the whispered password of his followers.

New Director of National Physical Laboratory

The Lord President of the Council of the Department of Scientifile and Industrial Research has appointed Professor R. H. Fowler, O.B.E., F.R.S., as professor of Plummer Professor of Applied Mathematics at the University of Cambridge, to be Director of the National Physical Laboratory with effect as from October 1st, 1938. Professor Fowler will succeed Dr. W. H. Bragg, who has been elected to the Cavendish Professorship of Experimental Physics in the University of Cambridge.

Just Gentle Persuasion . . .

In Germany, where all nationals are exhorted to listen to official speeches and pronouncements, the authorities are far from lenient in the case of radio pirates. During the first quarter of 1938, in the case of 251 prosecutions against persons found without a broadcasting licence, five were sentenced to terms of imprisonment ranging from thirty to eighty days, one hundred and eighty-eight to fines varying between three and one hundred marks, and one youth was merely warned "not to do it again!"
June 18th, 1938

PRACTICAL AND AMATEUR WIRELESS

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About Coil Connections

Details Concerning Some Obsolescent Coils which are Still in Use or on Sale

By W. J. DELANEY

We are continually receiving inquiries from readers for details of connections of coils which are not now in normal circulation, and as we have repeatedly pointed out it is not advisable to try out modern circuits with old parts. The recent introduction of all-wave tuning has, however, led many constructors to dig out from their junk boxes all-wave coils which were produced back in 1933, and in the lapse of time the connection details have become mislaid. Certain of these coils are also still being sold in certain stores. It must be pointed out that coil connections have never been standardised, as have certain other components, and thus the fact that a certain coil may have six terminals does not mean anything. Even the numbering of these terminals bears no indication to its type or the method of using it, and thus we may find that one coil will have terminal number 1 joined to the grid, whilst another will have terminal 6 taken to the same point.

All-wave Coils

In 1933 the Lissen Four-range coil and the British General all-wave Tuner were in common use and these are very popular with home constructors. The circuit of the Lissen coil is given in Fig. 1 and it will be seen that in this component the various sections are short-circuited by means of the self-contained wave-change switch as the ranges are lowered. The four bands covered are from 12 to 38, from 22 to 90, from 190 to 555, and from 800 to 2,000 metres, and for this, as well as the Lissen coil already mentioned, a standard .0005 mfd. tuning condenser should be used. It must be pointed out that several different types of British General Tuner were produced and the reference letters given in Fig. 2 may not apply to all of them. The coil illustrated was used in our All-wave Unipen receiver described in 1933.

Telsen Variable Selectivity Coil

Another very popular coil of its time, and one which is still in common use, is the Telsen component which had a small self-contained condenser mounted on top of it for aerial tuning purposes. It was known as a variable selectivity coil, and the circuit and connection numbers are shown in Fig. 3. In some cases it may be found desirable with this particular coil to include a fixed condenser having a maximum capacity of .0003 mfd. across points 4 and 6 to prevent medium-wave breakthrough. With this coil a separate wave-change switch has to be employed and this should be of the three-point type.

Another Telsen coil about which we still receive requests is the Type 349—one of the first miniature screened iron-core coils to be produced. This has six terminals only, and they are wired as shown in Fig. 4. With this, as with most other coils described, it is possible to employ a simple detector stage, or to use them in an H.F. stage as H.F. coupling components. In each case the anode takes the place of the aerial lead.

Band-pass Coils

An early Lewco coil of interest was the unscreened band-pass filter, built up round two small formers mounted on a base in a "V" formation. This coil also contained a switch in the base, and the terminals, instead of being numbered bear reference letters. These are shown in the circuit in Fig. 5, and it will be seen that a coupling condenser has to be employed. This should be of the non-inductive type having a maximum capacity of .02 mfd. and if possible a mica condenser should be employed. In this particular coil unit the series aerial condenser is included in the coil mount and thus, when used as an inter-valve coil, the anode would be joined to terminal A direct. This coil is not ideal for modern conditions owing to the fact that

(Continued on next page)
SO Bertini is going back "home" again. The thrill of Blackpool dance-music addicts will be content now that one of their idols is with them once more. It created a major bombshell when, three years ago, Bertini casually announced that he was leaving the town where he was an institution. Though London-born, Bertini was, for something like nine years, as important a part of Blackpool as the Tower itself. Then he developed an itching foot. He and his band took the high road, and started what has been a very successful country-wide variety tour. But Bertini owes Blackpool a debt. It is not only established him as a No. 1 dance-music attraction, but its crisp refreshing air cured him of a perpetual cough which was the legacy of war-gassing. Yes, Bertini will be glad to be "home."

It was a shrewd stroke of showmanship which prompted Lawrence Wright to sign up Bertini and his Band as a top-line attraction for his current "On With the Show" entertainment on North Pier. But then nothing but shrewd strokes of showmanship could have built up Lawrence Wright from a poor boy demonstrating his own songs on a cracked piano in Leicester market-place, to a position of wealth and power in the entertainment business.

The signature-tune of Blackpool is "Pleasure." It's as much a local commodity as lace is at Nottingham, cotton in Manchester. It's true to say that if you can't have fun in Blackpool, you're either not trying or dead. And Lawrence Wright, song writer and showman, has done more than his bit to take the "black" out of Blackpool with his annual summer show on North Pier. "On With the Show" recently made its bow again for the fourteenth consecutive year. Fifteen hundred people will be packed into the North Pier Pavilion twice daily for twenty weeks and the "House Full" notices will be constant unless 3,000 people a day . . . 18,000 a week . . . 360,000 during the season. Allowing for a few empty seats, the bandstand, and of course safe to assume that 350,000 people will see "On With the Show" this summer.

By the tinge the curtain rings down for the last time, it will have cost Lawrence Wright every penny of £10,000. There are fifty people in the show, which means a weekly salary list of nearly £600. There are 230 dresses in the show. One fan of real ostrich feathers which, built in sections of 20ft. high, will occupy the entire stage in one lavish scene has set Lawrence Wright back £300.

But it's no use having a packed house and a lavish dress, if you haven't a decent cast. In the past, such stars as Florence Oldham, Norman Long, Walter Williams, Jan Raffini and his Band, Sylvia Cecil, Fred Walsmeay, Reynell and West, Phyllis Robins (when half of the Iris and Phyllis act), Mona Vivian, Hal Swain, Rose Perfect, Lanne Fairfax, Trevor Watkins, Winnie Collins and Roy Barbour have all served under the "On With the Show" banner.

Even if you aren't going to Blackpool yourself this summer you will be interested because "On With the Show" will be broadcast at least three times.

From past experience Lawrence Wright has discovered that what Blackpool likes is plenty of good solid scenes, good singing ("I dare not put on a spoof of crowning in the show," Lawrie confided to me), a touch of military pageantry, and lashings of clean, wholesome, knockabout comedy.

The musical side of it looks after itself, with Bertini and His Boys on the stage throughout. His singers are Robert Naylor and Marietta. Naylor, of "Land of Smiles" fame, is a tenor with a voice as rich as Lord Nuffield. I've promised not to reveal the identity of the soprano, Marietta. All I can say is that she has been a well-known concert party soprano for some years, and recently had a brain wave. She changed her name, got herself an accordion, an Italian rig-out, and a pet monkey which sits on her shoulder, and blossomed out as something new, fresh and appealing.

It is interesting to know the big numbers that will be heard, because what Blackpool sings to-day, the rest of the country has a habit of whistling to-morrow.

High spot of the show will be a scene illustrating the number, "When Granny Wore Her Crinoline." A giant crinoline which will occupy the entire stage has been built to provoke "Ooohs and Aaalis" from the audience.

Robert Naylor's big number will be that smash hit, "Tears In My Heart." Leslie Sarony has contributed a military song, called "Follow the Band," and Lawrie's new team, Bob Dale and Art Strauss, have provided, among others, a song called "Indian Summer."

Horatio Nicholls, who is Lawrence Wright himself, has written the opening chorus, which is called "Laugh Thro Life." He wrote it on the Atlantis en route for West Africa at a time when he was feeling so miserable that even the sight of an envelope marked "O.H.M.S." couldn't have depressed him further.

But, on board, was one of those almost aggressively hearty women who have never known a moment's despondency in their life. Horatio asked her the secret of her cheerfulness. "Because I've learned to laugh through life," was her reply. Snap! the idea clicked in the song-writer's brain. He rushed to his cabin, wrote the song, had it printed on board, and it was played by Jack Hylton's Band throughout the cruise.

Equally snappy was the birth of another Horatio Nicholls' number. Called "I'm Saving the Last Waltz for You," it was written at Easter in the lounge of the Hotel Metropole, Blackpool, and played that same night by the band.

ABOUT COIL CONNECTIONS

(Continued from previous page)

the wave-range on the medium band is from 285 to 2,500 metres and it is not possible to tune down to a large number of popular stations. Turn can be stripped from the familiar, but some difficulty may be experienced in balancing the two windings, and if this is done then a separate panel must be fitted. It is advisable to use the condensers to enable the two circuits to be balanced for distant station work.

Lissen Type L.N. 5101

A screened coil in the Lissen range which is still popular is type L.N. 5101; but it must be remembered that this firm has produced dozens of screened coils and unless the type number is given on the coil screening can these reference numbers cannot be followed. The circuit is shown in Fig. 6, and the wave-range covered is from 285 to 550 and from 1,000 to 2,100 metres. It will be noticed in the circuit that the reaction condenser is shown joined between the anode and the terminal 5, or between the anode and the terminal 6 and earth, and this enables a metal panel or an insulated panel to be used at will. The latter connection is preferable as it puts the reaction condenser moving vanes direct at earth potential and this avoids tuning difficulties when critical reaction adjustments are being made. If a metal panel is employed and the condenser is joined between the anode and the reaction winding, in any type of coil, the condenser must be insulated from the panel (if this is earthed in the usual way), otherwise the reaction coil is short-circuited.

Fig. 6.—This was a popular Lissen coil—type L.N. 5101.
Second-hand Sets

H. E. F., of Graveshend, joins issue with me on the question of the disposal of second-hand sets. He says that he wishes to contradict some of my statements in last week's issue. As he is a dealer I must accept his word for it that sets sold by his firm, whether at 50s. or £10, all carry a three-months warranty, and any set taken in part-exchange is subjected to a thorough overhaul. If it is found not up to the required standard it is dismantled, and any parts suitable are kept for spares.

A set passing all tests is offered for sale and maybe at an absurd price, but my reader thinks that in this they are helping the public, for there are many people about who will have nothing to do with hire purchase, but find it difficult to save up for a new set, although they can manage £5 to £4. Admittedly there is the problem of repairs at a later date, but my reader thinks that in 1938 sets will give trouble, and if a firm has a service engineer worthy of the name, and good test equipment, there are few troubles that cannot be remedied. Providing reasonable second-hand exchange prices are allowed, a useful market can be found for second-hand sets, and the public can buy with a feeling of safety. If this reader will go through my paragraphs again he will find that I said very few dealers have the knowledge, and the equipment (the knowledge being the most important), to test a set, so they have to resort to the gentle art of "coding" the public that a certain set will do what they know it will not do.

Prize Biscuit

My attention has been drawn to an illustration in a Provincial paper, the caption to which reads: "The new B.B.C. Transmitting Station at Penmon, Anglesey, which enables many North Wales listeners with small radio sets to get distant stations." The B.B.C. has been holding out on me. I must certainly move near to Penmon where, with merely a pair of 'phones, I shall be able to listen-in to the local.

Poetry

HAROLD CARR, rotary master of ceremonies on the WLW "Truly American" programme, 5 to 5.30 p.m., E.S.T., Saturdays, recently turned poet. Whether it was the spring weather or disappointment in a recent fishing expedition, Carr did not divulge.

There's an old verse that goes like this:
When the wind is from the south, It blows the bait in the fish's mouth.
When the wind is from the north, Fishermen should not farc forth.
When the wind is from the east, It's neither fit for man nor beast.
When the wind is from the west, That's when fishing is the best.
Carr, back from a fishing expedition with the usual "they all got away" story, wrote a verse which was heard on "Truly American," and for which scores of listeners have written for copies. Here's his poem:
When the wind is from the side, Rent a boat and take a ride, When the wind is from the back, Stay inside your cozy shack.
When the wind is from the front, Load your gun and start to hunt.
When the wind is from the bottom, Fishing luck is good and rotten.
When the wind is from the top, Fishing luck is rotten and rotten.

Mixed Bag

HEREWITH a letter from G. H. of Bourne End: "I saw an article in a daily newspaper by the Radio Expert in which he gives vent to his dislike of the frequent gramophone records broadcast by the B.B.C. He says that he is not getting his 10s. worth. I wonder how much it would cost him if he bought as many records as we hear from the B.B.C. in a year. In other articles this expert criticizes the B.B.C. Sunday Programmes, comparing them with those of Continental stations, who use nothing but records for their sponsored programmes. I have been reading the stories of readers' most embarrassing moments. I have been a non-technical friend who likes theatre organs. I was hurrying past his house when he called me in, and asked me to mend a fuse as he wanted to listen to Reginald Foort. I opened the box and seeing a couple of blank holders I put some wire in, shut the fuse box and hurried off. Before I had gone far, he caught me, and said there were still no lights or radio. I said something unpleasant, and returned to discover that I had repaired two spare fuse holders which were not even in circuit!"

A New Handbook

I see in our companion journal, Practical Mechanics, that readers may obtain for 2s. and two coupons cut from consecutive issues, a fine book entitled The Practical Mechanics Handbook. This book was written in size and contents with one standard engineering book which in my apprenticeship days cost me a guinea. The Practical Mechanics Handbook contains information on turning, fitting, screw-cutting, mechanical drawings, the dividing head, mensuration, logarithms, trigonometrical functions, screw-thread standards, the metric system, hardening and tempering, soldering, brazing, silver soldering, making battery and mains spot welders, colouring metals, filing, marking out, how to obtain a patent, glues, cements and adhesives, drills and drilling, nuts, bolts and screws, battery charging, rust-proofing iron and steel, riveting, etc., etc. I recommend every reader of this journal to obtain a copy of this book, which, after the presentation edition is exhausted, will be sold for 5/-.

Get yours now and save money.

Receiver Design

To an outsider the trend of design of modern commercial receivers must be a continual puzzle. At last year's radio exhibition we had all the wave receivers, and at this year's show it will no doubt be all push-buttons. But I am interested to note that there is a change creeping in and that quality is being gradually introduced by several well-known manufacturers. This was noticed at last year's show on only two stands, but I have received advance details of two or three new schemes and it would certainly appear that there will be a serious attempt to revise present ideas and to make quality a
really high-spot of future design. This tendency is, of course, strength-ened by the B.B.C. ultra-short-wave broadcasts. Many listeners still do not realise what this high quality means. Those who have listened to the special television broadcast, how-ever, will have noted several interest-ing points in this direction and the improved frequency response is par-ticularly noticeable (especially to those who do not possess a keen musical ear) in sound effects. For instance, when M. Boulestin is giving his cookery hints there are many little sounds which could not come over faithfully on normal broadcast wave-lengths. Take, for example, the noise of the burning gas-ring on his gas-stove. There is a quality about this sound which is most remarkable, as also is the sound of water as he rinses some item in a bowl before using it. To the ordinary listener these small facts alone emphasise the improve-ment in quality, as he is able to recall the tests and puzzle corner sounds broadcast on the medium waves.

Chess!

I ALWAYS thought there was something rather out-of-the-ordi-nary regarding chess, especially when I read how people send letters to one another describing moves, and how a master plays fifty people at once. I do not know what to say about the latest B.B.C. broadcast where listeners are to be asked to spend money describing the move they would make in reply to that given out over the radio. The match will last a long time. I shall be bored in having to switch off when the move is announced, and I am sure hundreds will agree that it would be much more fun to hear a good musical comedy or play in place of a broadcast of this nature. What entertainment value can be attached to this type of broadcast? Spellings- bees are bad enough but I can see visions of something even worse now that delayed chess has been introduced.

A Financial Problem

A READER has written to me with tears in his pen, asking for a solution to his dilemma. It appears that this reader lives in one of the magnificent (?) new blocks of flats which have sprung up in various parts of London, and he required a new set to match the new furnishings he had bought for the residence. He selected a modern all-waver, and when tried out in his home the results were very disappointing, and, upon reporting the matter to the makers, they sent along a service engineer. After a test he reported that results were all that could be expected under the circumstances. When asked for an explanation, the circumstances were that the building was all-steel, being in square formation the set was screened on all sides, and under his agree-ment he could not erect an outside aerial. I must admit that this case appears particularly hard, but here is a case where the owner of the flats could serve a very useful purpose by fitting one of the many "community" aerals which are now available and often provide even better results than are obtainable by the ordinary house-holders. The height of these buildings enables a really good aerial to be placed on the roof, and any number of receivers may be fed from it without interaction. The cost would be trifling, and a very small additional sum could be placed on the rent to cover the cost of installation. I there-fore suggest that anyone similarly placed makes a suitable recommenda-tion to the owners.

Encouraging South African Music

IT is interesting to note that in connection with the scholarship of £200 per annum offered by the Performing Right Society for tuition in musical composition, in order to encourage South African composers, a Selection Board to adjudicate on the works sent in has now been appointed, including Professor M. C. Botha, Chairman, Union Secretary for Education and Chairman of the South African Broadcasting Corporation, and Sir Carruthers Beattie, a Director of the South African Broadcasting Cor-poration.

Mr. W. J. Pickerill, Director of the Cape Town Orchestra, will serve on the Committee during the temporary absence of Sir Carruthers Beattie. Amongst the conditions governing the scholarship are the following:—

Any South African-born person resident within the Union is eligible, and the scholarship to be tenable in London at one of the principal Academies.

The V.A.F. and Television

I learn that the variety artistes and kindred managements have re-quested the V.A.F. to repeat the warning to actors and actresses that the televising of their performances can be a breach of the barring restric-tions contained in their contracts. Artistes are warned that they should not enter into arrangements for the televising of their act, without having protected themselves by obtaining permission from the managements issuing their contracts. A trade paper comments: "This is apart from the general question whether such repro-duction of artistes' personalities and their material is to their advantage."
Short-Wave Section

A SIMPLE EXPERIMENTAL PORTABLE

A Small Set which is Convenient for Outdoor Reception on the 20 and 40-metre Bands

We have frequently received requests from readers for details of an ultra-simple, though reasonably efficient, short-wave portable. It appears that most of those who ask for these details require the set purely for experimental use—comparing reception conditions in different localities and the like. Programme reception is not necessary and headphones will be used.

Some time ago we made up a little set of this kind, using only a single valve, and it behaved very well. In open country sensitivity was sufficient to bring in the

**Doublet Aerial**

Fig. 1 shows the circuit adopted. Obviously, there is nothing sensational in this and nothing for which we claim any originality. It will be seen that provision is made for using a doublet or similar type of aerial, but an ordinary single-wire aerial can be used if preferred, simply by joining together one of the aerial terminals and the earth terminal. A throw-out aerial was employed, and it was generally found that a couple of insulated leads arranged approximately in line with each other were preferable to a single wire. We actually used a 15ft. length of twin flex, of which 10ft. was untwisted. Crocodile clips were fitted at the two extreme ends, but these were, naturally, attached so that they were insulated from the wires by the rubber and cotton covering. The clips simplified the "erection" of the aerial on top of a fence or between two sticks. To make the wire easier to handle, a knot was made at the end of the 5ft. twisted portion, and the two separate lengths were stretched so that they did not tend to re-twine together. Ordinary banana plugs were fitted to the ends of the twisted portion for easy connection to the set.

Small Tuning Condenser

One unusual feature that will be noticed when examining the circuit is that the tuning condenser has a capacity of only

45 mfd. We chose this value deliberately, because it was considered desirable to avoid the need for a slow-motion control if at all possible. By fitting a 3in. knob to the spindle of the 45 mfd. condenser, we found that easy and accurate tuning could be obtained. It should be mentioned that the use of a condenser of such a low capacity appreciably restricts the tuning range. This does not matter if reception is to be confined to the two wavelengths mentioned above. In fact, a still smaller condenser could be used if a few experiments were made to find the exactly correct numbers of turns for the grid windings of the coil.

The coil is, in effect, a double one consisting of six separate windings :two each for aerial, grid and reaction. There is no provision for short-circuiting a portion of the aerial and reaction windings (this was not found to be necessary), but an on-off type of switch is provided for short-circuiting the lower grid winding when 20-metre reception is required.

Throttle-control Reaction

Another not very common feature of the circuit is the use of throttle-control reaction. This was adopted after a few preliminary tests because it was found to be less prone to cause troublesome hard-capacity effects. A 0002-mfd. condenser is used, this being of the pattern developed for smooth reaction control, and fitted with a pointer, scale and reduction drive of about 10 to 1. Readers who have previously used this form of reaction control will remember that the condenser works in the opposite direction to that which applies with Reinartz reaction; in other words, an increase in capacity brings about a reduction in reaction coupling. The reason is that the condenser serves to by-pass H.F. from the anode of the detector valve, instead of allowing it to pass freely through the reaction winding on the coil. Coupling is increased by reducing the capacity of the condenser.

**Assembly**

The very few component parts required were assembled on a small batten measuring 6in. by 3in., as shown in Fig. 2—actually a smaller board than this could be used if space were at a premium. A lamp socket panel was fitted in front of the baseboard, this measuring 6in. by 4in. It carries the two condensers—one toward each side—two switches in the centre, and a terminal socket strip under each of the condensers. Single sockets could be used in place of the strips, or even terminals would serve, but they are less convenient. It will be noticed that the tubular coil, wound on a coax or cardboard former, fits over the valve and baseboard-type holder, leaving ample space for the few other components on the baseboard.

The unit was fitted inside a plywood box, the four battery leads being brought through a hole and connected to a valve plug adapter. A chassis-mounting valve holder to correspond was fitted on the small plywood battery box, so that connection between the two could easily be made. It might be thought that the complete outfit is a good deal larger than it need be, but as it was generally carried in a small attaché case this did not matter. Additionally, the parts were not cramped, and, therefore, experiment was more convenient.

Fig. 2.—A suitable arrangement of the principal components.

(Continued overleaf)
SHORT-WAVE SECTION
(Continued from previous page)

H.T. and L.T. Supply

H.T. current was taken from a couple of 18-volt G.B. batteries wired in series, but a midget H.T. battery could be used if preferred. The batteries take up more space but have a longer life and are noticeably less expensive in use. A very small unsatisfactory accumulator was used, and since the total output on this was only 1 amp, it would operate the set for thirty hours or more on a charge. Details of the box used to hold the battery are not being given, because the size is entirely dependent upon the particular batteries used.

Making the Coil

A home-made coil was used, this being wound on a 1 in. diameter Paxolin former, as shown in Fig. 3. The method of winding is perfectly straightforward, and the grid windings should first be applied. Start by making a couple of small holes with a fine bradawl and a pair of pliers, and pass the end of a reel of 20-gauge enamelled wire through these so that it is securely anchored. Then wind on seven turns or thereabouts. Make a single hole near the end of this short winding, cut off the wire and temporarily anchor it in the hole. Lower the tube so that it can be soldered to the lower end of the first section of the grid winding. Then wind on five more turns, before making a pair of holes, and finishing off the end of that winding.

Next wind on the second portion of the grid winding, anchor the end of the wire and wind on four side-by-side turns. Make a single hole, cut off the wire and lightly anchor it. Then make a hole, line above the top of the lower grid winding, pass the end of the remaining wire through it and back up the tube so that it can be soldered to the lower end of the first section of the aerial winding. Then wind on five more turns, before making a pair of holes, and finishing off the end of that winding.

The two reaction windings are dealt with in a similar manner, again using 28-gauge enamelled wire, but starting about 1 in. below the grid windings. Do not forget to leave sufficient wire at both ends of every winding to permit of a length of 28-gauge being soldered to it for making connections. Also note carefully that all turns must be wound in the same direction; it does not matter whether they are put on clockwise or anticlockwise as long as they all run the same way.

The coil is finished by bolting a small angle bracket at the bottom to serve for mounting on the baseboard with a screw. After the components have been mounted, put the coil loosely in position, and connect it by means of the flexible leads, which should be cut so that they are not much longer than is necessary for them to reach to the appropriate terminals. After testing the set and finding that it works properly the coil can be firmly screwed down to the baseboard.

Suitable Valve

Almost any type of triode valve can be used, but it will probably be found that best results are obtained by using a detector (D) or a general purpose (H or HI). Any of these will operate efficiently with 30 volts H.T., whilst their current consumption will be extremely small.

If it is preferred to add an L.F. stage this can be done by using a baseboard slightly longer or deeper than that shown, along with a midget type of transformer; the anode current to the detector is so low that the primary winding will easily carry it. When using only 30 volts H.T. the L.F. valve—not one of the small-power type—will work best without grid bias and will give sufficient amplification to produce good 'phone signals, although not to work a speaker.

Leaves from a Short-wave Log

Listen to Tripoli

Occasionally you may now pick up a direct broadcast from this Italian colony in Northern Africa, as relays to Rome for re-broadcast through the Italian network are made through IQN, a 5 kilowatt transmitter at Tripoli working on 31.71 m. (9.46 mc/s). Those French Harmonics

When tuning in on short waves a number of harmonics are encountered, in particular of French stations, and in some instances the signal is so strong that it can be easily mistaken for a direct transmission. Poste Parisien (Paris) may be heard on its 4th harmonic (78.2 m.—3.475 mc/s), 5th (69.56 m.—4.795 mc/s), 6th (52.51 m.—5.854 mc/s), 7th (44.69 m.—6.713 mc/s), 8th (39.01 m.—7.672 mc/s) and 9th (34.75 m.—8.631 mc/s). In the same way the programmes of Paris (P.T.T.) are picked up on the 5th (96.34 m.—3.475 mc/s) and 10th (43.17—3.96 mc/s); Bordeaux (P.T.T.) on the 3rd (52.9 m.—3.331 mc/s), 4th (69.65 m.—4.308 mc/s), 5th (53.72 m.—5.388 mc/s), 6th (46.43 m.—6.462 mc/s), and even on the 11th harmonic (25.355 m.—11.847 mc/s). Strasbourg (P.T.T.) provides the 4th (87.3 m.—3.436 mc/s), 5th (69.84 m.—4.295 mc/s), and 7th (40.89 m.—6.013 mc/s), and also the

PRACTICAL AND AMATEUR WIRELESS
June 18th, 1938

The June Boston Schedule

W1XAL, Boston (Mass.), U.S.A., on 26.45 m. (11.79 mc/s), possibly the only North American station which does not broadcast on this wave-length, has made slight alterations in the timing of its radio entertainments. It is now on the air on weekdays from G.M.T. 21.15-23.30, with

Member of the Derby Short-wave Radio Society during their first 3-metre field day, which was held on May 21st.
A

NOTHER landmark in the history of television course our memory flashed broadcasting of the Derby, which served further to emphasise the tremendous strides which have been made in television technique in this country. We witnessed the broadcast in a London cinema which was specially taken over for this occasion, and a Baird television apparatus was installed for the purpose. On a screen measuring 8ft. by 6ft. 6in., the entire scene was portrayed, from the preliminary examination of the complete course, to the saddling enclosure, the fun-fair, the tote, the bookmakers, and so to the off. The course of the horses was followed from start to finish, and a fine close-up showed the spurt with which Bois Roussel took the lead to finish in remarkably fine style.

Except for a slight interference towards the middle of the transmission, due to some outside source between the course and the Alexandra Palace, the transmission could be regarded as faultless. The long-shots gave remarkable views of such crowded scenes as the fun-fair, where the movements of the people as well as of the roundabouts were vividly portrayed. If one wished to criticise it would only be from a photographic point of view, certain scenes suffering from a peculiar form of distortion which is always present with telephoto lenses of high power. This is evidenced by a peculiar foreshortening which destroys perspective to some extent. This is often apparent in newspaper illustrations of a cricket match, where the distance between the two wickets appears very small, although the players appear to be of normal size.

A Comparison

The cinema, was not darkened beyond the degree adopted for normal cinema technique, and as we watched the horses going down the straight back 7 years to the first attempt by Mr. Baird to televise this classic racing event. We saw this in the early Baird studios in Long Acre, three or four of the experimental 30-line receivers being installed in a darkened room for the purpose, and in order to accommodate, and the limited audience we were carefully arranged before each receiver. Some of us had to sit on the floor and those behind had to kneel or stand so that every one had a view of the very small lighted aperture in which the horses were to be seen. In spite of its crudity in those days we visualised the time when improvements would provide a larger picture, but we ventured to think that no one present at that event could have had any conception of the remarkable strides which would be made in a comparatively few years. Obvi-ously the day is not far distant when the television screens will take their place in the cinema, and current events of national importance will be seen by the audience as an every-day occurrence. The Baird company, and the Gaumont British company are to be congratulated upon their enterprise in providing this public demonstration to prove once again that British television leads the world.

An Outstanding Event

THERE is no doubt that the most recent outstanding event as far as television is concerned was the televising of the Derby, Handicapped a day or two before as a result of a gale, the event was worked at high speed to build another and factory results. The main criticism was the too rapid panning over the scene prior to the running. When this was rectified by using the telephoto lens in use, the pictures showed optical distortion at the edges, this being more marked when vertical panning was resorted to. Then again, when televising the start of the race a peculiar form of interference manifested itself, this showing as horizontal bars moving up and down the picture at slow speed. These are minor criticisms, however, and the televised pictures of the exciting finish made up for any of the earlier defects. In all, three cameras were employed and reports of reception came in from a particularly wide area.

Interference Suppression

WHEN fairly strong interference from a passing motor car affects a television receiver the result is generally seen as a series of splashes of white which wipe a band or bands across the picture screen, this band moving up or down according to the ignition rate of the offending machine. When the interference is severe each splash of light takes a form something similar to a short, fat, pointed streak. Whose side faces the left of the picture, while the point is directed towards the right. The reason for this is that the wide area over which the screen represents the commencement of the cylinder ignition spark, and the energy picked up by the aerial and fed through the vision channel is sufficient to cause the modulation electrode of a cathode-ray tube to become very much less negative than normal. This brings about a considerable increase in the electron beam current, so that at the point of impact of the beam on the screen an intra-line light area is exhibited. The beam current is momentarily too large for either the focusing electrodes or the solenoid coil to control, and the consequent defocusing of the beam makes the spot spread over an area which represents in depth aashing from four to eight scanning lines. As the energy dies down in a manner similar to that of a damped oscillatory circuit the beam is brought under focus, and finally there is insufficient external energy to produce any visible screen illumination. To locate the aerial as far as from the interfering source as possible and, where direction permits, resorting to reflectors to reduce interference pick-up, there are other methods which have been developed in a genuine effort to cure this annoying trouble. One of these is to electrically convert the splash of interference from light to dark, for a black spot would be invisible to the eye, and although picture quality may be
marred somewhat this is far preferable to a screen which is covered with a miniature snowstorm effect.

**An Effective Method**

A NOTHER very effective method which has been incorporated in the latest Baird receivers is concerned with "interference suppression," the control knob for which is set in one or more positions over its full range according to the intensity of the interference experienced on the viewing site. As readers of this journal know, the modulation characteristic of a cathode-ray tube resembles somewhat that of an ordinary three-electrode valve. The interference suppression control working in the output stage of the vision receiver has the effect of moving the static operational point of the tube up or down this characteristic. When interference is severe the working point is moved up the curve so that there is a definite brightness limit to the beam intensity, and the offending light areas as seen on the screen are thereby reduced very considerably.

Picture detail suffers slightly, this being similar to distortion in an amplifier working too high on the output valve characteristic as the result of insufficient grid bias, but as stated before, this is preferable to a picture ruined by interference. Under normal operating conditions the control is set back to its fullest limit and only advanced for those sites where, for example, main road traffic tends to upset the picture standard for comfortable viewing purposes.

**A New Mast**

ONE of the difficulties associated with outside broadcast television transmissions which the B.B.C. have experienced is linked up with the reception of the beamed picture signal from the site where the performance is occurring. This is brought about by different forms of interference picked up en route, coupled with the beating effect of different carrier waves which happened when the receiving aerial was positioned right at the summit of the Alexandra Palace lattice mast. This was offset recently by using the spire of a neighbouring church to accommodate the receiving aerial, but the present aim of the B.B.C. is the erection of a mast towering about 150 feet over Highgate village. This mast is to be 16 feet square at the base, and while some taper to four feet square at the top. There is a measure of local objection to this proposed scheme, but it is understood that negotiations are still proceeding and there is every likelihood of permission being given. Highgate village is the highest point in North London, and the actual site chosen is directly on the route of the special television cable linking Alexandra Palace with Broadcasting House.

**A Programme Proposal**

OPINIONS may vary as to the type of programme which viewers consider the best, but it is freely admitted that while some productions have been on a very high level, there are many supporting items which do not bring credit to the B.B.C. service. A proposal has therefore been put forward that viewers be asked to record their opinion of programmes and give reasons for their preference to certain types. In this way the B.B.C. will be in possession of interesting data which will undoubtedly assist in compiling programme matter. The general level must be a very high one if interest is to be stimulated and maintained, and it is learned that the Television Committee is to be presented with a viewers' report in which constructive criticism is being made, with emphasis on the popularity of O.B.s of both local and national interest.

**Another Record**

WITH television, record viewing distances seem to be made to be broken. This is really inevitable when dealing with such a subject as ultra-short waves, for knowledge is still small, and it is the pioneer bands of amateurs and professionals alike who are proving beyond all doubt that the original pessimistic B.B.C. estimate of a 25-mile radius for the service from Alexandra Palace is a long way from the truth. The latest place to establish a reception record is Ormesby Bank, which is about four miles from Middlesbrough and 220 miles from Alexandra Palace. Those engaged in making the experiment readily admit that the site is an ideal one, being 700 feet above sea level, while a steel lattice mast 80 feet high is used to accommodate the aerial. For the actual test a two-valve pre-amplifier was used in conjunction with a standard commercial set.

**Television and Education**

ALTHOUGH any form of regular television service is as yet a remote possibility in America, the authorities of that country are already undertaking tests to ascertain the practical worth of television for educational purposes. Leading authorities in the teaching world saw recently a special programme conducted by the National Broadcasting Company. Running commentaries, laboratory experiments, and televised films were all combined to give an idea of how televised illustrations may help with future education. Such ideas are, of course, by no means new in this country, for the B.B.C. have quite successfully devetiled items of an educational character into their normal daily programmes.
Lightweight Extension Speaker Cabinet

My small speaker, having no fixing screw holes, had been attached to the chassis by a bracket. Wishing to use the speaker only as a separate unit, I made the cabinet illustrated and there is now absolutely no box resonance.

The framework is of 1in by 1in white wood, and glued to this is a front panel with a hole cut for a fret. The sides, top and bottom are of the same material, i.e., 3-ply wood. A piece of clean, old carpet is next glued on the edges and placed inside the box as packing, the speaker is held firmly in place by means of a wood strut shaped to fit snugly round the back of the speaker as illustrated. A few pieces of rubber and a coat of paint or varnish completes the cabinet.—E. Williamson (Brillington).

An Efficient Midget-valve Screen

In the construction of a midget receiver recently, I found that unless adequate screening was given to the screen-grid valve owing to its close proximity to other components, a percentage of instability arose which could not be overlooked; I therefore constructed the novel screen illustrated. Apart from deriving its chassis connection from two solder tags, I increased its efficiency on the short-wave bands by earthing again directly to the filament negative valve socket.

Having cut a piece of copper foil to the dimensions shown, all that remained was for the top and bottom sections to be turned over, thus when fitting and removing the XN4 valve, the possible scratching of one’s fingers on the otherwise sharp edge of copper was prevented.—V. G. Henchworth (Norwich).

A Neat Hydrometer Drip Stand

The accompanying sketch illustrates a rather novel hydrometer stand which I have recently constructed. A strip of mild steel constitutes the main support, and to this is soldered a brass clip made from a strip of 3/32in. brass. The main support is recessed into the base, and four small rubber feet, screwed on as shown, prevent the stand from slipping. The small jam jar is also recessed to the depth of three thicknesses of ply, and its fitment into the base in this manner should be tight, yet providing ease of removal when required.—A. R. Thornez (Anerley).

A simple method of balancing a pick-up.

For some time I have been using a cheap pick-up for gramo reproduction with my radio. It is very satisfactory and gives very good results, but it rather trenches and tears the recordings. This is not due to any faults with the pick-up, except that it is very heavy, so I devised the simple device shown in the sketch to reduce this weight on the record. It is the very simple principle of a pair of scales, and I have adjusted my pick-up with this simple device to an apparent weight on the record of 1oz. This weight ensures that there is no break-through of the deep notes, and surface noise is lessened. Details of the device are clearly shown in the illustration.—W. Featherstone-Kirk (Ferring-on-Sea).
O WING to amplifiers being so often associated with high-power outputs, it has become common to think of them as being -essentially mains operated, therefore, in view of this and the number of requests received for a battery-operated outfit, the unit mentioned above has been designed. To the many readers who have made such requests, and who may require something different from that given below, I would draw their attention to the latest edition of "Sixty Tested Wireless Circuits," wherein will be found much valuable information, together with complete circuits, concerning amplifiers and their design.

The first consideration with any battery-operated apparatus is current consumption. The second, at least so far as amplifiers are concerned, is the output obtainable. Bearing in mind the fact that these two requirements are very closely related to each other, and that dry H.T. batteries are likely to be the source of anode current supply, limits to suit both factors had to be selected, and it soon becomes apparent that it is absurd to think in terms of 4, 5, or 6 watts output, as so many constructors would desire.

If one can eliminate the question of dry H.T. batteries by, say, using large-capacity H.T. accumulators or, for example, a Mines Unit, then the output can be raised considerably, but, even so, one cannot soar to the large outputs obtainable from some of the mains-operated "power" amplifiers.

So many pick-up enthusiasts appear to have the impression that unless an amplifier can deliver, say, 6 watts of undistorted output, it is not worth considering for record reproduction. Well, I suppose it is a matter of personal taste, but, bearing in mind that one is usually concerned with using the equipment in a room of average size, I would suggest that such power is out of all proportions.

From the reproduction point of view, by which I mean judging audibly, I maintain that an output system capable of handling 2 watts is more pleasing, when it is fully loaded, than a 5- or 8-watt outfit with the volume turned down to the same output. However, whatever the pros and cons of the case may be, it is always wise to remember that the ear is not too critical as regards intensity of sound when considered from the point of view of watts. For example, it would take a very experienced ear to differentiate between 3- and 5-watts output, therefore I have selected a happy medium, remembering other limiting factors.

I think of them as being -essentially mains much valuable information, together with readers who have made such requests, and above has been designed.

Battery-operated outfit, the unit mentioned in mind that one is usually concerned with is a matter of personal taste, but, bearing in mind the fact that these two requirements are very closely related to each other, and that dry H.T. batteries are likely to be...
"mixed" before being fed into the grid circuit of the L.L.2, thus allowing two pick-ups or one pick-up and a "mike" to be used according to individual requirements. This item is always very handy as it increases the uses of the amplifier considerably apart from giving the operator greater scope so far as results or effects are concerned.

The third control R.3 is a combined potentiometer and switch, the potentiometer section being used as a tone control while the switch is wired to cut off all batteries. It will be noted that the tone control is really a low note booster or high note cut-off, but the values have been selected to provide a most satisfactory variation in the tonal response and it will be found very useful for the elimination of record surface noise or needle scratch. It must be appreciated, when considering this arrangement, that the natural characteristics of the amplifier are on the high side, so any additional form of high note booster is not required, in fact, it would be detrimental.

The transformer is placed so that the grid leads to the two output valves are short and direct, the resistances Rg being included to prevent, in conjunction with the two fixed condensers Ca between each anode and the negative line, parasitic oscillations which are sometimes generated in symmetrical push-pull circuits.

The anode circuit of the L.L.2 is decoupled by means of a resistance and a condenser to eliminate any possible instability through battery coupling, but the anodes of the P.P.225's receive their H.T. via the output or speaker transformer. No output transformer is included in the amplifier as the majority of modern moving-coil speakers are fitted with a multi-ratio transformer which usually allows satisfactory matching to be secured.

Particular attention must be given to the connecting wires associated with the two input controls. As these potentiometers are in direct contact with the input grid, it is essential to cover all connecting wires with metallised braiding.

**Fig. 2.—Panel layout or drilling diagram.**

**Fig. 3.—The amplifier, with all parts in position ready for wiring.**

Layout

It will be seen, from the illustrations, that a small simple chassis has been used to hold all components, as this allows a clean top deck to be obtained and facilitates wiring. It will be quite an easy matter to build a compact cabinet round the chassis or, if a more professional appearance is required, to make a cover to fit into the top of the chassis out of stout perforated zinc.
Early Experiments in Car Radio

An Interesting Account of the First Radio Equipment Installed in a Motor-coach in 1923. By L. ORMOND SPARKS.

A brief announcement stated recently that a fleet of 350 motor-coaches was being fitted with radio installations by one of the large radio manufacturers.

It is highly possible that the layman did not register any great interest or amazement in the statement. Why should he? Car radio is, to-day, quite a common thing.

To me, however, the announcement was of greater interest. Not from the point of view of progress, as my remarks will show, but for the fact that it aroused memories, and made me wonder what the coach people had been doing since the early days of 1923, when I successfully equipped the first,—so far as I have been able to ascertain,—motor-charabanc with radio.

The radio receivers and transmissions of to-day are vastly different from those of 1923. With modern equipment, it is possible to receive radio programmes under almost any conditions, with little more trouble than switching on the average home receiver, therefore, it is, I suppose, quite natural for the public to take these additional applications of radio as part and parcel of the world to-day.

In 1923 the passengers who patronised the charabanc mentioned above were so frankly amazed and impressed with the results that they forgot, for once in their lives, the quaint old British characteristic of taking anything and everything as it comes, without showing the slightest surprise or emotion, and pined me with many questions concerning the outfit. One very sceptical old lady almost insisted that I had a "gramophone contraption" fitted under the seat or somewhere.

Some of the older radio enthusiasts will appreciate that, the gear and valves available in 1923 made the whole matter very different from what the same achievement would involve to-day.

The Installation

The author adjusting the "Gecophone" receiver during the initial tests.

When I first had the idea of equipping a motor-coach, I was fortunate enough in securing the whole-hearted co-operation of the largest local motor-coach firm, the Royal Blue Coaches, of Bournemouth, and of my then employers, Bright's Stores, of the same town.

I decided to use the "Gecophone" apparatus which was produced by the General Electric Company, but I was up against the trouble of obtaining sufficient amplification H.F. or L.F. under the conditions prevailing.

After several experimental trips to determine the best type of aerial to use, the circuit most suited to my requirements, and the elimination of interference from the car, I eventually fixed on the following:

The receiver consisted of a two-valve "Gecophone" receiver which employed a triode H.F. stage coupled to the triode detector by a tuned-anode coupling. This particular circuit had a rather neat reaction control, bearing in mind the P.M.G.'s limitations on reaction in those days, and I well remember the moment I switched on the receiver a dozen times before the coach, off, checked batteries and adjusted the controls.

The output from the detector had, of course, to be amplified. Well, there were no high-efficiency pentodes or high-gain amplifiers to be had then, so I had to experiment with two single-valve L.F. units, until I got them to work peacefully together with good quality output. Two transformer-coupled stages of that period, with the old "R" type valves, could cause some weird results; still, in the end everything turned out all right, and it was only a question of where to house the gear and how to equip the coach. For compactness, I mounted all the apparatus in a long, stout wooden case provided with two clamps which allowed it to be fixed to the back of the seats immediately in front of the rear seating compartment, which then became the operating cabin.

The batteries were all contained in a separate case on the floor below the receiver cabinet.

Fitting the Headphones

Early Experiments

Fitting the Headphones to enable the output to be distributed throughout the coach, a two-pin plug was fitted in front of each seat, thus allowing every passenger to plug in their headphones at will, a small hook being provided so that the headsets could be hung up when not required. The aerial was eventually done in the manner shown in the photograph, its height being such that it did not interfere with the passengers getting in or out of the coach.

At the time these experiments were going on, the Bournemouth broadcasting station was not in being, so I had no alternative but to work to Cardiff which, it will be remembered, by the older enthusiasts, did not interfere with the passengers getting out or out of the coach.

A halt while Cardiff was tuned in during the first demonstration run to Wimborne. The aerial system is supported by the four vertical rods.

Needless to say, the apparatus was doing her share of the act and coming through really well. I signalled for the "operator" compartment, drove up to the appointed spot to pick up our passengers, which included members of the local Council, the Press and directors of the two firms concerned. Needless to say, my directors were also rather anxious that the outfit would not let us all down, and feeling for them did not make it seem too much like a picnic for me. However, we drove off in style, complete with a large banner right across the front of the coach, and headed for Wimborne.

The Trial Demonstration

The author adjusting the "Gecophone" receiver during the initial tests.

A few miles out of Bournemouth the coach stopped and I was asked to switch on or, in other words, prove my stuff. I well remember the moment I switched on and donned my headphones, and my silent sigh of relief when, lo and behold, Cardiff was doing her share and coming through really well. I signalled for the (Continued on opposite page)
PRACTICAL AND AMATEUR WIRELESS

EARLY EXPERIMENTS IN CAR RADIO

(Continued from previous page)

others to put their 'phones and watched their expression of surprise and astonishment as they listened to the programme.

I then passed the signal for the driver to start up and we proceeded towards our destination. The item being radiated was a selection from popular operas, and I suppose my luck was in, as the piece did not finish until we came to a stop in the quaint old market place of Wimborne. After a short stop for refreshments to celebrate the occasion, the return trip was commenced, a different route being taken, and I still remember the great feeling of satisfaction as Cardiff wished us "Good night," and concluded her programme, as did all stations in those days, with "God Save the King," which we heard perfectly as we sped homewards through the darkness.

There is little more to say regarding the equipment or its use, other than to add that this one function perfected throughout the rest of the summer, the co-owners running special Radio trips every night, and the way the seats were booked in advance that it was appreciated by all.

Fifteen years in a long time, and much has happened, so far as radio is concerned, since those pioneer days of broadcasting, therefore, it does seem rather strange that those responsible for the comfort of travellers, especially over long distances by road, have not exploited before that which depended on the help of my co-operators, back in 1923.

PRACTICAL MECHANICS' HANDBOOK

All mechanics will be interested in the valuable gift book which has been produced by F. J. Camp for readers of "Practical Mechanics." This is a work such as has never been previously published. This book is available for only 2½ and coupons cut from two consecutive issues of "Practical Mechanics," which is published at 6d. monthly. Further details, and a reservation form, will be found in the May issue of "Practical Mechanics," now on sale. When this reservation edition is exhausted the "Practical Mechanics Handbook" will cost 5/-.

COMING TELEVISION PROGRAMMES

Molière

MOLIÈRE'S best known farce, "Le Médecin malgré lui," will be presented in the afternoon on June 17th, and again in the evening of June 21st. On Sunday, June 19th, "100 Years Old," the comedy of Spanish village life by Seráfín and J. Alvarez Quintero, will be seen in the English version by Helen and Harley Granville-Barker.

"Badger's Green"

VIEWERS who remember the television programme "Badger's Green" will, last year, will look forward with special pleasure to "Badger's Green," the cricket play by the same author, R. C. Sherriff, to be presented in the afternoon on June 22nd and again in the evening programme on June 28th. The "Thread of Sorrows," a thriller by J. B. Bell, will be televised with an all-male cast in the evening of June 25th.

P.W. DEAF AIDS

Described in June 4th issue.

KIT "A" Cash or C.O.D. 37/-
Carriage Paid
or 8/- down and 10 monthly payments of 3/-.

Build all complete with knobs and escutcheon. Shirt, lead-In wire, transformer, inductor, and instructions.

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All WAVE ATTRACTION for entertainment. Choice of small, medium, large, and extra large to suit all tastes. £8/6 cash or C.O.D. (7/- down and 12 monthly payments of 6/-).

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Sales on bargains which cannot be repeated. All WAVE RECEIVERS, batteries and components, Chassis, everything is being sacrificed to give you for new season's line. Send NOW for giant bargain list.

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THE "ATOM" PORTABLE

A New Miniature Portable Embodying the Superhet Circuit and Incorporating Standard Batteries

The "Atom" Portable, supplied by Gordon Elf, Ltd., is one of the new season's designs embodying a number of interesting details. The overall size of the cabinet is only 11½in. by 7½in. by 6½in. and this houses a complete 4-valve superhet chassis, moving-coil loudspeaker, frame aerial and two standard batteries.

These are a 90-volt standard Drydix unit and a 2-volt A.H. I.T. cell. The frame aerial is accommodated in the rear door of the cabinet which is shaped for the purpose. The superhet circuit is built round the latest Mazda Octal-base valves and a two-gang condenser is employed for tuning the aerial and oscillator stages. A double-diode triode is employed in the third stage and this provides A.V.C. for the I.F. stage and a relay voltage is provided. For I.F. tuning standard screened I.F. transformers are employed.

Controls

A special slow-motion drive is incorporated in the novel dial on the front of the cabinet and a small aerial trimming condenser is fitted above this to enable maximum results to be obtained on both wavebands. The two remaining controls at the bottom of the tuning dial are for volume and combined on-off and wave-change switching.

At the rear of the cabinet two sockets are fitted and connected to the frame aerial, so that an external aerial and earth may be connected when desired. The dial is calibrated with station names and a very good selection of programmes is available on the frame aerial alone. When an external aerial is connected the results are, of course, greatly improved, although selectivity suffers slightly. The quality of reproduction is very good for the type of receiver, and the 6in. moving coil speaker provides not only substantial volume but also a very well balanced tonal quality. The total H.T. consumption is less than 8 mA, and the accumulator which is provided will give good service before recharging is necessary.

The selectivity, due to the incorporation of a frame aerial and the superhet circuit, is adequate to provide the programme separation that is normally desired, and there is no undue high-cut note. The total wave-range covered by the set is from 200 to 2,000 metres, and the receiver is available complete with batteries for £8 8s.

IMPORTANT BROADCASTS OF THE WEEK

NATIONAL (261.1 m. & 1,500 m.)

Wednesday, June 15th.—Haul Variety : No. 6.—Cockney Comedians.
Thursday, June 16th.—The Skipper's Birthday: a harbour night's entertainment, written by F. Morton Howard.
Friday, June 17th.—Die Meistersinger, Acts 1 and 2, from Covent Garden.
Saturday, June 18th.—Music Hall.

REGIONAL (342.1 m.)

Wednesday, June 15th.—La Bohème, Acts 1 and 2, from Covent Garden.
Thursday, June 16th.—A commentary on the Axel Gold Cup.
Friday, June 17th.—International Society of Contemporary Music: first orchestral concert, from Queen's Hall, London.
Saturday, June 18th.—Life Begins at Sixty: a revue by Denis Warren.

MIDLAND (296.2 m.)

Wednesday, June 15th.—A Violin Recital.
Thursday, June 16th.—The Trout Fisherman at Work: an outside broadcast from a Shropshire stream.
Friday, June 17th.—Variety from the Hippodrome Theatre, Aston.
Saturday, June 18th.—Gilbert and Sullivan Music: orchestral programme.

NORTHERN (449.1 m.)

Wednesday, June 15th.—Lightweight T. T. Race: commentaries from Isle of Man.
Thursday, June 16th.—Book Censorship in Burbleton: written by Frank Tidley.
Friday, June 17th.—Senior T.T. Race: commentaries from Isle of Man.
Saturday, June 18th.—Diocesan Festival Choirs, from Wakefield Cathedral.

WORLD (305.7 m.)

Wednesday, June 15th.—Senior T.T. Race; commentaries from Isle of Man.
Thursday, June 16th.—T.T. Race; commentaries from Isle of Man.
Friday, June 17th.—La Bohème, Acts 1 and 2, from Covent Garden.
Saturday, June 18th.—Melodies of Wales: an orchestral programme.

SCOTTISH (381.1 m.)

Wednesday, June 15th.—Operatic features: Giselle.
Thursday, June 16th.—Scotch Lester Dance Party.
Friday, June 17th.—Choral programme from the Poets Hall, Bangor.
Saturday, June 18th.—Melodies of Wales: Operatic features.

WELSH (373.1 m.)

Wednesday, June 15th.—Welsh Professional Golf Championship; eye-witness account.
Thursday, June 16th.—Gushee Emlyn (The Viper of Emlyn); feature programme.
Friday, June 17th.—Choral programme from the Poets Hall, Bangor.
Saturday, June 18th.—Melodies of Wales: Operatic features.

NORTHERN IRELAND (307.1 m.)

Wednesday, June 15th.—La Bohème, Acts 1 and 2, from Covent Garden.
Thursday, June 16th.—Choral programme from the Poets Hall, Bangor.
Friday, June 17th.—Irish Dance Music.
Saturday, June 18th.—Dean Swift, a programme by Denis Johnston.
THE "P.W." DEAF-AID

How to Increase the Sensitivity of this Useful Device and an Economy Hint

By W. J. DELANEY

The deaf-aid which was described in our issue dated June 4th last has aroused keen interest, and two small groups have arisen from the various letters which we have received regarding this device. Firstly, the problem of the life of the biasing cell has arisen, principally because this in the original design is continually in circuit with the microphone. The current which flows is quite small, and it was assumed in the original design that the aid would be used fairly continually during the day. Consequently, it was not considered worth while to economise on the small cell, seeing that it costs only a few pence to replace. However, it is worthwhile to lengthen the life of this cell, if the aid is only needed occasionally. A small point has arisen in the microphone circuit as well as in the L.T. circuit, and a slight change in the connections to the switch is required. Fig. 1 shows the modification, from which it will be seen that three points on the on-off switch are used, and these are now joined to the L.T. negative leads instead of to the positive leads. Fig. 2 shows the theoretical circuit with the modification incorporated, and it should be found quite a simple matter to make this change. It is not thought necessary to give the modified theoretical diagram as the change should be obvious from the accompanying illustrations. In conclusion, it may be stated that the microphone should always be kept pointing away from the earpiece—hence the reason for placing the control and phone connection at the back of the cabinet.

CONRAD HAY AND DISTRICT AMATEUR RADIO SOCIETY

O N May 26th, the above club held a very successful "junk sale" over which GSPJ presided as auctioneer. A sum of 30s. was raised, and substantial contributions made to the club funds. On May 31st an interesting lecture was given by 2BDJ, who spoke on television, and illustrated by means of diagrams all the latest developments in the field of radio. Meetings are held every Tuesday evening, commencing at 8 p.m., at 27, The Broadway, Consett Heath. A DF aerial by 2DRC, for field days, and also a DF aerial by 2DFU. Sentries were erected at Elstree, in grounds kindly lent to us by one of our members. A silk flag, with the society's badge emblazoned on it was presented to us by one of our members. A silk flag, with the society's badge emblazoned on it was presented to us by one of our members. A silk flag, with the society's badge emblazoned on it was presented to us by one of our members. A silk flag, with the society's badge emblazoned on it was presented to us by one of our members. A silk flag, with the society's badge emblazoned on it was presented to us by one of our members.

LU N D O N T R A N S M I T T I N G S O C I E T Y

A WELL-ATTENDED field day was held on Whit Monday at Headquarters at 10 a.m. Many members were engaged on experiments in grounds kindly lent to us by one of our members. A silk flag, with the society's badge emblazoned on it was presented to us by one of our members. A silk flag, with the society's badge emblazoned on it was presented to us by one of our members. A silk flag, with the society's badge emblazoned on it was presented to us by one of our members. A silk flag, with the society's badge emblazoned on it was presented to us by one of our members. A silk flag, with the society's badge emblazoned on it was presented to us by one of our members. A silk flag, with the society's badge emblazoned on it was presented to us by one of our members. A silk flag, with the society's badge emblazoned on it was presented to us by one of our members. A silk flag, with the society's badge emblazoned on it was presented to us by one of our members. A silk flag, with the society's badge emblazoned on it was presented to us by one of our members. A silk flag, with the society's badge emblazoned on it was presented to us by one of our members.

BRADFORD SHORT-WAVE CLUB

R A P I D progress is being made with the new transmitters, and considerable success is being attained. The construction committee is busy assembling the necessary gear to make this event a huge success.

B R A D F R O D S H O R T - W A V E C L U B

CARDIFF SHORT-WAVE CLUB

NEW members are invited to any meeting, and will receive a hearty welcome.

H. F. CAMM

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Coulphone Transformers

The accompanying illustration shows the robust nature of the mains transformers supplied by Coulphone Radio Mfg. Co., Ltd., of Ormskirk, Lancs. These are of the super-shrouded type, and the mains input regulation is effected by means of the small screw terminal seen on the insulated strip at the top. The regulation is exceedingly good and the transformers run without undue heating. Various models are available, and all are colour-coded in accordance with the standard code employed for this type of component. Special models will be supplied to order, but amongst standard models may be mentioned the following:

- 350-0-350 at 60 mA, with rectifier heater winding at 4 volts 2.5A., and a 4 to 0A. winding for ordinary 4-volt heaters, which costs 12s. 6d. The model illustrated costs 25s. and delivers 350-0-350 volts at 150 mA., and has 4 volt 2.6A., 4 volt 4A., and a 4 volt 6/8 amp. windings. In addition to mains transformers Messrs. Coulphone can supply output transformers of the heavy-duty type, including a super-shrouded model with secondary output, windings of 8 and 15 ohms, impedance suitable for Rola G12 or similar speakers, which costs 22s. 6d. All transformers carry a full 12 months guarantee.

New Tungsram Battery Valves

Among the new battery valves now available in the Tungsram range are the H.F. pentodes, in both the straight and the variable-mu types. Both of these valves have the grid taken to the top cap, and both are of the high-slope type. The SP2D (the straight model) has a 1 amp. filament, and is rated at 150 volts maximum for anode and screen. The slope is 1.7 mA/V and the maximum current is 10 mA. The VP2D, which is the variable-mu model, has similar ratings, but the slope is 2 mA/V. These valves are very useful in modern all-wave receivers, and the top-cap grid connections will greatly reduce losses and facilitate wiring. The standard 7-pin base, is, of course, provided. The price is 11s. each.

Hivac C.R. Tube

A USEFUL low-priced cathode-ray tube has been produced by the High Vacuum Valve Company and is known as type CR3. This has a 3in. screen and the heater is rated at 2.5 volts 2 amps. The voltage for anode 1 is 400 and for anode 2 it is 1,300 maximum. The negative grid voltage for current cut-off is -50 volts approximately, and the overall length of the tube (including the pins) is 11ins. The image colour is a brilliant green, and the price of the tube is 22s.

New Coscor Model

The illustration shows a new Coscor All-wave A.C. mains receiver, known as Model 396. This is a 6-valve chassis incorporating a high-gain H.F. amplifier, operating on all wave-bands, ensuring a very long range and also freedom from background noise. An 8in. moving coil speaker is fitted and the output stage is a triode. The remaining valves are variable-mu pentode high-gain H.F. amplifier, triode hexode frequency changer, I.F. amplifier, and double diode triode 2nd detector, L.F. amplifier and A.V.C. The dial carries 48 station names and tone control is provided. The wave-ranges covered are 16-52.5, 190-550 and 810-2,085 metres. A switch plug is provided for extension speaker and pick-up connections are included. The price is 9½ guineas.

New Cosmoscor Playing Desk

A new model of the playing desk is shortly to be added to the Cosmoscor range. This will take the form of a luxury model and will be available in console as well as table models. The cabinet is finished in fine walnut, and the general design takes the form of a shallow cabinet in which a drop front is fitted. When this is lowered the turntable and pick-up is brought forward so that a record may be placed into position. The pick-up in these models is of the crystal type, and is fitted with a swivel head to facilitate needle changing. Among the other refinements are an automatic start-and-stop device, volume control, and speed control. The price of the table model is £5 10s. for A.C. operation, and £6 10s. for Universal (A.C./D.C.) mains use. Details of the console models are not yet released. A lower-priced desk in which the magnetic type of pick-up is to be fitted will also shortly be introduced at £4.

W.B. Transformers

Many of the new W.B. transformers are now available for service engineers and others, and are intended as replacement units. Among these may be mentioned the Universal output component, designed for a steady D.C. of 30 mA. and providing six ratios. This is centre-tapped and it is possible on some of the lower ranges to pass a current up to 120 mA. The price is 5s. L.F. transformers designed for the parallel-feed method of connection are also available at 6s. 6d., whilst a microphone transformer with ratios of 49 and 60 to 1 costs 8s. 6d. On the mains side there is a model designed for normal mains inputs (40 to 60 cycles) and delivering secondaries of 250-0-250 at 60 mA, 4 volts at 2.5 amps, and 4 volts at 4 amps. The latter winding is provided with a centre-tap. This component costs 15s. For use with certain types of receiver Messrs. W.B. are also supplying a complete mains pack in which a mains transformer, smoothing condensers and valve-holder, etc., are ready mounted. This is to sell at 47s. 6d.

Franklin Cleaning Brushes

FRANKLIN ELECTRIC LTD., of 2-10, Wilson Street, E.C.2, can now supply separately three brushes for use with their cleaning fluid known as Fecol. The price of the set of three brushes is 9d., and these will be found of value to the service engineer for cleaning switch contacts and other delicate mechanisms.

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Impressions on the Wax

A REVIEW OF THE LATEST RECORDS

Parlophone

The popularity of the tunes from the film "Snow White and the Seven Dwarfs" has been emphasised by the fact that Richard Tauber has chosen one of the tunes "One Song" for his latest record "Parlophone BD 20367. The coupling is "You're Mine."

In the 12in. classic series the Berlin State Opera Orchestra and Chorus, conducted by Prof. Robert Heger, have recorded "The Flying Dutchman" (Act III, Sailors' Chorus) coupled with the Pfügers' Chorus from "Der Hohenzollern" on Parlophone B 20364.

Light orchestral recordings are supplied by Orchestra Mascotte with "Cavalier from "Tannhässe" on Parlophone E 11361. Chorus) coupled with the Pilgrims' Chorus is America's No. 1 "Swing" singer according to statistics, also sings two songs from the film "Swing, Teacher, Swing." They are "Please Be Kind" and "Moments Like This," on H.M.V. B 8749.

In this country.

Pianoforte Solos

RHYTHMIC piano solos are becoming increasingly popular, and three medley records make their appearance this month. Patricia Rosborough plays a "Manhattan Music Box" selection coupled with "Dizzy Fingers" on Parlophone B 1129, Billy Thorburn records a "Waltz and Fox-Trot Medley" on both sides of Parlophone B 1118, and a "Slow Fox-Trot Medley" and "Quick-step Medley" coupled with "Get Merry" by G. Moore appear on Parlophone B 1117.

Tessa O'Shea, the popular radio comedian, gets plenty of laughs with "I've Had My Kiss Me" by the Blackpool Band on "Parlophone B 1130, and the Jaddux of "Band Wagon" fame have recorded "Ultra Modern Swing" and "The Snake Charmer" on Parlophone B 1129.

In the Parlophone new swing style series we have Eddie Carroll and his Swingophone Orchestra playing "Creole Love Call" and "Dancing in the Moonlight" on Parlophone R 2623, and the second new rhythm style series is further supplemented with "Sing Baby, Sing" by Luis Russell and his Orchestra, and on the reverse is "Jubilee Stomp" by Duke Ellington and his Orchestra--Parlophone R 2623.

H.M.V.

There are two new sound-films supply most of the material for vocal records of light character in this month's issues. Nelson Eddy sings four songs from the "Girl of the Golden West," in which he plays opposite Jeanette MacDonald.

This record employs the same Wild West story by David Belasco as did Pucinii's opera "La Bohème." The tunes are, however, first rate, and there is a stirring chorus by a quartet of male voices. The songs are "Who Are We to Say" and "Soldiers of Fortune"--H.M.V. BD 1633, and "Senorita" and "Sun Up to Sun Down"--H.M.V. BD 1635. Betty Driver, who is already, at seventeen, popular as a radio, stage and gramophone star, sings in the film "Swing, Teacher, Swing," and "Goodnight Angel" on H.M.V. BD 556. Meanwhile, "Sweet Adeline," incidentally a song written by Joe Loss, is America's No. 1 "Swing" song, according to statistics, also sings two songs from the film "Swing, Teacher, Swing." They are "Please Be Kind" and "Moments Like This," on H.M.V. B 8749.

Some songs of Reginald Foort's new series are featured by his first record "Half Moon on the Hudson," coupled with "I Can Dream, Can't I?" on H.M.V. BD 5367. The swing music section contains Benny Goodman's recording of an arrangement by Arthur Askey (Big-hearted Arthur of the B.B.C. "Band Waggon") has found a home in the 12in. classic series. The Meistersextet is a name new to these circles given FREE. 4-Valve Model, with extra S.G. ensile stage, 37/-.

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A PIONEER LOOKS BACK

SIR AMBROSE FLEMING, inventor of the thermionic valve, broadcasting his personal reminiscences recently, said:

"I made acquaintance with Mr. Marconi in April, 1898, at Bournemouth, where he was working his wireless telegraphy between the Isle of Wight and Bournemouth. I have not yet forgotten my surprise when I received signals and a message to me sent by Maxwell electric waves twelve miles over sea, printed down on a paper tape.... But it was clear that it would require vastly more powerful waves to travel three thousand miles than had already been covered.

"A site was selected at Pendlebury; a lonely spot on the coast of Cornwall.

"In December, 1901, Marconi and two assistants went to St. John's, Newfoundland, taking with them balloons and kites to elevate a temporary receiving aerial. The Poldhu station was installed to send out at certain times three quick short electric discharges forming groups of electric waves denoting the letter 'S.' After some trials, Marconi was able to hear in a telegraph office in London, connected to the receiver, the three ticks denoting the letter 'S,' showing that these wireless waves emitted from Poldhu had travelled round the earth for three thousand miles.

"It became necessary to discover a more sensitive and trustworthy wave detector than the coherer which was so far being used. In 1904 I was so fortunate as to find it. Its action depended upon the fact that white hot metals and also hot carbon emit negative electricity in the form of very small particles called electrons.

"This thermionic valve soon became widely used. An American worker—de Forest—added a zigzag wire called a grid to my valve and this enabled it to magnify as well as detect electric oscillations. Then later it was found that this grid or threecrode valve could create (as well as detect) electric vibrations.

"As far as speech and music are concerned the valve has caused the earth to shrink to the dimensions of a single room."

Stray Emission in Cathode-ray Tubes

THE picture signal as represented by the modulated carrier-wave of the Alexander Palace station gives a range from full black (30 per cent. modulation) to full white (100 per cent. modulation). Assuming that the chemical composition of the powder employed for the screen of the cathode-ray tube is such that the resultant colour when it fluoresces under the electron bombardment during picture tracing is a black and white effect, the result observed should be a light replica in miniature (without the natural colour, of course) of the scene being televised. Complaints are often made, however, that instead of blacks in the picture there are only greys, and in consequence the picture lacks the range of contrast which is so essential for the best results. This is due to the fact that the tube is out of range, and arises from a failure of the tube to black out completely when the brightness control of the receiver is turned to its minimum position. This can be tested quite easily by making observations with the set in a darkened room. Instead of the natural colour of any light intensity the field of scan will be clearly visible to the eye. The brighter the screen under these conditions the less will be the contrast range in the receiver.
PRACTICAL AND AMATEUR WIRELESS

June 18th, 1938

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ETTERS FROM READERS

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

Station TGWA—Guatemala

SIR,—I hope the following piece of news may be of interest to some interested wireless readers. Every morning during the past week, at approximately 9 a.m., I have heard a transmission from TGWA, Guatemala, on the 31-metre band. At frequent intervals, an announcement was made in English telling listeners that they were listening to the "Voice of Guatemala." The programme consisted chiefly of dance music of a local nature, which, although sounding unusual to European ears, was very interesting to listen to. I cannot find this station among the lists of short-wave stations in various periodicals, so perhaps some other reader may have heard it and can enlighten me as to the exact wave-length, and times of transmissions. There is, I believe, a transmission daily on the 19-metre band from TGWA, but what of the 31-metre transmission?—A. C. STAPLES (Derby).

New Devices!

SIR,—As a regular reader of PRACTICAL AND AMATEUR WIRELESS I sometimes wonder whether too much attention is paid to the amateur and beginner, and not enough to the advanced wireless experimenter. To illustrate my point I enclose two cuttings, one of which refers to a portable transceiver, and the other to some apparatus and to our efforts to keep our readers in touch with that development. Looking through the daily papers, the illustrations showing public address work often reveal "practical wireless." Technical details are desired, not merely pictorial references.—W. K. CLEMENTS (Kew Gardens).

[When new ideas are brought out they are specifically reserved throughout the countries signatory to the Hague Convention and the U.S.A. Reproductions or adaptations of any of these are therefore expressly forbidden.]

Environment on Pitcairn Island

SIR,—Many readers may be interested in the following particulars of the radio equipment which was installed on Pitcairn Island through the fine example of cooperation of the leading American manufacturers, and donated by them "free of charge."

A 36in. steel cabinet using 16in. panels and chassis; three decks, with audio on the bottom; oscillator; and final at the top. A Shure model 705 crystal (f, feeding a three-stage, and transformer coupled to a pair of modulators, with 450V. H.T. from a bleeder network, and by arranging the battery p.d. plus a small cathode resistor giving 25V. bias. An 807 crystal oscillator, using cathode regen., and operating on 40, 40, and 600 metres, using Biley VP4 crystals 14,546, 7,245, and 478 ke/s—and utilising ganged grid-switching.

The final is an Amperex ZB120, which requires little bias and driving power, and internal variable link-coupling to terminals on top of cabinet. Two half-wave doublets cut to proper lengths for each band, with 75ft. lengths of Bussell concentric cable for the 20 and 40-metre channels, as provision has been made for individual double antennas.

Five tripler meters on the cabinet, indicating: 807 anode current; fil. voltage; antenna current on 600 metres; ZB fil. and plate currents. Filament rheostats are fitted to give a fine adjustment. With 260 mAs at 20, the Dynamotor, thence is 60 watts carrier output. Filament current is 4.1 amps., and the Dynamotor 28 amps. Two cut-out moulded glass insulators, and storage batteries are provided which is sufficient for 8 hours continuous running of both receiver and transmitter.

The Sargent Model 11 MF receiver covers 30 m/s to 100kc/s, having 4 valves with 1 H.F. stage and bandspread; p.m. i.e. speaker, and jacks for phones in first or second L.F. stages, and the H.T. from a separate generator of 40 mAs. at 240v., and taking 6 amps.

Trust all the above account will help us to be thankful of our ability to obtain our supplies from the mains, which are always on tap.—"SCOCCY" (Edinburgh).

Two New Zealand QRAs

SIR,—The following may be of interest to other readers of PRACTICAL AND AMATEUR WIRELESS. I have just received cards from two New Zealand S.W.L.s, and they wish to have their QRA nosed around for exchange of cards. Their QRAs are as follows: Fireman George Kemp, Central Fire Station, Christchurch, Canterbury, New Zealand; and C. O. Peppereil (R9LL) Ronouts, Taranaki, New Zealand.

Both cards look good and are worth trying for. I have been listening to WXZAT on the loudspeaker at R7, peak 7 to R9. Receiver: B.S.T. Trophy 3 battery model, but statics are rather bad of late.—W. M. GRUMMETT (2CMF) (Greendale; Yorks.).

LEAVES FROM A SHORT-WAVE LOG

Continued from page 346

11th (31.75—.9494 mc/s). Bennes (1.P.T.T.) has only been logged so far on its 4th (72.12 m.—.4166 mc/s) and 5th (57.7 m.—.5-2 mc/s). Radio Toulouse, France, however, is found on various points of the condenser dial, such as the 42nd (81.5 m.—.3-602 mc/s) and 43rd (65.75 m.—.5-476 mc/s) and 7th (47.1 m.—.6-391 mc/s). A further careful search will reveal many more. It is useful to log them carefully, for they have been definitely identified, as on many occasions they will prove a helpful guide in finding new distant stations and other signals, or for determining the broadcasting station of the distant signals.

Regular Broadcasts from Ethiopia

It is reported that a regular schedule of transmission has now been drawn up for broadcast through a 1000-watt 1 kW. transmitter erected in the vicinity of Addis Ababa. So far, two programmes only have been given daily, at 6.30 A.M. (72.9-10.10) and 12 noon (10.10-12 no). The day transmission has now been drawn up for 5th (65.75 m.—.5-476 mc/s) and 7th (47.1 m.—.6-391 mc/s). When these announcements are made in the Italian language.

The Vatican Tries Out a New Channel

An experimental broadcast was recently commenced from H.V.J., Vatican City, on a hitherto unused band, namely, 21.47 mc/s. (11.74 mc/s).
### Practical and Amateur Wireless

#### BLUEPRINT SETS

**CRYSTAL SETS**

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<tr>
<th>Blueprint</th>
<th>Description</th>
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<tr>
<td>PW49A</td>
<td>AW: Three (1st ed.)</td>
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<tr>
<td>PW50A</td>
<td>AW: Three (2nd ed.)</td>
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**TRANSISTOR SETS**

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<th>Blueprint</th>
<th>Description</th>
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<tr>
<td>PW51A</td>
<td>Three Transistor Set</td>
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**SUPERHETS**

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<th>Blueprint</th>
<th>Description</th>
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<tr>
<td>PW52A</td>
<td>Two Transistor Superhet (No. 1)</td>
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**PORTABLES**

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<th>Blueprint</th>
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<tr>
<td>PW53A</td>
<td>Portable Superhet (Model 50)</td>
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Speaker Connections

"I recently bought second-hand a moving-coil speaker which has four coloured contacts—white, blue, red and black. The volume is very poor compared with my other speaker, which is not a moving-coil. I have noticed a certain amount of trouble. How shall I alter the speaker so that there are only two contacts? My set is a home-built straight three and delivers a fair amount of volume for its type."—F. M. (Ferndale).

This is another case where second-hand apparatus can cause a considerable amount of trouble. The speaker may be removed from a commercial receiver and be totally unsuited for your set. Firstly, the coloured leads are not identified by any particular colour code or scheme and thus the makers alone know what the colours indicate. The speaker may be an energised model, in which case two of the contacts must be connected to a high-voltage source to provide an energising current. Without this the volume will be very poor.

On the other hand, the four contacts may be tappings on an input transformer to enable it to be matched to Power, Super Power, Pentode or Push-pull valves, and in this case you should be able to find out what the colours indicate by the terminals and the name and address of the sender. Draw the reader's attention to the fact that the Queries Service is intended only for the elucidation of technical matters arising from the construction of receivers-detailed in this issue or on general wireless matters. We regret that we cannot, for obvious reasons—(1) Supply circuit diagrams of complete multi-valve receivers. (2) Supply names and address or modifications of receivers described in our contemporaries. (3) Supply alterations or modifications to commercial receivers. (4) Answer queries over the telephone. (5) Grant interviews to quenst.

Headphone Connections

"I wish to connect a pair of headphones to my mains superintendent for late night listening, and wonder what is the best plan to adopt. I do not wish to interfere with the output stage as I believe the pentode can be damaged by an open circuit in the load connection, and at the same time I am keen to be able to switch the speaker on when a signal has been located just for test purposes. What is the best plan for me to adopt?"—H. F. (Clacton-on-Sea).

If your output valve is transformer-coupled you could connect the phones through a small condenser between earth and the anode of the output valve. This will not, however, prevent signals from being heard through the speaker, and therefore the best plan is to connect a low resistance of the variable type across the speech coil of the speaker. With this you could reduce volume to cut-off point and turn it up when required.

Varley Permeability Tuner

"I have a Varley Tuner which has coloured terminals and I wonder if you could tell me the connections for these points. There are three coils which I understand are for the E.F. transformer type."—F. E. A. (Kettering).

The primary winding of each coil is identified by a red and brown terminal, the yellow terminal being taken to the change-over switch on the secondary of the aerial circuit, therefore, yellow and brown should be joined together so that the primary is maximum in both waves, and in all coils the black terminal is earthed. If no A.V.C. is fed to the coils or a straight circuit is employed you will also have to bond black and blue terminals on each coil, but if A.V.C. is employed it should be taken to the blue terminal.

Pick-up Tone Control

"I wish to fit a tone control across my pick-up circuit but am uncertain regarding the best scheme to adopt. Can you recommend any alternative ideas which I could try out, or on the other hand, say which is the best arrangement in the view of the makers alone know what the colours indicate. It is therefore necessary to find out what the colours indicate and if your supplier cannot tell you this you will have to communicate with the makers of the speaker.

Cyclo Converter

"In the correspondence columns of your paper for May 21st there is a reference to a Cyclo Converter. As I am desirous of seeing the details, will you kindly let me know in your next number or numbers of the journal what number or numbers of the journal the details, will you kindly let me know?"—J. R. M. (Edinburgh).

The converter in question was a two-tube unit employing a triode and a pentode valve as a frequency-changing stage for use with an existing receiver employing H.F. amplification. A plug-in stage for use with an existing receiver was described in our issue dated October 30th last, and this gives an output from 5 to 7 watts.

Quality Set

"I have a set in out of touch with radio for some time but now wish to make a quality receiver—regardless of cost. I want separate receiver and amplifier units with an output of about one watt, and high quality is the primary aim. Can you tell me what circuits you have published of this type? If necessary, I can take off the L.F. side of any set you have published, as I shall add an all-wave receiver section at a later date."—I. F. G. (Stradishall).

We have not published a set giving the output mentioned, but have described several quality amplifiers. The Listeners' 5-watt amplifier (blueprint W. 262) is a good model, being the 12-watt amplifier, described in our issue dated October 30th last, a very good quality unit but is not available in blueprint form. A paraphrase high-quality amplifier was also described in our issue dated January 18th, 1938, and this gives an output from 5 to 7 watts.

RULES

We wish to draw the reader's attention to the fact that the Queries Service is intended only for the elucidation of technical matters arising from the construction of receivers—detailed in the pages which are sent to us should bear the name and address of the sender. All sketches and drawings which are sent to us should bear the name and address of the sender. Requests for blueprint but a standard L.F. stage may be added to your existing apparatus.

J. O. (Blackpool). Much depends upon your local conditions and the lengths you require. A vertical wire about 100 or 150 in length often proves most effective.

J. B. (Burnley) and Others. It is impossible to give trading card constructional details, but we regret we are unable to recommend a blueprint. This in will be found tables and all the necessary data to enable any type of transformer to be constructed.

R. D. (Ifford). Your query was replied to in our issue dated June 11th last. We only send a postal reply when a stamped and addressed envelope is enclosed with the query.

G. H. (Walsall). We regret that we are unable to supply a blueprint to make use of the parts you mention.

F. M. (Newcastle-on-Tyne). We cannot supply a blueprint but a standard L.F. stage may be added to your existing apparatus.

F. W. (Dublin). It would probably be worth while making the change over the set so that modern plug-in coils could be used. You could improve the set by making some modifications in the circuit, but we are afraid you will be unable to get replacements of the particular coil now in use.

S. M. (Gloucester). We regret that it is not possible to identify the condenser and cannot, therefore, state whether it is suitable for use with your set.

F. R. J. (Burton-on-Trent). It would be possible to carry out the idea mentioned, but it might prove expensive.

W. W. (Pickering). We are unable to identify the coil in question. The makers are no longer carrying on with radio tubes.

The coupon on page iii of cover must be attached to every query.
PRACTICAL AND AMATEUR WIRELESS

June 18th, 1938

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HOW MANY CONTROLS?

Practical and Amateur Wireless, June 25th, 1938.

See page 366

Practical Wireless

Edited by F. J. CAMM

June 1938.

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SOLDERING

The operation of soldering is ignored by many constructors. The result is that many receivers fail to give a good performance merely because the connection between various points is so badly carried out that high-resistance joints affect the circuit design. We have before mentioned that cleanliness is one of the first principles and that good solder and flux should be used. In spite of this many amateurs still try to make use of the various types of "cold solder" which are sold at stores for the repair of domestic cooking utensils. These are totally unsuited for making electrical connection, and apart from the fact that they will not amalgamate metals they often introduce a coating of grease or other insulating material which is detrimental. These materials are quite in order for filling a hole in a kettle, for instance, as the water in the kettle absorbs the heat and prevents the filler from running. When soldering is properly carried out the solder amalgamates with the metal and the result is that the connection becomes practically as strong as a single piece of the metal and the electrical continuity is perfect. A little care spent on this subject, or, better still, an hour's practice with the soldering-iron and some spare wire, will enable the various points to be fully understood and then soldering will be found as quick and simple as terminal connections.

Darts Championship

The increasing popularity of darts lends interest to the forthcoming broadcast in the National programme (June 30th) of a darts championship. This will take place at the Agricultural Hall, Islington, and Commentator C. W. Garner, Secretary of the National Darts Council, will carry out the duties. There were no fewer than 87,000 entries, and it is probable that the finals of this band, which was formed in 1934, and the Royal Welsh Show programme. Sir Dan Godfrey became President of this band, which was formed in 1934, and its most beautiful stretches of wild and rugged country in the Principality and offers some wonderful piscatorial opportunities.

For Anglers

The Salisbury City Silver Band, conducted by J. C. Dyson, will broadcast a few weeks ago, will doubtless be followed by the Children's Hour Edition of Radio Gazette.

The Royal Welsh Show in the Welsh programme on June 29th a broadcast will be taken from the Sophia Gardens, Cardiff, where preparations for the Royal Welsh Show are now practically complete.

Test Match Broadcasts

The Australian Broadcasting Commission is arranging, at a cost of £30,000, to broadcast to Australian listeners a ball-by-ball commentary on all of the Test Matches. Special arrangements are being made to facilitate these broadcasts and they will not be taken by the English stations.

Another Commercial Station

IT is now stated that negotiations have been completed for the use of an independent Continental station by an English company for sponsored broadcasts. The exact site and wavelengths have not yet been decided upon but it is stated that preliminary tests are shortly to be undertaken with a view to finding a suitable wavelength and power to ensure that the broadcasts will be well received in this country.

Scottish Transmitter

PRELIMINARY tests have been carried out and aerial tests will shortly be undertaken from the new B.B.C. transmitting station at Nigg, Aberdeenshire. The wavelength to be used is 235.5 metres and the power is given as 5 kW.

Salisbury Band

THE Salisbury City Silver Band, conducted by J. C. Dyson, will broadcast for the first time from a studio on July 2nd in the West of England programme. Sir Dan Godfrey became President of this band, which was formed in 1934, and twice the band has won the Amesbury Midsummer Cup. It was also successful in winning the Pitt River's Trophy at the Winter Contest of the Wessex Association, and has thus become Champion of the Wessex Association for 1938.

For Anglers

FISHERMEN who enjoyed the composite talk entitled "A Complex Angler," broadcast a few weeks ago, will doubtless be followed by a talk in Welsh on June 28th entitled "Psychology of a Sea Angler." This is one of the most beautiful stretches of wild and rugged country in the Principality and offers some wonderful piscatorial opportunities.

The Fun of the (Newcastle) Fair

IMPRESSIONISTIC sound pictures of the great Town Moor Fair at Newcastle will be heard in the Northern programme on June 23rd. This is one of the biggest fairs of its kind in the world.
ROUND the WORLD of WIRELESS (Continued)

Broadcasting House Extension

W/E understand that the demolition of the buildings adjoining Broadcasting House in Portland Place will begin in October. The enlarged Broadcasting House is likely to take about two years to complete.

P.A. for Boat Travellers

EXPERIMENTS have recently been carried out at Folkestone Harbour with P.A. speakers, for giving directions to passengers arriving at and departing from the port.

Southport Night's Entertainment

The Northern microphone is to make a tour of some of Southport's entertainments on July 1st, to bring to listeners a programme called "Southport Night's Entertainment." Variety will be broadcast from the Garrick Theatre; music by Arthur Jacobson and his band from the ballroom in the Floral Hall Annex, and a relay from the Ernest Binas Concert Party show in the Floral Hall itself.

Variety from Scotland

ESME MARSHALL, one of the principal artists from the Glasgow Alhambra Revels, will make her first studio broadcast in Scotland on the evening of June 22nd, when she will take part in a variety programme. Many listeners will remember her as the popular "boy" in last season's pantomime, "Puss in Boots," at the same theatre. She will be supported by several other artists. The B.B.C. Scottish Variety Orchestra will be conducted by Kenzie Stephen and the show will be compered by G. Archer Mitchell, the well-known West of Scotland entertainer.

Empire Guests

GLASGOW, it has been said, has become interested in the British Empire. For six months, and anyone who has had anything to do with the Empire Exhibition at Bellahouston Park will know that many of the most interesting visitors have come from the British Dominions and Colonies. Special space has been left in the Scottish programme on June 22nd for the accommodation of these guests from the Empire, and it is hoped that a number of interesting visitors from overseas will be brought to the microphone on that date. This is the first of a new series which will continue during the period of the Exhibition.

A Rugby Works Band

ON June 28th the British Thomson-Houston Military Band will be conducted by Jeff Baxter in a programme of popular music; and Archie Doorbar, of Stoke-on-Trent, will sing a group of baritone solos in the interlude. The B.T.H. Band, which is broadcasting for the first time (except in Midland wavelength), has a very high reputation among works bands, and has many public engagements in the Rugby area. Its Bandmaster. Mr. Baxter, had 25 years' army service and was for six years Bandmaster of the 1st Battalion South Staffordshire Regiment.

INTERESTING and TOPICAL NEWS

Chess Tournament

It has been found necessary to postpone the opening move in the Chess Tournament between members of the B.B.C. and listeners from July 1st to July 8th. The B.B.C.'s opening move will accordingly be announced after the 7.30 p.m. Regional News bulletin on the latter date. Subsequent announcements each Monday, Wednesday and Friday will be made of the listeners' latest move and the B.B.C.'s staff's reply to it.

Glastonbury Town Band

THE Glastonbury Town Silver Band, conducted by Lionel A. Leavey, with Margaret Winterflood (soprano) as the soloist, will broadcast from West Region on June 25th. The Band was founded over a century ago, and made its radio début two years ago. This will be its tenth broadcast.

A Nottingham Dance Band

RUBEN SUNSHINE AND HIS BAND are also to broadcast for the first time on June 27th. This combination consists of 13 players with Ruben Sunshine, who has had a number of engagements in Nottingham and district. It has been providing dance music regularly at the Victoria Station Hotel, and the broadcast is another interesting Midland item.

"Romeo and Juliet" Music

EDWARD GERMAN'S incidental music to Romeo and Juliet will be played by the B.B.C. Northern Orchestra, led by Alfred Barker and conducted by H. Foster Clarke, in a concerto to be broadcast on June 27th.

"Bubbles" from Bournemouth

"BUBBLES," a Concert Party presented by Will Seymour, from the Pier, Bournemouth, on June 28th, will include: Christine Bosky (soprano-baritone), Nancy Young and Nan Kenway (entertainers), Leo Conrique (pianist), Jan Ramsden (violinist), Kathleen West (dancing eccentricities), Elia Drummond (soubrette), Jack Crabtree (cartoonist), Jeffrey Fiddick (entertainer), and Will Seymour (comedian).

Variety from Northampton

MIDLAND is to supply a theatre variety broadcast for the National programme on June 30th from the New Theatre, Northampton. Artists who may be included in the broadcast part of the programme are Frank Heavens, Morton Fraser, the Harmonica exponent, and Bertha Willmott.

Dance Cabaret from Bournemouth

DANCE Cabaret will come from the Royal Bath Hotel Ballroom, Bournemouth, on June 29th, when the artists will be: The B.B.C. Radio Orchestra, "Idiot," assisted by Billie Carlyle; Webster Booth, "The Romantic Tenor"; Davy Burnaby and Mildred North; The Carlyle Cousins, "In Close Harmony"; H. L. Gooding, "Britain's Ambassador of Song"; Billy Thorburn and his Music.
SOLDERED CONNECTIONS

A Practical Article, specially written for beginners, explaining the correct procedure for making good soldered joints.

By Radio Engineer

It is apparent that there are a number of constructors who have not mastered the simple practice of making a good soldered connection.

Terminal connections are efficient, but they do not compare with soldering.

With terminals there is the risk of the pressure applied to the surfaces in contact becoming reduced, either through the terminal head becoming loose or through distortion of the wire. Again, it is possible for the surfaces to become coated with a film of oxide which reduces the efficiency of the connection by increasing the resistance between the surfaces.

It is not sufficiently appreciated that a circuit can be seriously affected by such variations. A very small amount of solder, by means of the soldering iron, moving the bit over the job to allow it to become heated.

When electricity is available, one cannot do better than use an electrically-heated bit, which has the advantage of retaining its heat so that continuous work can be carried on.

With the ordinary type of soldering iron it is, of course, necessary to heat it on a gas ring, a clean flue or other source of smoke-free heat, until its temperature is raised to a point when it will melt the solder. When doing this, take care not to overheat the copper, a rough indication of the correct temperature being when a faint greenish flame is produced, though after a little experience, one is able to judge by the time the bit has been in the flame.

Flux

When the copper and the parts to be soldered are heated, their surfaces are liable to become oxidized by contact with the atmosphere, therefore, some oxidizing agent will prevent the solder from uniting with the metals, it becomes necessary to provide some agent which will prevent this from taking place.

The name given to the agent commonly used is “flux,” two well-known commercial examples being Coraline and Fluxite, which take the form of a paste.

Many constructors might remark, “What about ‘killed spirit’?” The liquid flux which is often used for certain soldering work. Well, so far as any electrical work is concerned, don’t use it, as, in spite of its name, it can be quite an active spirit so far as copper is concerned, its acid content eating into the metal and setting up violent corrosion. When used in radio receiver construction, it is often responsible for weird earthing noises.

When the copper bit has been heated, it must be lightly smeared with flux and melted solder, which is then run over its surfaces until they are coated with an even film. This is called “tinning,” and it is essential to see that the bit is always kept in that condition, and quite clean.

The operation is best carried out by rubbing the heated iron on a clean piece of tin after applying the flux and solder. Remember, a dirty copper bit or one not heated sufficiently will never make a soldered joint.

These two items are the cause of the majority of failures.

Preparing the Job

The first thing to do is to see that the surfaces to be soldered are perfectly clean and free from grease. Use a fine file, emery cloth or penknife, according to the work, to make the materials bright so that the actual metal is exposed. Even with tinned copper wire and soldering tags, it is a wise plan to scrape their surfaces before soldering.

After this, a smear of flux can be applied. Don’t pile it on, as the excess will only be wasted, and make the job look dirty. Now “tine” the surfaces by applying a very small amount of solder by means of the soldering iron, moving the bit over the job to allow it to become heated.

When this preliminary tinning has been done, place the metals, to be joined, in the metal抯 position, and again apply the iron—making sure that it is still hot enough to melt the solder.

If all is well, it will be found that the solder will run between the surfaces smoothly and not drag, as it will do if the bit is below the correct temperature. Hold the iron on the job to allow all parts to become hot enough for the smooth flowing to take place; the larger the parts, the greater the amount of heat required. If the solder is just dabbed on, or if the iron is too cold, it will be found that a poor joint has been made, or, in other words, the solder has not been able to unite with all surfaces and must, therefore, be remade.

A good joint is often indicated by a dull grey crystalline appearance, and if there is any doubt, look at it again to be on the safe side.

Solder will not “take” to the metals, do not apply more solder, but clean all surfaces again, re-tin them, and start afresh. You will soon get the knack, especially if you experiment with greater pieces of wire, making different types of joints.

With flexible wire, it is very important to clean all strands, twisting them together before the flux and solder is applied. As a guide to the best way of making connections usually met with in radio work, the diagrams shown in Fig. 4 are given, but the efficiency of all of them depends on the solder being applied in the correct manner.

Finally, always remember to...
The 21-watt Battery Operated Transmitter, described in our issue of December 30th, 1936, has proved most popular, but the licensed operators who, having electricity supplies available, have requested a mains version of a similar set, will find that its performance is not capable of doing useful work. The theoretical diagram shows that the valve consists of two triode sections having a cathode and heater circuit common to both, being housed in one bulb; therefore, from the point of view of layout and wiring, the assembly can be treated as a single valve. This means that the number of connections will be reduced, while the saving in space will be more than ample for their needs. As a matter of fact, similar sets are quite popular, but there are many amateurs who, having electricity supplies available, have requested a mains version of a similar set.

The Modulator

The second triode section is used as the modulator valve, and it will be seen that it is a perfectly straightforward arrangement. The signal is connected to the grid of the first triode section, formed by the tank circuit, the coil L being tuned by the variable condenser C. For normal 40-metre working, the coil can be a standard commercial product of good make designed to cover that band, while the condenser should have a value of 0.0001 mfd, or if an Eddystone 0.00016 mfd, is available that will do equally as well. Don't use a cheap condenser of doubtful insulation. It will pay in the end to get a good make, such as an Eddystone, as a poor quality component can introduce serious losses. The aerial can be tapped straight on to the tank coil by means of a small crocodile clip or, if a Zep type of aerial is in use, link coupling can be employed. The same applies to an artificial aerial.

The high-tension to the anode is fed through a good low-frequency choke, the characteristic of which must be such that it will prevent any low-frequency currents from passing back into the H.T. supply. The only other component in the anode circuit is the small fixed condenser C2, which has a capacity of 0.002 mfd. It is essential for this to be of the micropic dielectric type capable of operating under the value of H.T. applied.

The Circuit

The primary of the microphone transformer is connected in series with a sensitive carbon microphone and a suitable energizing battery, the actual value of which will depend on the microphone and the ratio of the transformer. It is advisable to include an "on-off" switch in the primary circuit to allow the battery to be cut out when the apparatus is not in use.

For Morse or "continuous wave" work, it will be necessary to embody a key to break the train of oscillations as desired. The set lends itself to experiments in this direction, but if normal anode voltages are applied the key can be placed in the H.T. positive lead. It must not be overlooked, however, that the key will be alive with respect to the negative line, and therefore reasonable care must be taken to prevent undutiful shocks to the operator. If both 'phone and C.W. are going to be used, it is wise to arrange a plug and jack connection for the key, then the jack can also be used for plugging in a milliammeter for checking and tuning purposes.

As in other circuits previously given, a simple key filter circuit is embodied to reduce key interference. This consists of a fixed condenser of .01 mfd, and a small resistance of, say, a hundred ohms.

Construction

The circuit is such that the layout is not super-critical, provided a reasonable amount of care is taken to see that the connections to the oscillator are kept short and direct. The coil and variable condenser should be located close together, while both of them must be arranged so that the connections to the grid and anode of the valve do not have to wander round other components. The mike transformer can be mounted on the same baseboard or chassis if the mains equipment is not too close. It will be found that violent hum will be introduced if the mike transformer is allowed to come within the field of the mains transformer, and it is usually necessary, unless a good screening box is provided, to separate the two by at least 3 feet.

The H.T. supply can be obtained from a normal 250-volt 80 mA rectifier, particular attention being paid to the smoothing circuit. If the 6 volts at 3 amp. is not available for the 6A6, a neat and efficient transformer can be obtained for a few shillings from The Premier Supply Stores.

Operation

If a milliammeter is available, plug it into the H.T. positive supply. A meter having a maximum scale reading of 50 mA will be suitable.

Theoretical circuit of the transmitter. For the sake of clarity the values are shown separately, but the elements are actually all contained in one envelope.

After switching on the heater circuit, allow a few seconds for it to heat up, then connect H.T. supply and note the meter reading.

The tank tuning condenser can then be slowly rotated until the minimum setting of the needle is obtained; the exact adjustment will be rather critical as the needle will dip suddenly and then start to rise as the point is passed.

The A Simple Low-power A.C.-operated Transmitter Suitable for 'Phone and C.W.

By L. O. SPARKS

Aerial and microphone transformer. For the sake of clarity the values are shown separately, but the elements are actually all contained in one envelope.
June 25th, 1938

PRACTICAL AND AMATEUR WIRELESS

Short Wave Section

SOME NEW AERIAL IDEAS
Suggestions for Unusual Uses of Existing Types and Some New Arrangements for Short-wave Work.

By W. J. Delaney.

The increasing activity which is taking place on the television wavelengths is introducing a number of new problems, and at the same time these are leading to new conceptions regarding short-wave working. Readers will remember how, when the television programmes were instituted, it was stated that the approximate range was likely to be about twenty-five miles. The Derby was received on a standard commercial television receiver at a point over 300 miles from the B.B.C. transmitter! This was not a freak reception, and distances over 100 miles are now quite regularly covered. The main reason for these long-distance records may be stated to be due primarily to the aerials, and not to the receiving circuits which are in use. The standard dipole alone, when properly designed and used in conjunction with the correct impedance feeder line, will result in a substantial increase in signal strength, but this alone is not sufficient. The judicious use of reflectors will give a tremendous gain when properly applied, and it is probably in this direction that the main field for experiment lies.

Reflectors

In the ordinary way the reflector is placed behind the aerial so that the signal as it was, collected and concentrated on the aerial. It is generally taken for granted that the aerial should be vertical. and the reflector and the transmitter, taking these in a straight line. It has been found, however, that this is not always the best plan, and a great deal will depend upon the surrounding country. If a hill intervenes it may be found that the wave is deflected, and tests have shown that the reflector may be placed to one side with an improvement in signal strength. The behaviour of the other aerials still seems a little erratic; it is not “according to the book,” and the reflector may yet prove to be of greater value than is imagined when we consider the contour of the country results in a distortion of the normal radiated wave.

The experimenter should, therefore, try the effect of shifting the reflector from the aerial whilst the signal is watched by another observer so that the results may be carefully observed.

Tilted Aerials

We recently reported upon a patent which had been taken out abroad for an arrangement whereby an aerial could be tilted, and this point should also be borne in mind when endeavouring to pick up really long-distance signals. Although the B.B.C.
television transmissions, for instance, are radiated from a vertical aerial system, it does not necessarily follow that the receiving aerial should also be vertical.

Theoretically, it should, but, again, theory is not always borne out in practice, and it is quite possible that by tilting the aerial it will be possible to obtain better signals merely because the signal arrives at an angle due to the effects of local hills, valleys, or even buildings. The reflector may also be tilted or moved in order to receive the signal from local interference, and for this purpose it should be placed between the aerial and the source of interference, and again experiment may have to be undertaken in order to locate the most suitable position.

Unusual Aerials

The amateur transmitter often adopts various aerial arrays in order to endeavour to obtain improved radiation, and there are a number of interesting arrangements which may often be employed at the receiving end. Long-distance work is not always the best pay. Contrary to belief, the elevated capacity will prove a very valuable pick-up even down to 10 metres, and some interesting experiments were recently carried out with a large square of wood across which were stretched a number of strands of 7/22 copper wire. The centre of the square was mounted on an eccentric joint so that as a supporting rod was rotated the square took up all positions from horizontal to vertical. The results were very interesting when an American station using a beam aerial was received. A stand-by receiver was kept on to enable normal fading to be observed, but it was found that the revolving aerial gave a complete variation from maximum volume to complete inaudibility — on an 8-valve superhet! A horizontal network, designed on the lines of the old-time "umbrella" aerial, flattened out, completely prevented a simple detector-L.F. receiver from giving results owing to the fact that oscillation could not be obtained on the lower wave-lengths. The aerial was lowered, and the strands were connected together at both ends with a slight improvement. When several strips of wire were soldered across — again converting the assembly into a large metal carpet or network, the set worked splendidly, and results were better than a single short wire.

It will, therefore, be apparent that it does not always pay to follow theory in regard to long-distance reception, and it is worth while carrying out various trials and tests — no matter how ridiculous the idea at first appears to be. Certain fundamental rules must, of course, be borne in mind, such as insulation, but in other respects the results are dependent upon various factors which might be revealed by a chance experiment, and which will result in a general improvement in short-wave technique.

Leaves from a Short-wave Log

The Radio Tower of Babel

Of all the European stations, Rome, 19.00-22.00, on 25.71 m. (11.81 mc/s), would appear to be the one which broadcasts in the greatest number of languages in the course of one day. A typical programme is as follows: G.M.T. 11.00 — Oriental Music, Italian news; 12.00 — English news and Chinese translation for Far East; 13.30 — Entertainment for Indians abroad; 16.00 — Oriental broadcast for Near and Middle East; 17.15 — a similar programme for China; 19.00 — French broadcast only; 19.00 — French; 19.19 — English; 19.37 — Italian; 19.58 — Serbian; 20.15 — French and Italian news; 21.38 — News in German; 24.00 — Portuguese and Spanish for Latin America. At 22.00 through 22.003, on 11.13 m. (9.635 mc/s) a talk is given in Esperanto, followed by one in Spanish at 23.30, and in Greek fifteen minutes later. At G.M.T. 01.30, English is broadcast for the benefit of listeners in Northern America.

From the Far East

J. Z. Natsuki (Tokio), on 19.79 m. (15.16 mc/s), is now transmitting a series of tests daily between G.M.T. 05.00-08.15. XGW, Shanghai, on 28.79 m. (10.42 mc/s), broadcasts a daily news bulletin in the English language between G.M.T. 14.00-17.00. The studio programmes feature a man and a woman announcing in Intervalle language, Portuguese, English, French, and Chinese. Address: Senor J. Estrela, Chief of Radio Station C.R.Y., Government Broadcasting Station Post Office Buildings, Macao, Portugal, China.

Macao Calling

STATION CQY, formerly on 29.7 m. (10.1 mc/s), is now CQY, Macao (Portuguese China), and has adopted the 51 m. (9.504 mc/s) channel with an increased power to 500 watts. A programme is now given daily between G.M.T. 12.30-13.30, and announcements are made in Portuguese, English, French, and Chinese. Address: Senhor J. Estrela, Chief of Radio Station C.R.Y., Government Broadcasting Station Post Office Buildings, Macao, Portugal, China.

Portugal's Experimental Broadcasts

The GSV, Lisbon, group of transmitters, may now be heard daily carrying out test broadcasts on various channels. The schedule, although not fixed, appears to be: G.M.T. 11.00-13.00 on CSW4, 25.34 (15.14 mc/s), 12.00-14.00 on CSW4, 34.18 m. (9.94 mc/s), 15.00-17.00 on CSW4, 30.18 m. (9.94 mc/s); occasionally 17.15-21.00 on CSW2, 27.17 m. (11.04 mc/s), and return to CSW3 between G.M.T. 22.00-01.00.
IMPORTANT BROADCASTS OF THE WEEK

NATIONAL (261.1 m. and 1,500 m.)
Wednesday, June 22nd.—Don Giovanni, Act I, from Glyndebourne.
Thursday, June 23rd.—Wimbledon Championships commentaries.
Friday, June 24th.—Old Time Music-hall.
Saturday, June 25th.—The Champion Oars. A commentary on the last three chukkas, from Burlington.

REGIONAL (342.1 m.)
Wednesday, June 22nd.—The Northumberland Plate : A running commentary on the race, from Gosforth Park, Newcastle-upon-Tyne.
Thursday, June 23rd.—A Musical Biography—Franz Josef Haydn.—6, The Last Creative Period (1796-1803).
Friday, June 24th.—Orchestral concert. Saturday, June 25th.—Concert Party programme.

MIDLAND (296.2 m.)
Wednesday, June 22nd.—Midland Marionettes, in concert party.
Thursday, June 23rd.—A Musical Biography—Franz Josef Haydn, No. 6, The Last Creative Period (1796-1803).
Friday, June 24th.—Variety programme. Saturday, June 25th.—Georges Bizet : Orchestral programme.

WEST OF ENGLAND (285.7 m.)
Wednesday, June 22nd.—Family History—A: 73.1 m. from Penzance and Montgomery, from Wilton House, Salisbury.
Thursday, June 23rd.—Abroadadora, a programme of rites, spells and incantations.
Friday, June 24th.—An Open-air Concert, from the Grounds of the Royal Fort, Bristol.
Saturday, June 25th.—Band concert.

WELSH (173.1 m.)
Wednesday, June 22nd.—Music by Welsh Composers, Part Second.
Thursday, June 23rd.—Bromsgrove H. of H. (A Midsummer Night's Dream), Welsh adaptation.

SECOND TEST MATCH
Interviews with well-known cricket personalities, including players, will, it is hoped, be a feature when the Second Test Match is televised from Lord's, beginning on Friday, June 24th. Play will be televised daily from 11.30 a.m. to 12.30 p.m. and 2.30 to 3.30 p.m.; and 3.30 to 5 p.m. Two cameras, mounted on the main stand at the Nursery end, will bring the whole of the action into the picture. A third on the "Tavern" will give more intimate shots. Telephoto lenses should enable viewers to see bowlers and batsmen in close-up.
Special television commentaries will be given by Captains H. B. T. Wakeham, and the above, have a little patience and persevere until you have acquired the knack.

SHORT-WAVE LOG
(Continued from previous page)

Germany Still Goes Ahead
ON May 1st last, Germany possessed 9,374,701 licensed radio listeners, or slightly more than double the number declared in 1932.

Finland on New Channel
THE Lahti-Helsinki short-wave station has begun regular daytime transmissions on 25.47 m. (11.78 mcs). The provisionl transmitter is rated at 1 kilowatt, but power will be increased to 25 kilowatts in the course of the current year. Other channels allotted to this station are 19.75 m. (15.10 mcs), and 31.75 m. (9.6 mcs). Daily transmissions are already being made regularly on the latter frequency.

And Guatemala
A NEWER transmission recently logged in the early morning hours was from TOWA, Guatemala City, on 30.98 m. (9.655 mcs). This channel is mainly used for the relay to the capital of foreign broadcasts, e.g., from other cities in Central and South America. Regular broadcasts are carried out on 16.85 m. (17.8 me/s); 25.51 m. (11.76 mcs); and 31.74 m. (9.56 mcs). The call is: Broadcasting Nacional, La Voz de Guatemala.

More Foreign Harmonics
THE 3rd harmonic of Milan (1) is audible on 122.9 m. (2.445 mcs) and the 2nd of Genoa (1) on 131.8 m. (2.29 mcs). Broadcasting from Tokyo, 3rd harmonic signals the 4th harmonic, namely, 30.15 m. (3.728 mcs), and the 2nd of Helsinki (2) can be picked up on 161.75 m. (1.99 mcs); also 4th on 75.37 m. (3.98 mcs). Of the German stations, Berlin provides a strong 7th harmonic on 93.96 m. (5.877 mcs), and Brussels a 5th on 63.16 m. (4.75 mcs). The 100-kilowatt Melnik (Czechoslovakia) transmission can be logged clearly on its 4th harmonic, or 67.4 m. (4.435 mcs). For dwellers near the South Coast of England the most persistent harmonics are those of Radio-Normandie (Fecamp), in particular the 7th on 30.377 m. (9.877 mcs), and the 4th on 53.1 m. (5.644 mcs). The B.B.C. stations are more elusive although the 4th of London Regional may be occasionally heard on 38.01 m. (7.893 mcs), and the 8th of Welsh Regional on 46.96 m. (6.432 mcs).

WESTMINSTER - CATHEDRAL P.A. EQUIPMENT
WE are informed that the Tannoy P.A. sound equipment, which was recently completed at Westminster Cathedral, has proved very satisfactory. The equipment was first temporarily installed on January 29th for the return of Cardinal Hinsley and now, after four months' night work on the installation, is fully complete, and in excellent service.
Seven moving-coil microphones with separate switching and fusing are included, feeding to an amplifier that incorporates a special form of A.V.C. This eliminates the control that would otherwise be necessary to avoid overloadings. The output from the three-15-watt power amplifiers, arranged to feed groups of speakers. Thirty-eight speakers are distributed throughout the building.
An interesting point is that speakers near any given microphone are automatically switched out when the microphone is in use, thus avoiding acoustic reaction.

SOLDERED CONNECTIONS
(Continued from page 335)
keep the bit clean and well tuned; see that it is neither too hot nor too cold; clean to brightness all parts to be soldered; use flux sparingly, and, above all, have a little patience and persevere until you have acquired the knack.

Fig. 4—Some examples of good and reliable soldered connections.
Keep all the soldering material together in a small box or drawer so that everything is to hand when required, and see that your kit includes a tin of flux, a sheet of medium emery cloth or fine file, one or two lengths of "tinman's" solder and an iron which is fitted with a bit suitable for the work most likely to be encountered. It is possible to obtain solder having a core of powdered resin, and this is quite suitable for normal cleaning purposes.

[No additional text appears to follow this point.]
Interference and Earthquakes

ONE of our seismologists stated the other day that there is so much electrical interference that it was becoming increasingly difficult to take records of earthquakes. In fact, he thought that in a few years it would be quite impossible.

Sooner or later legislation will be introduced making electrical interference an offence. It ought to have been a long time ago, bearing in mind the annoyance it is causing, and the expense it is putting listeners to in endeavouring to get rid of it. Whatever method is applied in connection with the receiving set to suppress interference, it must to some extent interfere with the performance of the set. It is an onus which ought not to be placed upon set designers or listeners. Now that radio is part of civilisation I hope that manufacturers of electrical apparatus, such as electric motors, vacuum cleaners, sewing machines, hair dryers, and particularly the designers of ignition systems of motor-cars, will regard it as part of their problem so to produce their apparatus that it does not interfere with wireless or television.

I am aware that television itself is causing a certain amount of local interference with ordinary sound broadcasting, but I happen to know that that problem is being tackled and I do not think it will endure.

Television is particularly susceptible to all forms of electrical interference, and in order to save manufacturers of television apparatus a lot of trouble, they should press for legislation regarding electrical interference. Television cannot become popular if one has optical evidence of the existence of all of the electrical apparatus round about in the form of zig-zag streaks across the television screen. However satisfactory the receiver, the less-informed members of the public will regard visible interference as a defect in the design of the apparatus. We must prepare the land before we build the house.

History is Made

FOR the first time in the history of the world, two historic functions have been made visible to members of the public miles away from the place where the functions occurred. I refer to the Derby and the Trooping of the Colour. I witnessed both on the end of a cathode-ray tube, and I congratulate the B.B.C. and the designers of my set on the excellence of the broadcast and the excellence of the reception. I have before remarked that a great deal of the history we learn at school is open to grave doubt. I do not believe the story of King Alfred and the Cakes, or Bruce and the Spider, or any of the other legends and clap-trap which history books still perpetuate. In future, we shall not be in any doubt as to what Chamberlain said in 1936. It is recorded either on wax or on a steel tape. We shall be able to record television in exactly the same way, and as I have before remarked, it is technically possible even now. I am glad to learn that at the next Radio-Lympia a television conference for radio dealers may be held, those in the service area only being invited.

The I.A.R.S.

MR. J. BUTLER, of 92, South Circular Road, Portobello, Dublin, tells me that he has broken away from a certain English wireless society and formed the above. He is very anxious to get into touch with anyone in Ireland interested in furthering the objects of a National Radio Society for Ireland.

Push-button Tuning

ONE of the leading component manufacturers tells me that it is his opinion that the reason why I only received one postcard in reply to my request for readers who were interested in push-button tuning to get into touch with me was, firstly, that this journal does not circulate amongst those of the public likely to be interested in push-button tuning; secondly, that I only have a small following; or thirdly, that readers are lethargic about writing on such matters, unless it is made very easy for them to do so and/or they have a vital interest in the subject. My correspondent adds that I "may take it from him" that push-button tuning has definitely arrived, and that "it will be acclaimed by the man in the street." I think my correspondent is guilty of a little sophistry. I do not need this correspondent or anyone else to tell me that push-button tuning has arrived, for it was its arrival which inspired my paragraph. What I complained about was its coming when other and more urgent things were in need of manufacturers' attention. Do not let us blind ourselves to the fact that push-button tuning is merely a mechanical improvement, and radio manufacturers ought to know by now that far too much attention has been devoted to tuning scales, slow-motion drives, etc., etc., ad nauseam. The tuning scale and the tuning drive have been the happy hunting grounds of inventors for far too many years. No one complains about having to tune a set to a particular station. We all know at what particular part of the scale the station to which we desire to listen is located. The fact that this new system will be acclaimed by the man in the street supports my case that readers of this paper are not interested in push-button tuning, for they are not "men in the street" but knowledgeable people not interested in gadgets. The man in the street may be. In spite of the fact that this paper has a very large circulation, consistently maintained since it was first produced, it is possible that it does not circulate amongst men in the street interested in push-button tuning. Regarding his second point that I only have a small following, I can only assure him that I have been writing these columns for very many years, and the size of my post-bag steadily grows. I receive several hundreds of letters in the course of a month, and I am glad to add this manufacturer to my list of readers. I repeat that, whilst push-button tuning may provide a selling point to the man in the street, when they find that it will not, as they may be led to believe, get any more stations from a set (in fact, less), and is merely a mechanical method of turning the tuning condenser, it will cease to be a selling point, and fade out of the
market like so many other gadgets have done. Time will prove the accuracy of my forecast, that you will not see push-button tuning on very many sets in three years' time.

**Using a Pick-up**

I AM often receiving inquiries regarding slight adjustments to receivers described in this paper. One of the most frequent is how to use a pick-up.

The little set to be used for the reproduction of gramophone records, a pick-up may be joined from the grid of the detector valve to G.B. in the usual way, a pair of sockets being mounted on the rear chassis runner for the purpose. A change-over switch may be connected in the grid circuit if desired, or the set may be merely detuned when using the pick-up to avoid radio breakthrough. When using the pick-up it may be found that the output is more than adequate, and then by reducing the H.T. voltage on the output stage to 90, and by reducing the H.T. voltage using 3 volts grid bias, the total anode current may be reduced in the output stage to about 3 m.A, thus providing very economical operation.

**Chess Tournament**

The B.B.C. tells me that it has been found necessary to postpone, from July 1st to July 8th, the opening move in the Chess Tournament between listeners and members of the Corporation staff. The B.B.C. staff's opening move will, accordingly, be announced after the 7.30 p.m. Regional News bulletin on the latter date. The subsequent moves in the game will be announced at the same time each Monday, Wednesday and Friday.

**New Annual Schools Programme**

Details of the Schools Broadcasting Service for the coming year are contained in the Annual Programme of Broadcasts to Schools, 1938-1939, recently published.

General satisfaction has been expressed by teachers and others re the various series broadcast last year, and it is felt that little need for change is indicated. There are, however, one or two additions.

Chief among these will be a special French series for Fifth Forms which English schools are taking from Scotland, and two courses of physical training, also being relayed from Scotland every Tuesday morning.

So successful were last year's broadcasts of "Our Village," the special series for rural schools, that this is being revived in a slightly different form under the title, "Our Parish." Broadcast physical training is a new idea for the schools. Experimental in nature, it is being broadcast for one term in the first instance. Its aim will be to help schools with limited facilities for physical training by providing a supplement to the teachers' own work.

Altogether there will be twenty-nine broadcast series for English and Welsh schools during the coming year.

Children of every age are catered for from the infants of five who listen to Miss Ann Driver's Music and Movement, to Secondary School boys and girls of sixteen and over who listen to the Friday talks to Sixth Forms and often discuss them afterwards with their teachers.

In addition to details of the various series, the Annual Programme contains notes on the use of the school radio, on problems of installation and reception, advice on the choosing of sets, and a special section headed "The Contribution of School Broadcasting."

In April, 1938, it is revealed in the budget, there were 8,250 schools in England and Wales on the B.B.C.'s Register, which has risen in the last month to 8,477. These comprise, as well as elementary and secondary schools, convents, War Office schools, agricultural colleges, junior instruction centres, and a number of special centres and institutions.

**Hot and Bothered**

I RECEIVED a strange request the other day from a reader who asked me if I could give him details for making a set which made the listener perspire! He said that he was in a house and when the wireless set was switched on the owner of it perspired! The request was quite a serious one, as I only presumed that my correspondent had his leg pulled. I know several constructors who perspire over sets, and it may be that the programme was making the listener go hot under the collar. Perhaps there was a jazz-band on, or one of those individuals—the very lowest form of animal life—known as crooners was drizzling at the microphone.

"Scotland on the Air"

I AM informed that a book entitled "Scotland on the Air," dealing with the development of broadcasting in Scotland and its present position, is due for publication next month. The book, which carries a foreword by Sir J. C. W. Reith, Director General of the Corporation, has been compiled and edited by Mr. George Burnett, Public Relations Officer of the B.B.C. in Scotland.

The majority of the articles have been written by senior members of the B.B.C. staff in London.
Another American Attempt

The recent television experiment carried out in America was not employed for the picture signals with mixed opinions by the New York critics. The subject chosen, "The Mysterious Mummy Case," was a dramatic play where the entertainment value left something to be desired, but the method of production was good; the direct vision was supplemented by dove-tailed film scenes in order to extend the scope of acting. The demonstration was staged by the NBC, in conjunction with the RCA, in one floor of the RCA building. A presentation about one mile away. The carrier frequencies used were 46.5 megacycles for vision and 49.75 megacycles for sound, but it is difficult to understand why the higher carrier frequency was not employed for the picture signals in order to secure the advantage of a better band-width for a given percentage of carrier frequency modulation. Picture definition was one of 441 lines interlaced, with 60 frames per second to give 30 complete pictures per second. Picture control was used at the transmitting end, while cathode-ray tube receivers giving a picture approximately 10ins. by 8ins. were accommodated in one floor of the RCA building about one mile away. The present Marconi and H.M.V. apparatus of the same company which was rear projected, but the cathode-ray tube projectors where the screen is hinged to a top lid which has to be lifted when in use, have the picture projected on to the back of the screen, and this also applies to the Scophony mechanical optical equipment. Baird's colour screen was rear projected, but the cathode-ray tube apparatus of the same company which is now commercially available to cinemas employs front projection. In either case special screens have to be used in order to construct as far as possible any loss of light which would otherwise detract from the picture view. Another very important feature that has to be watched, especially if the pictures are to be shown to a large audience, is the directional properties of the screen. To give a dispersive effect in order to widen the angle of vision brings about a loss of overall light intensity, and it is only by very careful design that a happy medium can be struck to maintain good pictorial and entertainment value with an absence of eye strain. The usual observer, or even at times the regular viewer, too often fails to appreciate the many diverse problems which encompass television reception as typified by a complete receiver, and the right type of remote screen is only one of many.

Electron Multipliers

Little has been heard of electron multiplier technique for some time, but it is known that certain firms are devoting a considerable time to research in connection with applications and improvements in this device. Farnsworth, of America, has been one of the leading experimenters, and in a new form of multiplier which he has produced the electron stream has been concentrated within more practical limits. To carry this into effect, the target in order to widen the angle of vision brings about a loss of overall light intensity, and it is only by very careful design that a happy medium can be struck to maintain good pictorial and entertainment value with an absence of eye strain. The usual observer, or even at times the regular viewer, too often fails to appreciate the many diverse problems which encompass television reception as typified by a complete receiver, and the right type of remote screen is only one of many.

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It is stated that an official of the British Post Office regards visiolephony— that is, television with television—as the next logical step in the present development of methods of communication. The telephone has very largely superseded the telegram on the score of convenience and the pleasure of actual conversation at little extra cost, and the addition of sight is regarded as an extra inducement for increasing the scope of the telephone. It is known, of course, that some of the Dollis Hill experiments have been going on in this connection, but in Germany the first work was undertaken nine years ago. The present trend in that country is to abandon methods of scanning for this work and employ a projection type cathode-ray tube to furnish the light spot movements. With the resulting light and shade reflections can be made to activate the electrode surfaces of suitably positioned multiplier photo-electrodes. Transmitting and receiving cathode-ray tubes can be accommodated in the same unit, and because of the increased sensitivity of the electrode assembly eye discomforts resulting from the rapidly moving scanning spot. No doubt in the near future more will be heard of the progress made in this connection and it is hoped that the authorities will lose no time in applying the results in a really practical manner.

**Interference Legislation**

At some time or another there is no doubt that every reader of this journal has experienced the annoying effect of electrical interference when operating either a radio or television receiver. The greatly improved sensitivity of modern sets is often the result of this very fact, and so serious is the whole problem that a joint committee of manufacturers, engineers and Government officials covering a number of industries made a thorough investigation some time ago. The carefully considered results of their deliberations were followed by a Government appeal, together with suggestions for eliminating this "menace" to home listening and viewing. It is therefore welcome news to learn that before the end of this year the Government intend to pass a Bill through Parliament under which every piece of machinery which might conceivably interfere with radio or television reception will be fitted with interference suppressors. Legislation of this type will undoubtedly be welcomed, and the Bill is at present being drafted in conferences between the Home Office, the Ministry of Transport, the Electrical Commissioners and the General Post Office. In the case of television, both sound and vision can be marred by quite a wide variety of electrical interference. As a case in point mention can be made of the trouble experienced in the "viewers" picture circuits of the opening of the Ideal Home Exhibition. Curious patterns kept appearing on the cathode-ray tube screens of certain manufacturer sets. With the aid of the Post Office's testing apparatus the fault was finally located in a neon sign on the floor below. The frequency of this trouble was very objectionable, and the subsequent television pictures were clear and distinct.

**Cinema Television Developments**

Recent developments in cinema television have made it quite clear that every effort is being made to clarify this new form of public entertainment. The Spohophany Company are arranging to install equipment for this purpose in cinemas covered by the Odeon circuit and this company's first installation is to be made at the Monseigneur Theatre in London, now in course of construction at Baker Street. The screen size is to be six feet by five feet, but it is hoped later on to at least double these dimensions as soon as the experimental work now being carried out is completed. The hope is being quite freely expressed that before long permission will be granted for an experimental service to cinemas, and if this does materialise then progress will be rapid. In the Talkie Theatre there has followed their Derby success by showing the televised Trooping of the Colour to a private audience, and it is known that inquiries for details of this equipment have been coming in from the cinema industry at a very rapid rate. Similar apparatus will be displayed on the G.B. Equipment Co.'s stand at the Folkstone Exhibition, so that everyone interested can examine the apparatus thoroughly and learn all the parts of its operation. As a new medium for news dissemination the scheme is an admirable one, and the great advantage of its compact, portable nature, coupled with simple operation and maintenance.

**Needing Special Consideration**

The type of cathode-ray tubes now being employed for big-screen television purposes are a direct development from the ordinary ones used in modern receivers. Due to the very high brilliance of the pictures built up on the tube screen prior to projection through a lens on to a remote screen, special consideration has to be given to design and manufacture to enable the tubes to work efficiently over a reasonable period of time. In the first place very high anode voltages are employed, often up to 30,000 volts as compared with the 4,000 to 5,000 of the home set; together with this an acute problem and the connection to the anode is brought out from the glass envelope via a special side terminal. Since the very high voltages incur an increased electronic bombardment the fluorescent powder used for the screen has to be of an improved type, and be capable of giving more light. Unless the screen material is linear in its excitation response from light to dark the resultant picture will exhibit a somewhat patchy appearance. Very careful attention has to be given to the proper bonding of the chemical powder to the interior of the ground glass face of the tube, and so remove any possibility of it flaking off when in use. Screen thickness must be accurately controlled to prevent the brightness of the image falling off at any level of illumination. As regards the vision signal itself, again the tube screen should be as thin as possible to prevent any loss of light when projecting the image taken from the side of the screen which for five years he was a soloist. His father, incidentally, is a Cantor in the East End of London, and his brother, too, is the First Cantor of Sydney. It is apparent that this vocal talent runs through the entire family. (Alan's younger sister is singing lead in a road show, and another brother is touring the halls as a single act.) Even as a schoolboy his hobby was drumming, and on leaving school he began to take this up seriously, and later appeared on the stage with his sister in an act, as a drummer-vocalist. About this time he also joined an amateur theatrical society, in which he and his school-friend sang duets, accompanying themselves on the ukulele.

His name and voice began to become familiar to many people, who engaged him to broadcast and record with their respective bands, including: Joe Loss, Harry Leader, Don Besser, Jay Willbur, Ruby Starris, and then Lew Stone, taking Al Bowlly's place as a vocalist, with whom he toured all over the country, and was for a long time resident at the Hollywood Restaurant, London. And, lastly, with Arthur Roseberry, before joining Ambrose. Besides broadcasting as a vocalist with these bands, he has also appeared on "the air" as a soloist in the B.B.C.'s variety programme, has toured the halls as a single act, and worked in Cabaret at most of London's hotels and night clubs.

**A Brief Biography**

Alan Marsh, the popular vocalist with Ambrose and his Orchestra, commenced his musical career while still at school. As a very small boy, he was in great demand at school concerts and musical entertainments, in which he was prominently featured. Later, at the more mature age of nine, he joined a choir, in which for five years he was a soloist. As a schoolboy his hobby was drumming, and on leaving school he began to take this up seriously, and later appeared on the stage with his sister in an act, as a drummer-vocalist. About this time he also joined an amateur theatrical society, in which he and his school-friend sang duets, accompanying themselves on the ukulele.

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A recent portrait of Ambrose's popular vocalist, Alan Marsh.
A Radio-Gramophone Switching Arrangement

The accompanying sketch illustrates an arrangement I adopted for the change-over from radio to gramophone in a receiver which was unstable due to long leads going to a pick-up terminal block. Encasing the leads in metallic sheathing was tried, but I found that this resulted in some loss on the radio side. I therefore decided to fit a switching arrangement, and mounted the switch close up against the detector valveholder (to allow of the shortest leads possible) and fitted an insulating extension spindle for operating purposes. The arrangement can be clearly seen in the sketch, which shows it as now in use on the radio side.

The extension spindle assembly is the type made by Messrs. Eddystone for short-wave control purposes, and is very efficient, and which would be out of harm's way, yet handy to get at. The arrangement works on the principle of the endless movement and the materials required are as follows: 10 pulley wheels; 5 axles; 4 perforated metal strips; piece of wood for supporting arm; fine string; weight (made from pieces of spare wood); and a few screws and bolts. The microphone can be slid along, or pulled down at any convenient spot required along the wooden arm. - R. Bowes (Perryhill).

SPECIAL NOTICE

All wrinkles in future must be accompanied by the coupon cut from page iii of cover.

THAT DODGE OF YOURS!

Every Reader of "Practical and Amateur Wireless" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay 5/- or 5/6 by post from 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 envelope "Radio Wrinkles." DO NOT enclose Qizetes with your wrinkles.

A Collapsible Aerial

The structure illustrated shows how I have got over the problem of providing an aerial for use with my portable, which had no frame, and there were no trees for attaching a line. The framework is of strips of wood 1 in. wide and 2ft. long, fastened by means of screws and nuts with washers between. The spikes were made of sheet brass (X and Y) to fit together when closed. Some screw-eyes and cord keep the whole taut, and with the earth terminal attached to one of the spikes. The whole job packs flat, and in very light.

A novel collapsible aerial for use with a portable set, efficient, and which would be out of harm's way, yet handy to get at. The arrangement works on the principle of the endless movement, and the materials required are as follows: 10 pulley wheels; 5 axles; 4 perforated metal strips; piece of wood for supporting arm; fine string; weight (made from pieces of spare wood); and a few screws and bolts. The microphone can be slid along, or pulled down at any convenient spot required along the wooden arm. - R. Bowes (Perryhill).
A LIE-DETECTOR

How to Make Recording Instruments in which "Radio" May Be
Applied to Detect Psychological Reactions — By "DETECTOR"

DURING the past year or so, we have heard a great deal about the "lie detector," an instrument which presumably registers certain physiological changes occurring in the body following some emotional stress—no matter how insignificant. The particular type of detector known as the "polygraph," devised by Dr. Keeler, of the North-Western University, U.S.A., is the one which has received most notice in the Press on account of the number of cases which have been tested in the criminal courts. The principle upon which it is based depends on a minute increase in blood-pressure resulting from a momentary psychical disturbance following a series of test questions to probe the truth of the subject's answers. Some little time ago there appeared a letter in a daily paper querying the absolute truthfulness of such an instrument and the implication of an anomalous reading was raised. Indeed, this is of vital importance, for an innocent subject may easily register a "jump" in blood-pressure when a specific point in a serious question was raised. As was mentioned: "To rely upon a machine where a moral issue is involved is highly dangerous."

Measuring Fatigue

It is with the other type of "lie detector" that I wish to deal, however, because in 1930 I carried out a number of tests with the object of measuring fatigue following mental effort. The part of the apparatus which I used was identical with that form of "lie detector" developed by W. G. Summers, of Fordham University, and consisted of a galvanometer in series with a battery and the subject to be tested. In other words, by measuring the resistance of the body—the pores—so that an increased secretion of sweat occurs, thus bringing down the resistance. My tests were conducted on a class of boys whose resistance was measured before and after a set task. Mental fatigue was found to send up the resistance.

These experiments were given a wide publicity in the Press of this country and abroad, and one enterprising reporter suggested that it might be possible to record the thoughts of a person. Evidently he was thinking of some similar tests to those of the "lie detector." But I must confess that the idea of using such an instrument for recording these things never occurred to me at the time. Of course, the tests are ridiculously simple when one comes to think of it—anyone can carry them out with suitable apparatus. A circuit for a simple layout is given in Fig. 1. One condition should be observed, however, that any suspicion of "shock" is best avoided by using a sensitive galvanometer. I inserted a Ferranti micro-ammeter—reading to 600 micro-amps full-scale deflection—in series with a 4-volt accumulator; two ordinary cylindrical electrodes (such as those used with shocking coils) being held in the hands.

Measuring Fatigue

This is purely a matter of choice, but I do not know, but the idea set me thinking that one other type of detector known as the "polygraph," devised by Dr. Keeler, of the North-Western University, U.S.A., is the one which has received most notice in the Press on account of the number of cases which have been tested in the criminal courts. The principle upon which it is based depends on a minute increase in blood-pressure resulting from a momentary psychical disturbance following a series of test questions to probe the truth of the subject's answers. Some little time ago there appeared a letter in a daily paper querying the absolute truthfulness of such an instrument and the implication of an anomalous reading was raised. Indeed, this is of vital importance, for an innocent subject may easily register a "jump" in blood-pressure when a specific point in a serious question was raised. As was mentioned: "To rely upon a machine where a moral issue is involved is highly dangerous."

Recalibrating the Scale

For a more straightforward reading, the scale may be recalibrated in ohms so that a direct resistance measurement might be taken. This is purely a matter of choice, however. Naturally, if a milliammeter is used it will be necessary to use higher voltages, and then the sensation of slight turning may be a rather unpleasant accompaniment apart from the fact that an incorrect reading might be given; it is best to keep therefore, to low-measuring instruments, of which there is now a good range from which to select. Another piece of apparatus which I have found interesting is based on the principle of variability of body-capacitance, when coupled to an oscillating circuit. Most readers have, I expect, seen those penny-in-the-slot machines which purport to tell character, etc., through the intermediary of valve amplifiers arranged in a complicated looking arrangement of condensers, transformers, chokes, coupled to an imposing electro-magnetic device for recording the actual written characteristics of the subject. All that is required to work this impressive-looking "robot" is a penny and the raising of a horizontal electrode. Now whether there is any actual circuit here, I do not know, but the idea set me

"Deviator" (Left) A suspect being questioned by means of a "lie-detecting" machine. (Above) A close-up of the "lie-test" recording device.

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thinking that it would be possible to construct an apparatus which really did respond to the body's capacity. The result was the instrument shown in the sketch, which, I think, is sufficiently descriptive to warrant very little explanation.

An Oscillator

The oscillator used in the above experiment consisted of an ordinary A.C. mains-operated two-valve set incorporating a metal rectifier. No doubt, any type of amplifier could be used and modified in the manner shown. The aerial and earth terminals of the set are connected to two small sheets of copper-foil bent in a cylindrical form so as to slide into the ends of a 1 in. diameter ebonite tube, leaving a space of about 2 ins. inside the tube between them; this tube is 12 ins. long. Grasped in the hands, the ebonite tube forms a condenser electrode and forms a capacitative coupling to the input stage of the amplifier. The output terminals (the L.S. of set) are connected in series with a polarised relay (G.P.O. pattern) and the secondary of a 100:1 transformer (the one actually used was a bell-transformer with the usual 3, 5 and 8 volt tappings on the secondary). Notice here that the transformer primary when used as a bell-transformer is the high-resistance side (240 volts), the secondary being the three tappings mentioned above; used in the output stage it must be reversed so that the secondary now becomes the primary. The tapping side of the transformer—the 3-volt tapping—is now connected to a milliammeter reading up to 10 milliamps (the one employed being a moving-coil instrument).

An Impulse Counter

The relay contacts are closed through any piece of apparatus such as a lamp, bell-indicator or buzzer and a battery. If required this circuit may incorporate an impulse counter to record the number of impulses impressed on the grid of the first valve, or to operate a graphical ink recorder. This is at the choice of the experimenter. The conditions of operation are quite simple, for the first thing to do is to tune the amplifier, using retection to produce a high-frequency whistle which can just be heard from the vibration of the relay armature. When this is quite audible, the set is oscillating and a meter reading is immediately given as shown by a momentary swing of the needle. This needle deflection increases when the ebonite electrode is grasped in the hand, at the same time a change in the pitch of the armature is distinctly discernible. Since there is a continuous fluctuation of current in the meter and relay, the latter periodically operates whatever local circuit is being employed, completing circuits through either pilot lamp, buzzer or ink-recorder as the case may be. It might be questionable if the layout has any practical value; it is difficult to assess any definite claim, but it is sufficiently interesting to warrant further experiment.

An Interesting Instrument

It is useful to know that some remarkable phenomena have been recorded in the first place by crude apparatus, and that many results at the time had few merits to accord them a place in modern technique. Nevertheless, some vastly important innovations have been found of use through chance happenings connected experimentally with electrical novelties.

In conclusion I would say that a certain amount of caution is absolutely necessary before any definite conclusions are drawn from experiments being, in the question of mental interaction, however intriguing and true they may at first appear. Exhaustive tests are always necessary before any piece of psychological phenomena can be made to fit into a prosaic scientific pattern and to accord with preconceived notions of physical law. I do think, however, that the researches of Professor Adrian, of Cambridge, have shown conclusively that there is a thought "rhythm" caused by demonstration outside the brain, and that this wave is not a true electromagnetic wave owing to its extremely low frequency—ten per second. This wave, known as the Berger rhythm can be modified by thought processes and is in some way connected with the sense of sight, being more appreciable when the eyes are closed, while thought-concentration interrupts it. Such findings are indeed valuable, both as a means of diagnosis and also in the comparison of normal fatigue reactions.

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HOW MANY CONTROLS?

The "Experimenters" Suggest that Variable Selectivity and Efficient Tone-control Systems should be More Widely Adopted by Constructors

The number of receiver controls has tended to diminish gradually over the past few years, and many experimenters are of the opinion that this is a bad thing. On the other hand, there can be no doubt that the greater simplicity of operation is appreciated by the class of person who is sometimes rather unkindly described as the "ordinary listener." Whatever the pros and cons might be, it is certain that a few extra controls are often valuable to the interested user of a receiver. It is true that they must be used discriminately if the set is to perform to the best of its capabilities, but the average reader of Practical and Amateur Wireless is quite capable of doing this.

Correlated Controls

Controls that are very valuable, and which are often omitted in the interests of simplicity, are those for tone and selectivity. To a certain extent the two are correlated, because the adjustment of a variable-selectivity control often gives effects similar to those of the tone-control. For example, if the band-width acceptance is reduced by means of the selectivity control, the higher notes are automatically attenuated or reduced in intensity in relations to the lower notes. And if a tone-control is not fitted, the output circuits being designed to give "mellow" reproduction when the selectivity is moderate—say 9 kc—there is a double attenuation of the higher frequencies if the band-width is narrowed to, say, 5 kc.

This shows the need for the two controls, although they may be ganged if both are suitably graded. As the controls can rarely gamp them suitably, however, separate knobs for the two functions are desirable. Then, if tuning is sharpened by narrowing the band-width acceptance, the I.F. circuits can be made to give comparatively high-note response.

To obtain really successful variable selectivity it is practically essential to use a superhet circuit. There will generally be two intermediate-frequency transformers and both may be of the variable-selectivity type, the controls being ganged. On the other hand, the simpler method of using a variable selectivity I.F. transformer following the frequency-changer with a normal "fixed" transformer between the I.F. and second-detector stages is usually perfectly satisfactory as long as the second transformer has closely-coupled windings; in other words, provided that it covers a wide band width due to the tuning being rather flat.

Variable Selectivity

The method of providing variable selectivity is nearly always dependent upon the design of the I.F. transformers. Two principal methods are by mounting one winding so that it can be moved mechanically in respect of the other, and by using a form of coupling winding between the two tuned windings, this having a variable resistance connected to it to produce more or less damping, and so to alter the degree of electrical coupling.

The system of tone-control can take one of many forms. In some cases a low-inductance iron-cored choke and fixed condenser are associated with the primary circuit of the first I.F. transformer, the potentiometer being used to increase the effect of either. Thus, when the condenser is in parallel with the transformer primary, there is a top-note cut-off, and when the choke predominates a bottom cut-off is produced. Theoretically, this method of "two-way" tone-control is ideal, but in practice there are many snags. The most important is that signal strength is curtailed at one end of the scale; another is that reproduction at the mid-way position of the control is not as good as it would be without the extra devices.

How Pentodes Help

Greater efficiency is to be obtained by using an extra valve for tone-control purposes, its function being to increase (by normal amplification) signal strength at one end of the scale. But the average constructor does not wish to add to the number of valves in this manner. Fortunately, evolution has helped to solve the problem in a fairly satisfactory manner. As most readers are aware, pentode and tetrode output valves are more sensitive to the high than to the low register. Thus, by providing a variable high-note cut-off, and setting it correctly, an effective measure of tone-control can be obtained.

There are very many ways of arranging the control, the most usual being to connect a fixed condenser and variable resistor in series between the anode of the output valve and earth. When the resistor is adjusted to its maximum value the combination has little effect, but as the circuit resistance is reduced, the condenser comes into effect and by-passes a certain proportion of the high frequencies. This method is not always as satisfactory as might be desired, and some manufacturers prefer to provide a fixed resistor and condenser in the output-valve anode circuit, and to include the tone-control in another part of the set. The fixed corrector circuit is designed merely to prevent excessive high-note response from making reproduction "squeaky."

Tone-control Methods

One convenient method of adding tone control in one system, the correction circuit mentioned is to include either a variable resistor and fixed condenser or a number of fixed condensers across the anode load of the 'penultimate' L.F. valve. When condensers are used alone there is a rotary switch for putting any one of them in circuit. Thus, if there were four condensers rated at between .01 mfd. and .002 mfd. there would be a four-way switch to which one terminal of each of the four condensers would be joined.

At least one receiver manufacturer combines a tone-control arrangement such as this with a variable selectivity control. An eight-way rotary switch is used, four positions of this altering the band width, and the other four controlling the tone-correction condensers. This is probably one of the best systems for use in a set intended for a non-technical user.

Another simple tone-control system, which is better in practice than theory would suggest, consists of connecting a 100,000-ohm variable resistor (of the graded type (in parallel with the primary
of the L.F. transformer in the detector or second-detector anode circuit. There are many other more-elaborate methods, but those mentioned are generally most convenient for the constructor.

Side-band Splash

One of the most valuable uses of either tone or selectivity control when receiving more distant stations is that it permits of the elimination of certain forms of interference such as side-band splash. When this occurs it is heard as a "rustling" or "dithering" noise on top of the programme being received, although the signal from the interfering station is generally unrecognisable. It is most pronounced on speech, when the depth of modulation is frequently increased by the control engineer. The trouble is due to the fringes of the two side-bands producing what might almost be described as beat notes. By cutting down the band width the trouble can be overcome, and if the high-note response of the L.F. portion of the set is slightly increased it will often be found that quality of reproduction does not suffer to any great extent. Even if it does, slightly inferior quality is preferable to annoying interference.

For "Straight" Sets

Some form of tone control can be applied to almost any type of receiver but, as has been pointed out, variable selectivity is a really practicable proposition only when using a superhet circuit. Nevertheless, there are methods by which the principle can be applied to oven simple types of "straight" receiver. For example, if an H.F. transformer or double-wound coil is used in either the H.F. or aerial circuits, a fair measure of control is possible by tapping the serial winding and bringing out these tappings to the contacts of a rotary switch, as shown in an accompanying illustration. Another method which is somewhat better although not always as convenient, is to use a band-pass tuner with "top-capacity" coupling. Two similar coils, both tuned, are together connected to the earth line, while the aerial is connected to a second winding of one of them. The corresponding winding of the other may be used for reaction if the circuit is of the Det.-L.F. type. Between the top ends of the two coils is connected a small-capacity variable condenser; a .0001-mfd. differential reaction condenser is satisfactory if connection is made only to the two sets of fixed vases.

An ultra-simple method, which is not particularly good, is to connect a .0002-mfd. variable condenser between the serial terminal of the set and the aerial winding.

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Special highly sensitive and recommended types, equal in performance to models costing as much as £16. For use with above amplifier or your own radio as amplifier. Supplied complete with transformer and G.B. battery. TABLE MODEL Cash or C.O.D. 2/- down and 10 monthly payments of 2/6. TELESCOPIC FLOOR-STAND MODEL. Chromium plated, cash or C.O.D. 2/- down and 11 monthly payments of 4/6.

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**BATTERY 4-WATT AMPLIFIER**

Efficient 4-valve battery version with Class "B" output. Ready for connection to batteries, speaker and microphone. Special offer 5/- or 5/- down and 11 monthly payments of 5/-.

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**THE SUM TOTAL OF A GOOD CIGARETTE**

PLEASURE SATISFACTION VALUE QUALITY = PLAYER'S
THE Ekco P.B. 199 is the first press-button receiver of the motor-tuning type we have received for test purposes, and if it can be taken as a criterion of the system which is rapidly becoming so popular, we can only say that the day of the ideal receiver is with us.

In appearance, the receiver is similar to an ordinary model, with the exception of the neat push-button strip which is fitted to the right of the large square three-scale dial. Twelve buttons are provided, eleven of which actuate the station selector mechanism—the remaining button being so arranged that it cuts out the motor control and allows the receiver to be tuned in the normal manner by an efficient slow-motion drive.

When the hand control is used, the "Mystic Eye" tuning indicator is brought into circuit and this very neat little device enables an accurate setting to be obtained with the utmost ease.

Before the receiver leaves the factory, it is set for eight medium-wave and three long-wave stations, each button having its station name clearly indicated by a small printed label fitted into an adjacent frame.

Fresh names may be inserted if it is required to change the setting of the selectors, and spare indicating labels, covering the majority of the worth-while stations, are provided with the receiver.

Bearing in mind the accuracy required when tuning a modern superhet, it is quite pardonable for one to wonder if it would not be a difficult job to set the selector mechanism correctly. Various aerials were tried and, in fact, everything was done to create the widely-differing conditions which the modern receiver is called upon to contend with, but the P.B. 199 came out on top every time.

With the dial control, dozens of stations were received at good entertainment volume, the speaker being able to handle an output more than one usually requires for domestic purposes without the slightest trace of distortion.

Apart from the tuning and wave-change control, there is a volume control, which compensates for the slightest variation in the mechanism so that "spot-on" tuning is always obtained.

Test Report

When the P.B. 199 was tested with the button control in action, it was found that all the stations indicated came in at a reasonably consistent sound level, the volume being pre-set by the manual control which also provides a smooth and well-graduated adjustment for the ultimate output required.

The pre-set station noise or any form of interference from the motor is non-existent, the speaker being completely dead when the dial control was travelling from one setting to another.

The button control was given a most exhaustive test, the mechanism being made to select one station after another over a considerable period and, in every instance, the desired station came in as soon as the pointer had reached the correct setting. Various aerials were tried and, in fact, everything was done to create the widely-differing conditions which the modern receiver is called upon to contend with, but the P.B. 199 came out on top every time.

With the dial control, dozens of stations were received at good entertainment volume, the speaker being able to handle an output more than one usually requires for domestic purposes without the slightest trace of distortion.

Apart from the tuning and wave-change control, there is a volume, tone, and selectivity control, the latter allowing the local or more powerful stations to be received with the highest quality of reproduction or, if so desired, a greater degree of selectivity to be obtained when reaching out for the more distant transmissions.

The short-wave stations were particularly good and, when tuning over these bands, the slow-motion control and the "Mystic Eye" proved most efficient and helpful.

This shows the main details of the motor-driven station locators incorporated in the Ekco receiver.

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The owner-driver's journal which tells you how to repair, overhaul and obtain the best performance from your car.

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SPECIFICATION

Specification: Model P.B. 199.

Receiver: Press-button, Motor Tuning. 10 Stage All-wave superhet for A.C. mains.

Table model.

Valve Combination: Ekco VP41, TX41, T41, T41I, 2D41, DT41, OP41 and R41.


Test report: Very efficient on all wavebands. High quality of reproduction on both radio and gramophone. The Tone control providing a wide and pleasing variation over the whole frequency range.

The Press-button tuning was found to be both consistent and accurate.


Price: 183 Gns.
A REVIEW OF THE LATEST GRAMOPHONE RECORDS

Decca

THE International Festival of Contem-porary Music now running in London (June 17th to 24th) is an important International Festival for it is attended by people all over the world. Amongst the British musical works performed at this gathering is Alan Rawsthorne's "Theme and Variation for Two Violins," played by Kathleen Wash-ter and "Mammancikum," coupled with " Please be Kind," is played by Red Norvo and his Orchestra on Voxion S 116, and (ux S 970 with Smith and his Onyx Club Boys have recorded " Here Comes That Man With the Jive" coupled with " I've Got a Heavy Date" on Voxion S 104.

Panachord


Panachord

Films feature in the dance tunes played by Ben Pollock and his Orchestra on Panachord 25976 as " Have You Ever Been in Heaven?" in which Hal Wanna Make Rhythm" are both from the film " Manhattan Music Box."

H.M.V.

The death of Feodor Chaliapin in Paris during April is much regretted by all music lovers. Only two double-sided records remain unissued, and these are now aval-able. One shows him in his most famous rôle, as King Boris in " Boris Godunov," in the Prayer and Death of Boris, the climax of the tragedy—H.M.V. BD 3464. The other features two songs, the well-known Russian folk song, " Black Eyes," and " The Proud Man," in which he shares his cell with an eagle, who seems to urge him to fly away—H.M.V. DB 553. Reginald Foort at the organ provides an on-motion reaction condenser, and all instructions. Ready for use with any 78 or 33 1/3 record. N.T.S. 259.

NEW Bargain Lists on request. Previously advertised still available.

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FREE! New Bargain Lists on request. Previously advertised still available.

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FREE! New Bargain Lists on request. Previously advertised still available.
Further Particulars of Frequency-changing Valves Are Given in this Article

A study of Fig. 50, signal oscillating potentials, and locally generated oscillating potentials, are acting on two separate grids of the valve. Actually, the effective mutual conductance of the signal amplifying section of the valve varies in sympathy with the oscillating potential on the grid of the oscillator section. The result, of main interest from our present point of view, is that the fluctuating current in the outer anode circuit is dependent upon the product of the signal and oscillator e.m.f.'s. This, in turn, means that there will be a component fluctuation having a frequency equal to the difference between the signal and oscillator frequencies. This "difference" frequency will, of course, be adjusted to the required intermediate frequency value, and the L.F. transformer of the outer anode circuit (Fig. 50) will respond to this particular frequency.

It is to be emphasised again that the signal section of the valve is not adjusted for detection. Incidentally, that is one reason why it is possible to apply A.V.C. to the signal grid.

There is a certain optimum amplitude for the local oscillations which implies that the oscillator (external) circuit should be designed accordingly. It is, of course, correspondingly desirable that the local oscillations should keep reasonably constant in amplitude, and the presence of the grid condenser and grid resistance in the circuit of Fig. 50 is concerned with this requirement.

The octode frequency-changer is a valve containing one electrode additional to the members contained in the pentagrid. This additional electrode is a suppressor grid which is mounted directly in front of the other anode, and is internally connected to the cathode. The presence of the suppressor grid has the effect of making the signal-amplifying (or "modulating") section of the valve have the characteristics of an H.F. pentode.

The triode-hexode frequency-changer can be regarded as consisting of two valves with a common cathode. Essentially, the triode-hexode consists of a triode oscillator and a hexode "mixer." The electrode assembly is represented diagrammatically in Fig. 51. Note that the grid of the triode section is internally linked across to an "injector" grid in the hexode assembly.

The oscillator tuned circuit is connected between the triode grid and the cathode, and the oscillating potentials set up on the triode grid are directly applied to the injector grid of the hexode. Electrons passing from the cathode to the hexode anode must necessarily pass through both the signal grid (carrying the input potentials) and the injector grid (carrying the local oscillation potentials). The current fluctuations in the hexode anode circuit are, therefore, dependent upon both the signal and local oscillation potentials and, as in the case of the pentagrid, will be proportional to the product of these potentials. As a result, the first I.F. transformer will be supplied with a component having the usual "difference" frequency.

The triode-hexode offers an appreciable advantage over the pentagrid and the octode, where short-wave reception is concerned. This is due to the fact that the virtual separation of the oscillator of the triode-hexode renders interaction negligible between the oscillator anode and the signal grid. Such interaction is appreciable with the pentagrid and the octode, particularly on short-wave signals, and has the effect of lowering the conversion efficiency.

A.V.C.

Automatic volume control is the term applied to the automatic control of the effective high-frequency amplification of a receiver in such a manner as to bring about a decrease of amplification with an increase of signal carrier amplitude, and an increase of amplification with a decrease of carrier amplitude. The primary objects of incorporating A.V.C. in a receiver are: (1) to prevent strong signals overloading the output stage, (2) to minimise the effects of signal fading.

The control upon the H.F. amplification is exercised by means of grid biasing, and this implies that the controlled valves must be of variable-mu types. The question that is raised now is, how can a direct voltage, dependent upon the signal, be obtained for application as bias to the grids of the controlled valves.

The problem brings us to a further consideration of the diode detector. In article seven of this series it was shown that if unmodulated H.F. oscillations are applied to a diode detector circuit the rectified current in the load resistance will be of steady D.C. character. Under modulation conditions the current in the load resistance will, of course, fluctuate at audio-frequency, and in article seven we were chiefly concerned with utilising the corresponding audio-frequency voltage developed across the load resistance.

In connection with our present interest it becomes a very useful idea to regard the current in the load resistance as consisting of two components: a D.C. component dependent upon the carrier amplitude, and an A.C. component dependent upon the modulation of the signal. Corresponding to these two current components there will be two voltage components set up across the load resistance. For A.V.C. purposes it is the direct voltage component that matters.

It must be emphasised that under conditions of negligible detector distortion, this direct voltage is independent of the modulation but is directly dependent upon the carrier amplitude so that the value of the voltage will rise with an increase of the incoming signal strength. The practical problem resolves itself into that of picking up this direct voltage and applying it to the grids of the H.F. valves. The direct and alternating voltage components are both present at the diode load resistance, but separation is easily effected by quite simple filtering arrangements.

It is possible to make a simple diode detector perform the double function of signal detector and A.V.C. detector, and Fig. 52 shows a basic circuit. C1 and R1, respectively, are the grid condenser and leak of the succeeding valve. CI will block D.C., so that the alternating component of voltage only will act on the L.F. valve.

(Continued at foot of col. 1, page 371)
PECKHAM DISTRICT SHORT-WAVE CLUB
A CLUB has been formed under the above name for the diffusion of short-wave gear and receivers, by Mr. Chadol, of London, Ltd., who showed how, by suggestions and criticisms of existing sets from clubs all over the country, manufacturers were able to improve their sets. Several happy afternoons were spent in demonstration and club discussions.

KING'S LYNN SHORT-WAVE CLUB
A SPECIAL meeting was held at the Adult School House for a demonstration of short-wave gear and receivers, by Mr. Chadol, of London, Ltd., who showed how, by suggestions and criticisms of existing sets from clubs all over the country, manufacturers were able to improve their sets. Several happy afternoons were spent in demonstration and club discussions.

LONDON TRANSMITTING SOCIETY
A SUCCESSFUL Jamboree was held on June 6th, Mr. Alman, Z2LC, being auctioneer. £110 was raised, going to society's banking account. We have to thank Mr. H. J. Hughes, Mr. Green, Z9TB, Mr. Morgan, Z9CO, Mr. Robbins, Z9DG, Mr. Barnes, Z9DK, Mr. J. E. Baker, Z9DF, for their help and assistance.

TECHNICAL FUNDAMENTALS No. 11
(Continued from previous page)
R2 and C2 provide the filtering for the A.V.C. feed line. The alternating component of voltage acts across R2 C2 in series. The impedance of C2 can be made sufficiently low in comparison to the resistance of R2 and C2 provides the filtering for the A.V.C. detector.

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DO ANY OF THESE SUBJECTS INTEREST YOU?

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IF YOU ATTEND TO THIS NOW IT MAY MAKE A WONDERFUL DIFFERENCE TO YOUR FUTURE
Letters from Readers

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

Interference

SIR,—I wonder if any readers have experienced and can explain the peculiar form of distortion which I have recently been getting on the short-waves. I have a simple home-made S.W. three, and on one night I noticed the presence of a high-pitched tone which I should call a "squeaking" sound. The signal rises and falls quite rhythmically, and the distortion is such that I cannot yet identify the language. I should like to know if it is a local phenomenon or if due to any faults in my set.—A. G. WISE (Hendon, N.W.8).

Spanish Tests

SIR,—Just recently I have picked up two Spanish broadcasts on various wavelengths. Two or three times I have heard these on different wavelengths, and on the same stations. The radio is as near as I can make out on my set the wavelengths are 25 and 30 metres. Can anyone assist me by identifying these stations? These broadcasts were heard about midday on three separate occasions. —T. DOEVEY (Cambridge).

[Although it is not possible to give any definitely without more details, it would appear that these were the experimental broadcasts from the new Lisbon transmitter.—Ed.]

Variable Selectivity

SIR,—I was interested in your article on coil types recently published, and should like to thank you for the interesting details. It is not often realised how valuable certain small details can be in a paper and I should like to tell you that I was using a very old set (vintage and make unknown) when I read this article. If any comments are made regarding the performance one is told that the shop is screened, it is a bad day, or some other excuse. Any suggestion that the set be taken home and tried on your own aerial is met with a polite refusal that the set could not be resold if brought back as it would be second-hand. What is one to do? I have yet to hear a set that is an showroom that I could take a fancy to, and every comment on performance has been excused. I have even made fictitious complaints in order to judge whether the salesman was making excuses without knowing anything about the set—and I have proved that he was. I hope things will be improved when television comes in.—L. ALMSS (Blackpool).

Radio Control

SIR,—I wished to carry out some tests on the wireless control of boats recently, and you gave me some details, but told me that a licence was necessary. I have been now in touch with the G.P.O. and am informed that no licence is required for ordinary radio control experiments. It is necessary, however, not to adopt spark transmission, and furthermore, I am informed that there is license in whatever in this connection, with one proviso. Should any interference be experienced which one can make out, the ordinary broadcast wavelengths the authorities may introduce some limitations on the activities of the experimenter. This information is of value to others who are interested in this branch of radio work.—C. FEARKEY (Gospelport).

The Vitesse

SIR,—I built the Vitesse receiver some time ago, and had done nothing but grumble at it. It was a sump point at home as I failed to get anything out of it, and my friends had told me that that was the fruits of home construction. I then did what I ought to have done at first, and wrote to you, as a result of which you kindly examined the set for me. You discovered two silly mistakes in the wiring which I had repeatedly checked (?) and after rectifying these and lining up the set you invited me to try it out. I must express my thanks for your service work and also for the design which is now setting all my friends by the ears. I have at least two friends starting in to build the set for their own use. You are doing amateur construction a real service and I, for one, greatly appreciate it. With renewed thanks.—G. WIttens (Liverspool).

"Economy S.W. One"

SIR,—Just a line to tell you that I have made the "Economy" S.W. I valver and it works splendidly. I have two aerials, one about 15ft long and the other 30ft, as I sometimes find I get better results with the shorter one. I have been a regular reader of Practical and Amateur Wireless for the last four years and it has helped me a lot on many occasions so here's wishing you further success.—C. G. Griggs (Herne Bay).

EVERYMAN'S WIRELESS BOOK

By F. J. CAMM

Wireless Principles and Fault Tracing simply explained.

3/6 or 6/- by post from Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2
New B.T.-H. Microphone

A SIMPLE carbon-type microphone is now included in the range of B.T.-H. microphones, and this is claimed to possess a very high degree of sensitivity. It is designed for use at banquets and similar functions where an unobtrusive unit is needed. The microphone contains 'Triogen' Coils, which measures 2 7/16in. long, 1 1/16in. high and 7/16in. deep. It is supplied 'on a stand providing an overall height of 21ins. The price of this microphone is 45/-.

Bulgin I.F. Transformer

THE accompanying illustration shows the Bulgin type C73 I.F. transformer, seen complete and with the unit removed to show the construction. The price of this panel is 3 guineas and it should be remembered that this will take the place of the two present panels. The complete tester costs 12 guineas.

Ediswan Valves

THE Edison Swan Electric Company are shortly releasing three valves designed primarily for use in modern television receivers. These are screened pentodes and a beam-power pentode. The first two are of the screened type with very small dimensions. The type SP41 is for use in I.F. or H.F. circuits, whilst the second SP42, is for use as a video output stage. The beam-power amplifier, type AC8 Pen, will fulfil the normal function on the sound side.

New Avo Valve Panel

THE Automatic Coil Winder and Electrical Equipment Co., Ltd., have introduced a new valveholder panel for use with their valve tester. This is a distinct advance over the previous types as it has only twelve valveholders, but takes up less room than other types of transformer, trimming being carried out through two holes in the top in the usual way. The cans measure 1 1/4in. square by 3 1/2ins. in height, to which must be added approximately 4in. for the top locknuts. Two lugs are riveted to the bottom of the cans and are provided with insulating washers and locking nuts, and the coils may thus be mounted on any standard metal chassis. If they are required for use with a wooden chassis it will be necessary to recess the underside to enable the lock-nuts to be tightened up. Litz wire is employed for the primary and secondary windings and the output wires are welded to ensure reliability of colour. The accommodating leads are provided for sub-chassis connection, and the adjusting screws on the trimmers are insulated from the H.T. supply. The coils are, of course, designed for an I.F. of 465 kc/s., and the price is 6s. Where it is necessary to use a higher gain, this transformer is available with a tighter coupling between primary and secondary windings. The price is the same, but the type number is C74.

Bulgin type C73 I.F. transformer, seen complete and with the unit removed to show the construction.

Battery Push-button Set

THE Decca Company announce that they will shortly release a battery operated push-button set. It will be a 5-valve superhet to sell at a first round about 59s. 6d., and in appearance will resemble the existing mains models.

ELECTRANIX BARGAINS

D.O. ELECTRIC MOTORS. 1,450 revs. D.C. 110 volts, 151/-.

SELECTED VALVES. 140, 150d, L800 and L802 cheap. For small short wave types 7 and 8 of c.w. with four socket valves in medium size. ALL values, have been revised, and the cards and boxes kits, consisting of resistors and condensers of varying values, have been redesigned. 'Franklin Electric Co., Ltd. The contents of the catalogues of any of our advertisers. Merely state, on address.

The D.C. AVOMINOR

ELECTRICAL MEASURING INSTRUMENT

Note: Prices are as at 1 July, 1938.

D.C. Avometer, Model 1. Price: £ 2 10 0.
CRYSTAL SETS.

**Blueprints. 6d. each.**

Four-station Crystal Set. £1.3.6d.

1934 Crystal Set. £2.3.0d.

**SHORT-WAVE SETS.**

One-valve: Blueprints, 1s. each.

S.W. Converter-Adapter (1 valve). £1.3.6d.

Side-tune Three (5G, D, Pen). £2.2.0d.

Four-Station Crystal Set. £1.3.6d.

Two H.F. Portable. £2.2.0d.

Simplified Short-waver Superhet (1 valve). £1.3.6d.

Four-station Crystal Set. £1.3.6d.

Three-station Crystal Set. £1.3.6d.

Simplified Short-waver Super. £2.2.0d.

Four-station Crystal Set. £1.3.6d.

Two-station Crystal Set. £1.3.6d.

**Mains Sets.**

1935 Super Five Battery (Superhet). £2.5.6d.

1936 Super Five Battery (Superhet). £2.5.6d.

1935 Super Five Battery (Superhet). £2.5.6d.

**PORTABLES.**

Four-valve: Blueprints, 1s. each.

All-Metal Four (2 SG, D, LF, P). £5.6.0d.

1934 A.C. Century Super A.C. £5.6.0d.

**PORTABLES.**

Two H.F. Portable. £2.2.0d.

Simplified Short-waver. £2.2.0d.

Four-station Crystal Set. £1.3.6d.

Three-valve: Blueprints, 1s. each.

New Class B Five (2 SG, D, LF, P). £5.6.0d.

1934 Crystal Set. £2.3.0d.

**SUPERHETS.**

Battery Sets: Blueprints. 6d. each.

Mains Sets. £1.3.6d.

All-Metal Four (2 SG, D, LF, P). £2.2.0d.

Superhet Converter (1/-). £1.3.6d.

A.W. Super Five Battery (Superhet). £2.5.6d.

**Mains Sets.**

One-valve: Blueprints, 1s. each.

Ultra-portable Three (6G, D, LF, P). £1.3.6d.

One-valve (Class B). £1.3.6d.

**Mains Sets.**

One-valve: Blueprints, 1s. each.

Ultra-portable Three (6G, D, LF, P). £1.3.6d.

One-valve (Class B). £1.3.6d.

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One-valve (Class B). £1.3.6d.
June 25th, 1938

PRACTICAL AND AMATEUR WIRELESS

ERIES and

EQUIPMENTS

Car Radio

"I wish to use a small battery portable as a car radio, using the standard batteries. I want to make this non-directional; if I make an aerial in the car (tourer) or under it, would this make the set non-directional? The idea, of course, is to run the set while in motion. Also, can you suggest a good form of suppressor for the car?"—E. J. S. (Ely).

It is quite possible to use an external aerial with a portable, joining this to the grid end of the frame winding. Most cars have aerial sockets and earth plates for this purpose. Alternatively, you can wind two or three turns of wire round the outside of the portable cabinet and join the aerial to one end of this, taking the other to the car chassis. This will overcome the directional effects. As your car is a tourer, the best place for the aerial will no doubt be under the running boards, and you may try out various lengths of wire for the purpose. You may not need suppressors, but if they are found necessary they may be obtained from Messrs. Dubilier, Dubilier & Delling-Lee.

Balanced Reproduction

"I am trying out some experiments in reproduction and wonder if you can give me any hints on obtaining better results. I have a large 10-inch moving coil and a small midget M.C. and should like to use both to obtain more even response of all frequencies. Should they be placed in any relative position regarding each other, or may they be side by side and fed with a common signal?"—H. E. (N.W.11).

Theoretically the large speaker should handle the bass and the small speaker the treble, and if mounted side by side and fed with a common signal they may give very good results. Improvement may be carried out, however, by separating them or even by placing the large unit so that it is directed downwards and the small unit so that it is directed forwards. On the other hand, maximum results would not be obtained if you built a special filter circuit designed to feed all frequencies up to a certain value to the large speaker and frequencies above that value to the small speaker. You should experiment with various transformers and fixed condensers in order to find a circuit suited to your speakers, your set and the general acoustics of the room.

Variable Condenser Rating

"I have an old variable condenser with nine fixed vanes and ten moving. Can you please tell me what value this is, and how to work it out?"—T. R. (Bournemouth).

It is not possible to state exactly what capacity the condenser possesses. The capacity is dependent upon the area of overlap of the plates and the spacing, and the latter is most important. Some condensers have the vanes very close together, while others there may be quite a large space between them. Therefore, if you cannot identify the make of the condenser, when given by the makers, the only solution is to have it tested upon a good capacity bridge. You could, of course, make a rough test for yourself by substituting the condenser on your set and substituting the condenser for your own, adjusting this to bring in the required station. This might enable you to estimate its capacity from the relationship between the settings of the two condensers.

High-Note Buzzer

"I am trying to improve my Morse and have been using an ordinary converted electric-bell movement as a sounder. I find, however, that the low note is rather depressing when used for long periods, and I want a high note to coincide with some of the special code transmissions which I can reproduce and wonder if you can give me any hints on obtaining better results. I have a large 10-inch moving coil and a small midget M.C. and should like to use both to obtain more even response of all frequencies. Should they be placed in any relative position regarding each other, or may they be side by side and fed with a common signal?"—H. E. (N.W.11).

We wish to draw the reader's attention to the fact that the Question Service is intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, from articles appearing in our issues or, on general wireless matters. We regret that we cannot, for obvious reasons—(1) Supply circuit diagrams of complete multi-valve receivers. (2) Suggest alterations or modifications of so many receivers described in our contemporaries. (3) Suggest alterations or modifications of so many receivers described in our contemporaries. (4) Answer queries over the telephone. Requests for Blueprints must not be enclosed with queries as they are dealt with by a separate department. Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., 24/26 Southampton Street, Strand, London, W.C.2.

Valve Tester

"I want to make up a valve tester and it appears that the only real solution to the different valve-base types is to mount a holder for every type on the panel. This will increase the size of the panel and seems wasteful. Is there no other way in which I can obtain the desired interchange by means of adapters, for instance? If so, where can I obtain them?"—W. F. E. (Luton, Beds).

The use of separate holders is adopted in most commercial testers, but with a little ingenuity you can make use of a single holder and separate adapters. A 9-pin holder could be mounted on the test panel, and special reducing adapters could then be inserted in this holder, so that different valves could be fitted into the adapters. We think you will find sufficient range of adapters in the Bulgin list, but it may even then be necessary to take out several terminals of the panel in certain cases and to make outside connection for certain types. This trouble is, of course, overcome when separate holders are mounted on the test panel.

Magic Eye Tuning Indicator

"I have had a Magic Eye cathode-ray indicator presented to me and should like to incorporate this in my set. Unfortunately, however, this is a rather old superhet and does not incorporate the valuable A.V.C. arrangement. Can I make use of the indicator in any way without it being just incorporated as a separate unit?"—V. W. A.

The indicator is normally used to show the exact tuning position, and it is difficult to judge this when A.V.C. is working properly. However, you may make use of the indicator could be incorporated to give a signal strength indication—somewhat in the manner of a simple "R" meter. In this ease it should be fed from the grid of the second detector, adopting more or less standard connections to the target and other electrodes of the indicator.

Tapped Resistance

"For test purposes I wish to use a tapped-wire-wound resistor, but the only arranged values may be tapped off. I have looked through all the component catalogues I have by me, but am unable to find anyone making such a component. I wonder if you can put me on someone who can supply this item?"—J. S. (Bath).

MESSRS. BULGIN supply two variable indicator resistors, both rated at 60 watts. You do not state what power rating you require. These two items are arranged in maximum ranges of 10,000 and 50,000 ohms and a slider on top is graduated in ten steps. You might need something smaller, and in that case we would suggest that you consider the W.B. variable resistor (the Adiabatic model) which is wire wound and selection is carried out by a rotary arm running over a number of studs. You could strip this down and rewind it to definite values according to your requirements. We cannot trace any other suitable item without more specific details as to your requirements.

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Edited by F. J. CAMM

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June 25th, 1938

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