THE ONE-VALVE SHORT-WAVE SET—

See page 681

Practical and Amateur Wireless

AND PRACTICAL TELEVISION

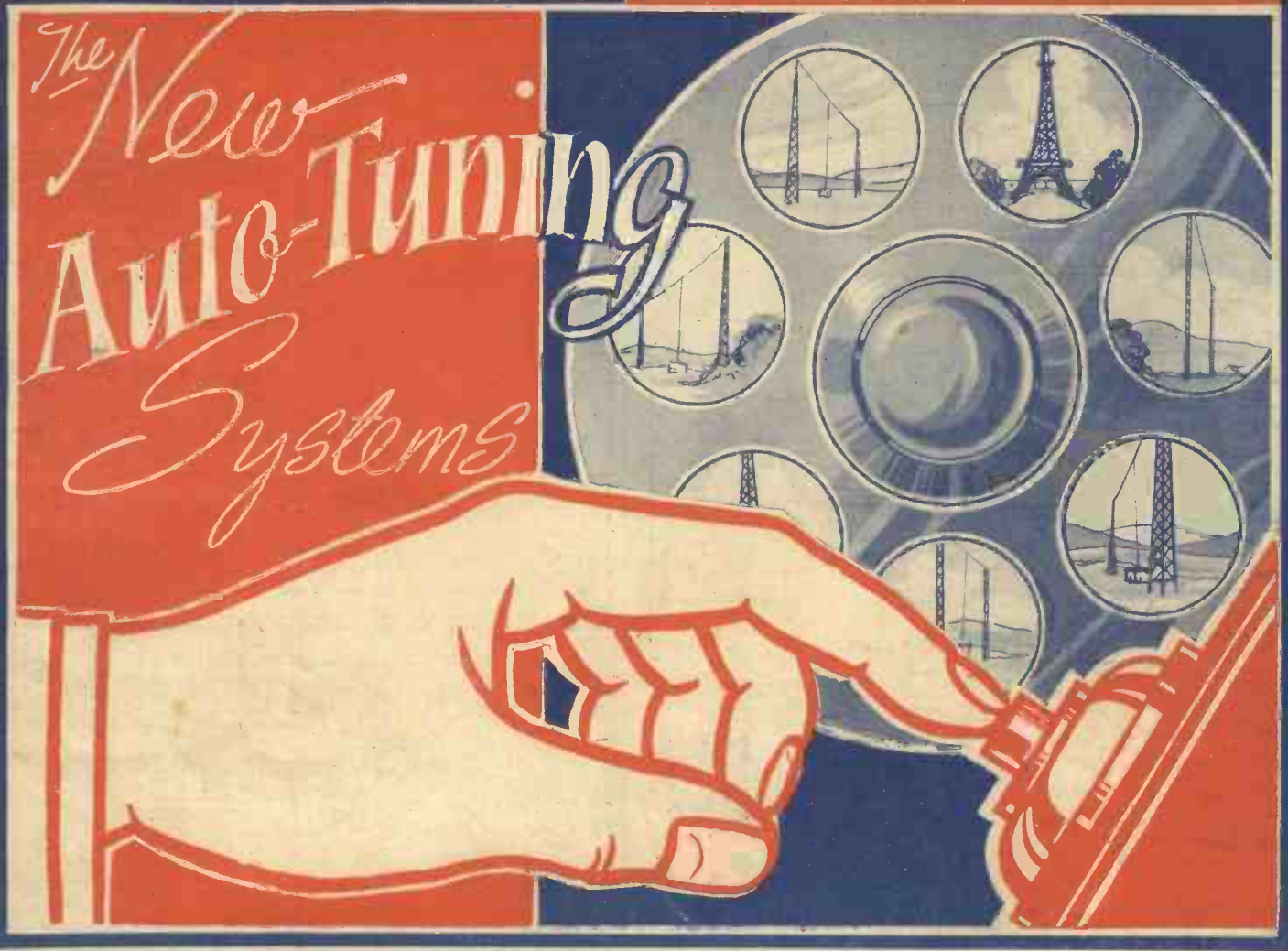
3D EVERY WEDNESDAY

Edited by F. J. CAMM

A GEORGE NEWNES Publication

Vol. 11. No. 285. March 5th, 1938.

The New Auto-Tuning Systems



TRANSMITTING TOPICS—See page 679

Practical and Amateur Wireless

Edited by F. J. CAMM

Technical Staff:
W. J. Delaney, H. J. Barton Chapple, Wh.Sch., B.Sc., A.M.I.E.E., Frank Preston.

VOL. XI. No. 285. March 5th, 1938.

ROUND *the* WORLD *of* WIRELESS

Push-button Tuning

EACH season sees some new development in radio receiver technique, and the present trend is to fit the standard receiver with some form of automatic tuning device. The idea is not new, and in our very earliest issues we gave instructions for fitting a form of auto-tuning to simple receivers. The introduction of highly-sensitive and highly-selective receivers introduced difficulties, and the large number of tuned circuits employed also made it difficult at first to see how such devices could be applied practically. In America the idea has been developed in several different forms, and now each manufacturer advertises his scheme and claims that it is the only perfect one. English manufacturers have been slow to adopt the device, mainly on account of the fact that they desired to overcome the imperfections of existing schemes, but now about twenty manufacturers have announced that they are producing or are about to produce receivers incorporating this feature. In this issue we give details of such apparatus as has been released to date, together with the advantages to be derived from the scheme, and further details will be given as they are received. It is anticipated that in the near future home-constructor apparatus for the purpose will be available, either for incorporation in an existing set or as an additional unit for use with any type of receiver.

Sir Adrian Boult for U.S.A.

THE B.B.C. announces that Sir Adrian Boult has accepted the invitation of the National Broadcasting Company of America to go to New York to conduct the N.B.C.'s new Symphony Orchestra in two concerts to be broadcast next May. This orchestra was formed last year, and it is now giving a series of ten special Symphony Concerts under the direction of Arturo Toscanini.

More O.B. Television

IT is now announced that included in the forthcoming outside television broadcasts it is hoped to give scenes from the finish of the Boat Race on April 2nd, Trooping the Colour on the King's Birthday, and on St. George's Day, April 23rd, to re-enact by means of models in the Alexandra Park lake, the Zeebrugge action of 1918.

Police Radio Extension

HOVE has now equipped its flying squad with wireless, and it is expected that the Hove police will soon be similarly equipped, thus following the lead set by the Brighton authorities three years ago with the introduction of the pocket radio. At present all Hove messages are telephoned to the Brighton headquarters, where they are broadcast from the special short-wave station, GTN, situated on the roof of the Town Hall.

ON OTHER PAGES

This Year's Radiolympia

THIS year's Radio Exhibition at Olympia will be held from Wednesday, August 24th, to Saturday, September 3rd, both dates inclusive. Plans are being drawn up for the schemes to be adopted for attracting greater public interest this year, and it is to be hoped that better television demonstration facilities will be provided.

Southampton and P.O. Relays

AT a recent Borough Council meeting at Southampton, the proposed Post Office relay scheme was turned down. This follows the announcement that all sections of industry in the town had bombarded the council, and the motion was defeated by thirty-four votes to twenty-three. It now remains for the Postmaster-General to decide what steps to take regarding the original proposal to instal this relay system.

Singapore Broadcasts

TWO new transmitters are being opened this month by the British Malaya Broadcasting Corporation. These are ZHP and ZHO, on 31.48 and 49.9 metres respectively. At the moment it is stated that the former will broadcast on Saturdays and Sundays, and the latter on week-days, but no definite hours have yet been set aside.

National Badminton Championships

FOR the second time the National Badminton Championships will be Broadcast on March 3rd. The contest is being staged at the Royal Horticultural Hall, Westminster.

Hawaiian Dance Relay

IN the London Regional programme on March 9th a novelty will be introduced in the form of a relay of national dance music from the Hawaiian Islands. The National Broadcasting Company of America has made arrangements with a famous Hawaiian Orchestra for regular broadcasts, and it is one of these special transmissions which the B.B.C. will relay.

Empire Follies

THE B.B.C. Empire Station's now famous concert party, Empire Follies, produced by Frederick Piffard, will be heard for the first time in the National programme on the afternoon of March 4th. This party, following the well-known precedent set by Pelissier in his Follies, includes gentle and amusing satire of everyday events.

Pools Plumbed

IN view of the present controversy on the Football Pools, listeners will be interested in a special B.B.C. broadcast in the Northern programme on March 8th. In this broadcast J. Howie Milligan will tell listeners how to win in the pools. His method can be summarised simply; it is to meet every possible chance beforehand. According to his system, listeners need only fill in enough coupons and they are bound to win. This burlesque "sounding" of the pools appears to be good advice, even if almost impossible to follow.

ROUND the WORLD of WIRELESS (Continued)

Swiss Ultra-short-wave Experiments

IT is reported that U.S.W. transmissions are being radiated from the top of the 100ft. observation tower of an hotel in Zurich, Switzerland. The transmitting aerial has an effective height of 3,000 feet above sea-level.

Jungle Broadcast

ACCORDING to a note from the U.S.A., broadcasts from VP3THE, a wireless station on horseback in the Amazonian jungle will shortly be heard in the United States over the network of the National Broadcasting Company. The Holden British Guiana Expedition of the American Museum of Natural History, first jungle expedition to be radio equipped, is to broadcast reports of its findings in the forests of southernmost British Guiana.

Radio Sunday-school

WHAT is apparently the only Sunday-school in the world which is maintained by means of radio is at Longreach, Western Queensland, Australia. From the wireless station there lessons are broadcast to children every Sunday, and there is also a wireless collection. The young listeners send their contributions by post, to be used towards the cost of the broadcasts.

Broadcast from 5,000-year-old Tomb!

ONE of the most remarkable broadcasts of recent years took place recently, when the Liverpool archæologist Mr. Walter Emery gave a talk with other eminent Egyptologists from the Pyramids, scene of Egypt's glamorous ancient history. Relayed with the assistance of Marconi engineers, the transmission was over land-line from the Pyramids to Cairo, from whence it was beamed to London. From London it was finally relayed via trans-Atlantic telephone to the U.S.A.

The eerie atmosphere of King Cheop's tomb, in which part of the broadcast took place, was very well put over—the echo from the vaults, which go back to 3,000 years B.C., being distinctly heard in spite of the great distance over which the programme had travelled. A distance, incidentally, of 10,000 miles.

New B.B.C. Appointment

A RECENT B.B.C. announcement is to the effect that Mr. Maurice Johnstone has been appointed North Regional Music Director. Since 1935 Mr. Johnstone has been a member of the programme staff of the B.B.C. Music Department in London, and the date of his transfer to Manchester will be announced as soon as this is known.

For the Sake of an Example

IT is interesting to note that over £1,000 has now been received by the Electrical Industries Benevolent Association from a campaign conducted as a gracious recognition, from the staffs and associated companies of the Crompton Parkinson group, of Mr. Frank Parkinson's year of office as President of the Association. Mr. Parkinson, himself, had no knowledge that the campaign was being conducted, which shows what can be done when one or two enthusiasts make a determined effort, and the Electrical Industries Benevolent Association hopes that in other firms large and small there will come along Electrical Industries Benevolent Association champions to sponsor its cause.

INTERESTING and TOPICAL NEWS and NOTES

This illustration shows N.B.C. officials and Marconi engineers making preliminary tests for the historic broadcast from Egypt.

More Women Radio Announcers

AT the Jubilee Conference of the International Council of Women, to be held in London this summer, plans for increasing the number of women radio announcers and speakers throughout the world will be discussed. A preliminary resolution from France declares that women broadcasters are of special value in raising the cultural level of women, combating social evils, and promoting peace.

Dr. Maria Castellani, organiser of women's broadcasts from Italy to foreign countries, will take an active part in the discussion. Women from 37 countries will attend.

Midland Orchestral Concert

ON March 6th the City of Birmingham Orchestra will be conducted by Leslie Heward in a Beethoven programme, including the Second Symphony. Charles Hedges, the Birmingham tenor, will be the vocalist for "Adelaide."

The Farr-Baer Fight

WE are informed that a commentary by Bob Bowman, through the courtesy of the Canadian Broadcasting Corporation, on the Farr-Baer fight at Madison Square Garden, New York, will be broadcast to British listeners from Droitwich only on Saturday, March 12th, at 2.45 a.m. For those who are unable to listen at this early hour, a recorded edition will be broadcast from 1.30 to 1.45 p.m.

Broadcast News Bulletins in Spanish and Portuguese

IT is announced that the B.B.C will begin on the night of March 14-15th a service of broadcast news bulletins in Spanish and Portuguese for listeners in Central and South America. As from March 15th, these bulletins will be broadcast daily from two B.B.C. short-wave transmitters at Daventry working simultaneously on a wavelength of 31.55 metres, under the call sign GSB and directed to Central and South America. The bulletin in Spanish will be radiated at 1.30 a.m., G.M.T., and will be followed by a bulletin in Portuguese at 1.45 a.m., G.M.T. The transmissions will be received in Central and South American countries during the evening of the previous day. The bulletins, which will be objective in character, will be compiled by the staff of the B.B.C. from the reports of the British News Agencies.

Band of Gypsy Girls

DON RICO'S Band of twenty-five Gypsy Girl instrumentalists will be on the air again on March 6th in the Northern programme. This band, which includes accordions, harp, guitar, trombone and strings, is no newcomer to the Northern microphone, having broadcast on many previous occasions.

SOLVE THIS!

PROBLEM No. 285.

Williams had a four-valve battery set having a variable-mu H.F. stage. Results were very poor, signals being weak and distorted. He tested the H.T. and L.T. and found them up to standard and then connected a milliammeter in the H.T. negative lead. The current shown was roughly correct, and then, with a view to testing the potentiometer controlling the H.F. valve, the G.B. negative plug connected to this was removed. Immediately the current shown on the meter *fell*. Theoretically, of course, it should have risen. What was the cause of this strange behaviour? Three books will be awarded for the first three correct solutions opened. Envelopes should be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Envelopes must be marked Problem No. 285 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, March 7th, 1938.

Solution to Problem No. 284.

The inductance of the frame aerial which Deville built did not match the tuning coils which he used, and thus he could not tune the frame and coils with a gang condenser in order to obtain results throughout the dial. The tuning would only match up at one or two points and thus a separate trimmer should have been used, or the frame tuned by a separate condenser.

The following three readers successfully solved Problem No. 283, and books have accordingly been forwarded to them: J. D. Morris, 17, Lynton Road, Heaton Moor, Stockport; F. Clarke, 21, Shepherd Street, Littleover, Derby; J. Emery, Sewell, Harpenden Road, St. Albans, Herts.

Where Accuracy is Important —and Where it is Not

Condenser and Resistor "Tolerance": Values of Components in a Typical Circuit: By-pass and Coupling Condensers: De-coupling and Coupling Resistors: Importance of Correct Mains Transformer Voltages - - - - By FRANK PRESTON

ACCURACY is always comparative, and with many wireless components it does not closely approach the absolute. And yet, in other components inaccuracy of two or three per cent. might be sufficient to render a receiver completely unsatisfactory. It is clear from this that it would be worth while to study the question more closely with a view to finding approximately what degree of accuracy is required in the values of different components.

As most readers are no doubt aware, fixed condensers and fixed resistors of good quality are generally accurate to within plus or minus 10 to 15 per cent. That is, the makers do not guarantee a fixed condenser with a nominal value of .001 mfd. to be exactly that value, but they do guarantee that its exact capacitance will lie between .0009 and .0011 mfd., if the "tolerance" is given in the catalogue as "± 10 per cent." In the same way, a fixed resistor with a rated value of 100,000 ohms will have a resistance of not less than 85,000 ohms nor more than 115,000 ohms, if the tolerance is plus or minus 15 per cent.

To Special Order

Of course, if for any reason a greater degree of accuracy than this were required, most of the well-known makers would supply the part on special request, but a slight extra charge would be made. The component would probably not have to be made specially, but the tester would have to choose it from the thousands passing through his or her hands.

From this it might appear to the casual observer that radio must be a very inaccurate science, but that is by no means the case. For example, if you were to buy a high-grade all-wave tuning unit, the sections would probably be matched to an extremely high degree of accuracy; they must be if the unit is to be efficient over the full range of wavelengths covered. Valves, on the other hand, are looked upon as extremely delicate and accurate assemblies. They are to a certain extent, but if the principal characteristics are within 10 per cent. of the published figures the user would rarely detect any difference between two valves with the maximum permitted variation in characteristics.

Useless Super-accuracy

Now let us look at the skeleton circuit of a four-valve superhet with rectifier, shown in the accompanying illustration. As long as trimmers were provided on the two-gang tuning condenser, the coils and condenser sections need not, initially, be balanced to a degree of accuracy finer than about 10 per cent.; in fact, in most cases any greater degree of accuracy would confer no advantages. That is because the matching of the two tuned circuits could be upset to a fairly considerable extent by the use of long leads, especially if some of these were shielded by means of earth-connected screened braiding. But if the coils and condenser sections were made to tolerance limits of 10 per cent. or thereabouts, quite small trimmers would be adequate to ensure almost perfect balance.

By-pass Condensers

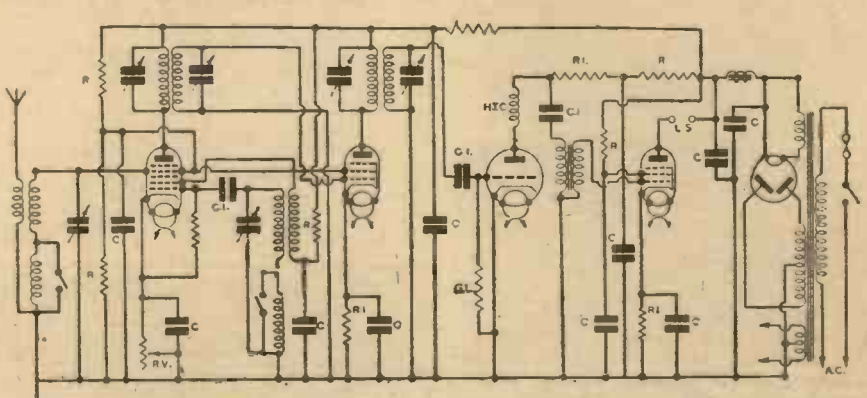
Among the fixed condensers there is a large number whose purpose is merely to provide an easy by-pass for H.F. and L.F. currents. These are marked C in the circuit. Provided that their impedance is low in relation to their corresponding resistors at the average frequency of the currents in their circuits, it is unnecessary that their capacitances should be within at least 50 per cent. of the average values. That explains why you often see values varying from .01 mfd. to 1 mfd. for the condenser connected between the screening-grid of a pentagrid or H.F. pentode and earth. Taking an average frequency of 1,000 kc/s (300 metres), the impedance of a non-inductive condenser of .01 mfd. is about 16 ohms. This is considerably lower than the value of resistor generally used in the lower arm of the fixed screening-grid potentiometer.

At 10,000 kc/s (30 metres) the impedance (strictly speaking, the reactance, which is almost the same for most practical purposes) would be only 1.6 ohms, and therefore the value of .01 mfd. would be adequate. In the same way, increasing the value to .1 mfd. would be equivalent to dividing the effective impedance by ten, which means that a .1 mfd. condenser has an impedance of only 1.6 ohms at 300 metres, or 16 ohms at 3,000 metres. Generally speaking, therefore, it will be seen that the lower of the two values mentioned would be perfectly suitable in a short-wave set, whereas .01 mfd. would be better on the medium-wave band, and 1 mfd. might be better on long waves. We can thus say that .1 mfd. would be suitable for use in most all-wave receivers.

Unwanted Inductive Reactance

It might be thought that it would be better to be on the "safe side" by using the largest of the three condensers. But it must be remembered that even a so-called non-inductive condenser of normal type has a certain amount of inductance. As inductance produces increased impedance, and as its value varies in direct proportion to the rated capacity, it is best to use the lowest capacity that gives a reasonably low impedance.

Similar rules apply to the H.F. by-pass condenser between the bottom of the oscillator anode winding and earth, although in this case the impedance should be considered in relation to the voltage-dropping resistor between the coil and H.T.+. If the value of resistor is not less than 25,000 ohms, a .1 mfd. by-pass condenser is suitable; if the value exceeds 50,000 ohms it would be possible to use a condenser of lower value.



This skeleton circuit of a typical four-valve superhet, with rectifier, is used to show in which parts of the circuit values are most critical.

Grid-coupling Condensers

Three condensers are marked C.1, these being coupling condensers. One is the grid condenser for the detector, a second is the oscillator grid condenser and the other is in the grid circuit of the L.F. valve. The two first could have a value of .0001 mfd., but the latter should not be less than about .01 mfd. The reason is that the detector grid condenser is dealing only with high-frequency currents, the frequency of which would be about 500 kc/s in a modern superhet. At that frequency a .0001-mfd. condenser has a reactance of just over 3,000 ohms, which is low in comparison with the almost-infinite impedance of the secondary circuit of the

(Continued overleaf.)

WHERE ACCURACY IS IMPORTANT

(*Continued from previous page*)

I.F. transformer and with the grid-leak resistance of about 2,000,000 ohms.

The L.F. grid condenser, however, has to handle low frequencies from about 50 cycles up to 5,000 cycles. If we take the average as 500 cycles we say that the average impedance of a .01-mfd. condenser is just over 30,000 ohms; this is low in comparison with the impedance of the two resistors in the detector anode circuit. In consequence, the L.F. currents will pass into the L.F. transformer far more easily than they can "leak" through the H.T. circuit to earth.

Among the other by-pass condensers we have those for by-passing the decoupling resistors for the anodes of the first three valves and that for the auxiliary grid of the output pentode. To prevent the building-up of audio voltages in the H.T.-supply circuit these should offer far less impedance than the decoupling resistors. That is why a value of about 1 mfd. is generally suitable, such a capacity offering an impedance of about 160 ohms to frequencies of 1,000 cycles. It will be quite clear, however, that the condensers would still be reasonably effective if their impedance were doubled. In other words, their precise value is not very important.

Bias By-pass

Other by-pass condensers are those across the bias resistors of the first two and fourth valves. In the case of the first two valves the condensers have to by-pass H.F. currents, so that a value of .1 mfd. is ample. But the last-mentioned condenser is in the L.F. circuit besides being in parallel with a resistor having a value of, say, 250 ohms. Thus its value must be higher, and as slight inductance has little effect on low frequencies it has become customary to use an electrolytic condenser of about 25 mfd. This might appear unduly high when it is remembered that its impedance to currents of 1,000 cycles is only about 6 ohms, but it should not be overlooked that there might also be present a mains frequency of 50 or 100 cycles—and that the impedance to 50 cycles is over 120 ohms! An appreciable "hum" voltage could be developed across a condenser of lower capacity, and in some cases, particularly when the set is operated from 25-cycle mains supplies, it is desirable to increase the capacity to 50 mfd. to avoid mains hum.

Smoothing the H.T.

The two other principal condensers in our circuit are those used for smoothing the H.T. supply. That adjacent to the rectifier should be of fairly critical capacity, since it influences the output voltage obtained by the rectifier. Most valve manufacturers advise 4 mfd. electrolytic, but for some valves 8 mfd. is suggested. The other smoothing condenser could have any value, and the higher it was the greater would be the degree of smoothing. In practice, however, a capacity of 8 mfd. is nearly always the best compromise.

Turning now to the resistors, the values of those marked R are determined entirely by the voltage which it is required to drop, and calculation is dependent on the well-known Ohm's Law. The detector anode resistance marked R.1, however, should have a value related to the impedance of the detector valve, the value being roughly twice that of the valve impedance. The values of the bias resistors (also marked R.1) are generally critical, especially in the case of the output valve. If the resistance is too high the valve is over-biased, which means that it cannot operate at maximum efficiency and, in the case of the L.F. valve, that distortion will probably be caused. If the value is too low the H.F. valves will become unstable, while the L.F. valve will pass too high an anode current and its life will be shortened. It is important that the bias resistor used should be of the value recommended by the valve-maker for the particular type of valve in use.

Accurate Voltage

It is not always realised that the mains transformer should have a degree of accuracy greater than that of many of the other components in the set. Thus, for example, if the voltage supplied to the valve heaters is too high, the heaters will be run at too high a temperature and will therefore have a shorter life than they should. What is not always as obvious is that if the voltage is too low the valves might be still more seriously affected. The reason is that if the heater is not raised to the correct temperature, the "sucking" of the electron stream from it causes gradual disintegration. This is, of course, most pronounced in the case of large-power output valves and rectifiers, the anode current of which is comparatively heavy. It is very easy to ruin a high-efficiency output valve taking a high anode voltage by under-running the filament or heater. It is still more easy to cause the early demise of a cathode-ray tube by the same means, for the H.T. voltage in that case runs into thousands of volts.

Important Broadcasts of the Week

***NATIONAL* (261.1 m. and 1,500 m.)**

Wednesday, March 2nd.—Symphony concert from the Queen's Hall, London.
Thursday, March 3rd.—Variety from the Holborn Empire.
Friday, March 4th.—Eight Bells: Variety programme.
Saturday, March 5th.—Palace of Varieties programme.

***REGIONAL* (342.1 m.)**

Wednesday, March 2nd.—The River Severn: The history and people of the River, from the Welsh Border to the sea.
Thursday, March 3rd.—Badminton Championship, from the Royal Horticultural Hall.
Friday, March 4th.—The Changing Midlands: Can the growth of Towns and Industries be controlled? A discussion.
Saturday, March 5th.—Orchestral concert.

***MIDLAND* (296.2 m.)**

Wednesday, March 2nd. — The River Severn: The history and people of the River, from the Welsh Border to the sea.
Thursday, March 3rd.—The Young Farmers' Policy To-day, a discussion.
Friday, March 4th.—The Changing Midlands: Can the growth of Towns and Industries be controlled? A discussion.
Saturday, March 5th.—The Leicester Brass Band Festival, from De Montfort Hall, Leicester.

***WELSH* (373.1 m.)**

Wednesday, March 2nd.—Melodies of Wales: vocal and instrumental programme.
Thursday, March 3rd.—Choral programme from the Central School, Coedpoeth.
Friday, March 4th.—Wales and Cambridge: a discussion between speakers from the two Universities.
Saturday, March 5th.—Wales in Exile: The Wimbledon Welsh Community, from the Spencer Hall, Wimbledon.

***WEST OF ENGLAND* (285.7 m.)**

Wednesday, March 2nd.—The River Severn: The history and people of the River, from the Welsh Border to the sea.
Thursday, March 3rd.—Westward Ho! No. 5 of a radio magazine.
Friday, March 4th.—A Variety programme from the Hippodrome, Southampton.
Saturday, March 5th.—Dance Cabaret from the Pavilion Ballroom, Bournemouth.

***NORTHERN* (449.1 m.)**

Wednesday, March 2nd.—Northern Notions—13, a recorded, studio and actuality review of interesting Northern events.
Thursday, March 3rd.—Scunthorpe Schools Musical Festival, from the Baths Hall, Scunthorpe.
Friday, March 4th.—Variety from the Theatre Royal, Stockport.
Saturday, March 5th.—A running commentary on the second half of the Rugby League Match, Salford v. Wakefield.

***SCOTTISH* (391.1 m.)**

Wednesday, March 2nd.—Crime Marches On! Episode Two, The Case of the Baleful Baronet.
Thursday, March 3rd.—Pleas for Pleasure: Recreational Revue.
Friday, March 4th.—Orchestral programme.
Saturday, March 5th.—What it is to be Young, a comedy by James Bridie.

***NORTHERN IRELAND* (307.1 m.)**

Wednesday, March 2nd.—Shepherds Hey, recorded feature programme.
Thursday, March 3rd.—Choral programme.
Friday, March 4th.—Chamber music.
Saturday, March 5th.—Association Football: Glentoran v. Portadown, an eye-witness account.

"TELL ME IF IT HURTS!"

A London doctor spent a series of week-ends and some £400 in making the amusing film, "Tell Me If It Hurts," which is to be televised in the evening programme on March 14th. The first film made by an amateur to be shown in a London cinema, it has just completed a successful five weeks' season in the West End. It deals humorously with the reactions of a man suffering with toothache and his experiences at the dentist's, and so realistic are the surgery scenes that the film had to meet the opposition of the censors. It was at length given an "A" certificate on the condition that it was prefaced by the statement: "This film is presented as a good-humoured joke, and we hope you will accept it in that spirit. No representation in it is intended of any living person."

The film, which runs to two reels, will be repeated in the afternoon television programme on March 21st.

ON YOUR WAVELENGTH

By Thermion

Recording Television

I AM reminded of a paragraph I wrote a few issues ago in which I said, or in which I implied, that it would be possible to record a television broadcast in the same way as we now record speech. A waspish critic, who thinks that he knows all there is to know, has caused me to chortle and guffaw by an exhibition of what I can only describe as tergiversatory technical nonsense. A lot of these pseudo technical people learn off a few parrot phrases which are useful in impressing their friends, and presume that there can be no possible exception. This hypercritical bloke trots out the usual bit that it's impossible to record frequencies up to three megacycles. He seems to forget that it has already been done. He seems to jump to the conclusion that to record such a programme we must use gramophone discs, or that we must receive it by the ether and record it. There are still people who believe that the earth is flat, and others who think that an equilateral rhomboid is a term of opprobrium. If this reader does know what a megacycle is and if he does understand methods of recording it is obvious that, he is talking through his hat. If he does not understand those things he is talking or writing about something he knows less than nothing about, rather on the lines of the definition of the quack-teacher who starts off by knowing a great deal about a very little and goes on learning more and more about less and less until finally he knows everything about nothing, or nothing about everything. I advise this critic to read an elementary text book and to study the technical papers, and also to re-read my paragraph, when he will see where he has erred.

Brentwood Amateur Radio Society

MY regrets to members of the Brentwood Amateur Radio Society that I should have referred to them in last week's issue as the Brentford Amateur Radio Society. The Hon. Secretary is Mr. J. R. Deane-Sainsbury, of "Brunook," Crossways, Shenfield, Essex.

Reply to Another Critic

I RECEIVED a letter from a reader of West Worthing inquiring for the dimensions, etc., of the short-wave coil and choke in the Triband Three. We replied, stating that it was not part of our query service to undertake the preparation of constructional details amounting to an illustrated article and send them through the post. Additionally, under the Editor's guarantee, the specified parts must be used. Obviously, his task would be rendered impossible if in addition in having to adjust the receiver he had to adjust individual components. Now, both he and I are well aware that there are some readers capable of making their own components, and the Editor has provided for them by producing those very excellent books, "Wireless, Coils, Chokes and Transformers, and How to Make Them" (2s. 6d.), "Wireless Constructor's Encyclopædia" (6th edition, 5s.), "Everyman's Wireless Book" (3s. 6d.), "Television and Short-wave Handbook" (3s. 6d.), whilst for those who require a circuit there is "Fifty Tested Wireless Circuits" (2s. 6d.). This unreasonable reader, however, replied that we do not wish to propose to cater for our readers, and he wants to know whether a description of any part of a set such as short-wave coils or chokes is to be withheld from our readers. This reader makes the usual claim that he has "read the paper from number one," and that being so he should have on file dozens of issues which have described the construction of such items as short-wave coils, all-wave coils, medium-wave coils, long-wave coils, ultra-short-wave coils, transmitting coils, mains transformers, chokes (H.F. and L.F.); a long series on designing your own receiver, a long series not only on making all sorts of coils, but how to incorporate them in given circuits. In fact, series of articles on almost every type of wireless construction. This reader ends his letter with a cheerful threat that he is awaiting a copy of my reply which he will send to his "many radio friends." By this paragraph he will know that I am informing his "friends" of the facts.

Club for King's Lynn

MR. G. W. S. RODGERS, of 112a, High Street, King's Lynn, tells me that one or two enthusiasts in his district are anxious to form a short-wave club. He would be glad if local readers interested would get into touch with him, or to Mr. A. W. Brookson, 15, Chequer Street, King's Lynn.

Junior Section for Worthing

MR. J. BOWERS, of 37, Sunningdale Road, Durrington, Worthing, says that he has been considering starting a Junior Local Chapter of the B.L.D.L.C. He says that at present they will be able to hold the meetings at his house, thus solving one problem. With regard to subscription, that is a matter for discussion by the members, although it is my opinion that it should not be made too small, otherwise you do not attract the keen member. Any reader under 21 years of age should write to Mr. Bowers, remembering that he is interested only in keen members.

Another Howler

F. W. J. C., of Kenton, writes: "On Sunday, January 30th, at 9.21 a.m. and again at 9.34 a.m., I was listening to Radio-Normandie. At these times there was a break off in the transmission for perhaps two or three minutes.

"The announcer, on transmission being resumed, apologised for the breaks and said: '*These repeated breaks are due to a very high wind here which interferes with transmission.*'

"This, to me, seems ridiculous, and if you think the same, no doubt the lads who like 'howlers' will appreciate this one which is all the more rich because of its source."

And Another

R. O., of Petworth, tells me that he was in a certain radio shop recently when an old lady came in for an accumulator. When this was produced she asked sweetly if it

would run down if she did not put it in the set until the next morning, for she wanted to make sure that it would last through that day!

The Superhet's Rival

I HAVE received hundreds of letters about the recent suggestion for a rival to the superhet. Most readers welcome it, but H. S. B., of Llansamlet, writes,

"Re superhet's rival. As a certain reader states, the straight can scarcely be considered a rival of the superhet. However, my desires are in the direction of a circuit of the kind suggested.

"The only snag is the cost.

"At the moment, we can't buy 'quality sets' at a 'popular' price, so we have incentives to construct them. We justify our hobby in that we provide something we can't buy. We achieve something!

"As it is, I 'modify' all 'quality circuits,' and buy 'surplus' components. Not because I imagine for one moment I can improve on the circuit and valves stated, nor on the components: I am compelled to. The result is that, good as results may be, I always feel that had I bought the specified components, I should have done better. This 'modifying' business is an evil affair.

"It is unjust to the designer. The 'specified component' makers' sales are small, and they erroneously conclude there is no market for components (certainly not for *their* components at *their price*), and finally the constructor doesn't get the results he expects.

"Why must we have elaborate, beautifully-canned coils—why silver-plated terminals and all the other trappings, giving an outward appearance of quality—21s. ganged condensers, nicely got up and admittedly efficient?

"If the little tin affairs used by manufacturers do their job, why can't the constructor use them? And so on with all the other components.

"Much as I like the prospect of seeing your proposed circuit, I fear that to use up parts I possess I shall 'modify' your circuit to suit them.

Radio Set for Cyclists

THERE have been requests from many readers of our companion weekly *The Cyclist* for a design for a very small and compact headphone portable wireless set. I should be glad to receive photographs and details from any reader who has built such a set. It must be remembered that light weight is an important factor.

Notes from the Test Bench

Soldering-iron Protection

THE service-man and the experimenter often find that long spells of soldering are called for in their work, but very often an interval will arise during the work (whilst components are mounted, tested or changed about) and the iron must be left connected all the time in order to avoid delay when it is again required. The ordinary iron will stand up to quite a lot of rough usage, but it is as well to prolong its life as long as possible by avoiding over-running. An idea which has before been mentioned in this connection, and which has been recommended to many readers, is to make a stand for the iron, so arranged that when the bit is placed upon a supporting strip its weight depresses the strip and automatically switches a resistance in series with one mains lead. The resistance should be so chosen that it makes only a slight reduction in voltage, sufficient to avoid overheating but to keep a suitable temperature. A separate support should be provided upon which the iron may normally be placed during soldering work.

Short Wiring

WE recently had the opportunity of seeing a novel method of assembly adopted by a reader who had experienced difficulty in building an all-waver to his own design. In most cases the constructor mounts components exactly as they are intended to be mounted by the manufacturer, screwing such items as coils, gang condensers and so on, to the flat chassis. This does not always provide the most efficient wiring, and in the case in question the amateur had cut a thin strip of aluminium the length of the coil-unit base and had bolted the condenser and coils on each side of the strip, the bottom of the latter being turned over for mounting on the chassis, thus the condenser and coil unit were mounted on their sides, but the connecting wires between the two units were less than 1in. in length, and apart from the fact that the dial had to be mounted separately there were no other difficulties introduced by the method of mounting.

This Year's Radiolympia

THE date of this year's Radiolympia is from Wednesday, August 24th, to Saturday, September 3rd, inclusive. Two months of 1938 have gone and it will not be so many weeks hence that the secretive Thermion is strolling round the Exhibition again. Book these dates in your diary.

The Southampton Relay

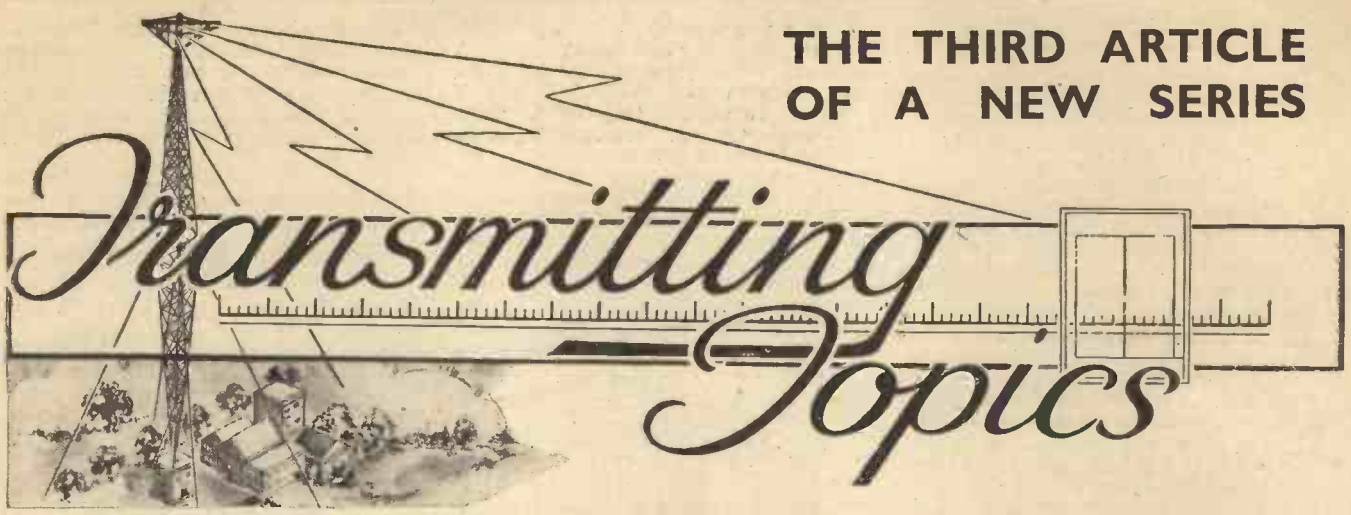
THE much-talked-of G.P.O. relay scheme for Southampton was rejected by 34 votes to 23 at a meeting of the Southampton Borough Council. I am glad. The Post Office, which controls the B.B.C., has no right to interfere in commercial enterprises and certainly no right to compete with them. What chance have ordinary commercial undertakings against Government price cutting, bearing in mind that the Government can run at a loss and still run when other firms will go into the bankruptcy court? I hope that any Government scheme for killing trade will meet with a similar fate. I particularly object to the B.B.C. and the Post Office entering the Radio Trade.

Radio Friendships—"Smoke Dreams" Fan Club

WHEN Paul Hughes, the dreamer, settles back in his easy chair Sunday afternoons to revive bygone days during his "Smoke Dreams" programme, nine old friends light up their cigars, settle back in their easy chairs in Washington, D.C., and join the dreamer in reminiscing.

"We haven't missed a Sunday since October," wrote A. E. Skurow, of Washington. "We're all past sixty, and when you reach that age there's nothing like a good cigar and some fine old memories to warm your heart."

Each week when "Smoke Dreams" is broadcast over the Nation's Station (WLW) and the NBC-Red network (1.30 to 2 p.m. E.S.T.) the nine men in Washington live the days gone by as the dreamer recalls them to his dog Sport. "Smoke Dreams" features Virginio Marucci's orchestra and choir with guest soloists. The programme is sponsored by H. Fendrich, Inc.



THE THIRD ARTICLE OF A NEW SERIES

Transmitting Topics

Further Notes on Circuits, and Details of Construction of the Rack for a 10-watt Transmitter, are Given in this Article. By L. ORMOND SPARKS

HAVING dealt with the main details of the two Hartley oscillator circuits last week, I propose continuing with other arrangements with which the amateur transmitter is likely to come in contact.

Tuned-plate Tuned-grid

The above title is given to a very popular circuit of the capacity coupled type, and as the beginner advances he will find it is more usually referred to as the T.P.T.G. circuit. The theoretical details are shown

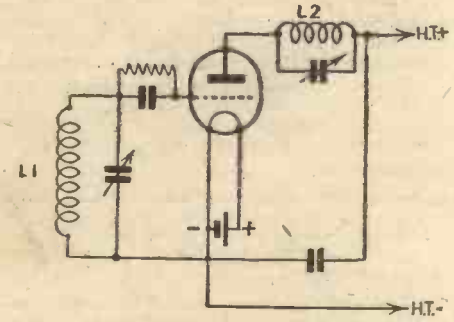


Fig. 1.—Circuit diagram of the tuned-plate tuned-grid arrangement.

in Fig. 1, where it will be seen that a coil and condenser combination is in both the grid and the anode circuits, but it must be clearly understood that the coils are not used for the purpose of obtaining regeneration by inductive coupling, as it is provided by the existing capacity between the grid and plate electrodes in the valve when certain external requirements are satisfactory.

These requirements are the tuning of the two inductances L1 and L2, and it can be verified by experiment that a state of oscillation will be produced when the two circuits are tuned to the same frequency, or, in other words, when they are in resonance with each other. Strange as it may seem, the maximum oscillation will be secured when the circuits are a minute fraction off resonance.

The tuned circuit L2 will have the greatest effect on the frequency of the oscillations, while, apart from the inter-electrode capacity of the valve, the characteristics of the grid circuit will govern, to a certain extent, the degree of regeneration or excitation obtainable with any given valve.

There is only one real snag with the T.P.T.G. arrangement, and that is, it is not too easy to adjust, but it has the redeeming feature of being quite stable once everything has been set. As the use of the words oscillation and stable seem rather confusing, I would mention that "stable" is used in the sense of maintaining the oscillations at a given strength and *frequency*, as one of the great things to

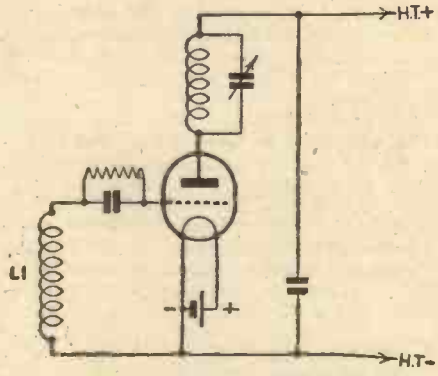


Fig. 2.—This arrangement is known as the T.N.T. circuit.

avoid in any generator of oscillations is any variation of their frequency.

The T.N.T.

This is shown in Fig. 2, and it will be obvious that it is nothing more than a modification of the T.P.T.G. circuit. The only difference is that the circuit L1 is no longer tuned by a variable condenser, thus

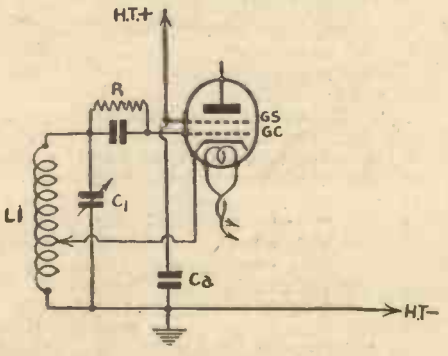


Fig. 3.—This method of coupling gives rise to the term electron-coupled.

making it cheaper to construct and, in one way, easier to adjust.

Once again the valve electrode capacity is called upon to provide the "feed-back" between plate and grid circuits; the anode coil is tuned by means of the variable condenser to resonate with L1, which, however, has to be so made or designed that it will resonate at the desired frequency by its self-capacity plus that of the valve and associated wiring.

The Electron-coupled Oscillator

This is a very popular arrangement, and as its uses are not solely confined to transmitting, it is a circuit which calls for every consideration.

Providing reasonable care is taken with the lay-out and the selection of the components, little trouble is likely to be experienced. The main items to watch are screening and the elimination of any form of external coupling.

If the circuit is examined—Fig. 3—it will be seen that it is simply an elaboration of the fundamental Hartley circuit, but as a screened-grid valve is used, the screening grid "G.S." might be regarded as the anode of the Hartley circuit, while the control-grid "G.C." becomes the oscillator grid, the normal anode of the S.G. acting as the output circuit.

It will be remembered that in the Hartley arrangement the filament tap is kept at earth potential and that of the anode at a high potential from a radio or H.F. point of view. Actually, these requirements are not vital, *providing* the grid, filament

(Continued on next page)

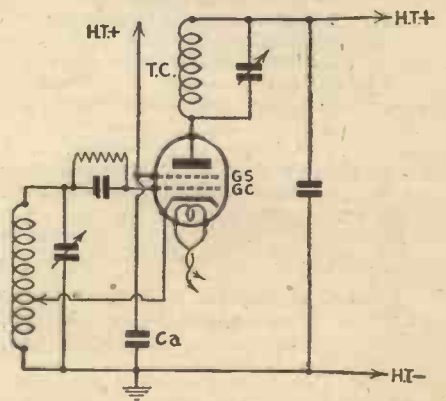


Fig. 4.—A modification of Fig. 3.

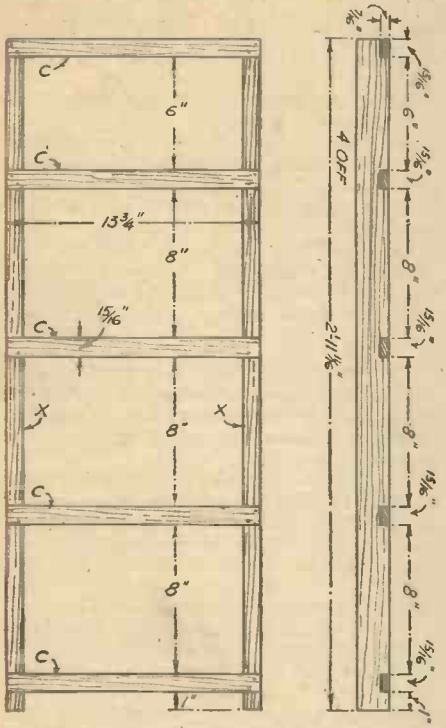
TRANSMITTING TOPICS

(Continued from the previous page.)

and anode are maintained at their correct *relative* potential, as will be seen from the description of the electron-coupled method.

In this instance it is the anode of the oscillator which is kept at an earth potential, when considering the H.F. currents, although from a direct current point of view it is actually at high potential. The fixed condenser Ca allows this state of affairs to be maintained, as it presents a negligible reactance to H.F. currents, thus holding down the anode, and at the same time preventing a short-circuit of the D.C. high-tension. By the way, it will be permissible for the beginner to think of "reactance" as resistance. The true definition, however, will be given as the articles proceed.

Without going into the actual operation of the valve, it must be appreciated that as the anode is tied down so far as H.F.



Figs. 5 and 6.—Front and side elevations of main frame.

currents are concerned, the cathode of the valve will be at an H.F. potential, but with indirectly heated mains valves, the heater circuit can be allowed to be at earth potential. This point is stressed, as it calls for a different arrangement with battery-operated valves, which do not embody an independent cathode.

In such instances, some means have to be devised whereby the active part of the filament is kept at an H.F. potential above that of the earth common negative line, such conditions being produced by inserting suitable H.F. chokes in series with the filament. It is obvious, therefore, that an indirectly heated mains valve has many advantages when considering the circuit in question.

Let us now complete the circuit shown in Fig. 3, so that it becomes that shown in Fig. 4.

A tuned circuit, T.C., has been added to the anode circuit, and if a positive D.C. voltage, as indicated by the H.T.+ line, is applied to the anode it will attract and receive the electrons through the screening grid "G.S.," which it will be remembered, is acting as the oscillator anode.

If, then, the circuit T.C. is tuned to the frequency of the oscillations, the H.F. component will produce voltage variations in the anode circuit of the same frequency of the oscillations, or, to put it in more simple words, the valve will be acting as an oscillator *and* an amplifier.

This feature brings us to another important item. Supposing, for example, the circuit T.C. is so arranged that it can be tuned to twice the frequency of the oscillator, that is, the *second harmonic* of the fundamental or original frequency, it will then be found that the output is still quite good. The same applies to T.C. being

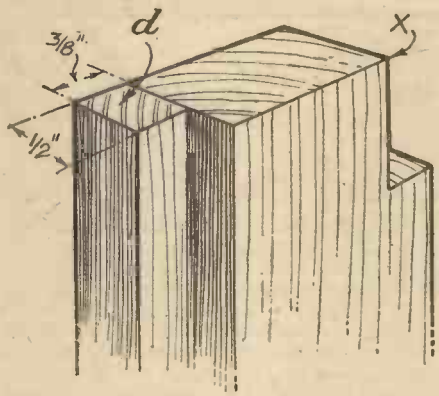


Fig. 7.—Showing how the four uprights are cut to receive cross bars.

tuned to the third and even the fourth harmonic, but it must be fully realised that the output will gradually decrease as one proceeds up the harmonic scale, therefore, it is not usual—with the circuit in question—to try to obtain more than the third harmonic.

In case it is not clear what advantage this offers, let us assume that the fundamental frequency is crystal controlled to, say, that equivalent to 40 metres. If T.C. is tuned to the second harmonic, it will be possible to obtain, with the same crystal, a good output on 20 metres, and so on, according to the characteristics of T.C. There is a term given to this procedure, but more about that next week.

Constructing the 10-watt A.C. Transmitter

Here are the preliminary details for the construction of the rack mentioned in my last article.

Before starting any of the work—from wood you may have on hand—it is best to purchase the full amount of material, thus avoiding those annoying delays caused by running short of supplies.

Here is the complete list of wood required for the rack:—

A full 12ft. of 1¾in. by ¾in.
,, ,, 19,, ,, 1in. by 7/16in.
,, ,, 21,, ,, ½in. by ⅜in.
,, ,, 12,, ,, 5/16in. quarter round beading.

To this must be added one pennyworth of 1in. fine French nails; the same amount of ¾in. brads; a sheet of medium and smooth sandpaper, and a 3d. packet of water-stain. To commence operations, cut the 1¾in. by ¾in. stuff into four *equal* lengths of 3ft. each (x), then mark them off as shown in Fig. 6, and remove the shaded portions by cutting into the wood with a tenon saw and taking the part out with a chisel of suitable size. Don't make the slots *too* deep or *too* wide. It is better to be on the small side, and gradually bring to the correct size to take the 1in. strip tightly.

Ten lengths, each 13¾ins., can then be cut from the 1in. by 7/16in. strip (c) and fitted into the slots thus forming two frames as shown in Fig. 5. See that the frames thus formed are *square*—I mean as regards the corners—and when you are satisfied that all joints are a good fit, the strips can be nailed in position by two 1in. French nails in each join.

After this, four 3ft. lengths of ½in. by ⅜in. wood (d) can be cut and fastened to the four 1¾in. by 7/16in. pieces on the opposite side to

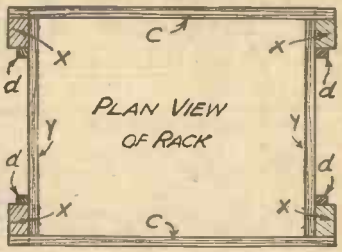


Fig. 8.—Indicating the position of the side members.

the strips, as shown in Fig. 7. These are fastened with the 1in. French nails. The two main frames thus formed are now ready to be fixed together to form the rectangular structure, by means of 10 lengths of the 1in. by 7/16in. wood, each 9½in. long. These are arranged and fastened with their edges level with the other strips of the same size, but at right angles to them. French nails are used for the fixing, two being used at the ends of each strip ('Y' Fig. 8). The main thing to watch with the constructional work described so far is to keep everything square and firm. At this stage, although all the woodwork is not quite finished, it is advisable to give the rack a coat of water stain. The colour used can depend on individual taste, bearing in mind the matching of other fittings or furniture. The original model was finished in medium oak. When the stain is thoroughly dry, the outside surfaces should be polished—not highly—by the application of beeswax and a little elbow grease.

Anna Neagle in "Star Gazing" Broadcast

MANY listeners will be interested to know that the career of Anna Neagle will be the subject of the next programme in the "Star Gazing" series.

By arrangement with Mr. Herbert Wilcox, Miss Neagle will herself take part in the programme—the eighth of these "radio biographies"—when it is broadcast on April 11th and 12th. On the following day, April 13th, Miss Neagle will begin work on her next production for Mr. Wilcox, "Sixty Years a Queen," a successor to "Victoria the Great," her last film, which has had so great a success.

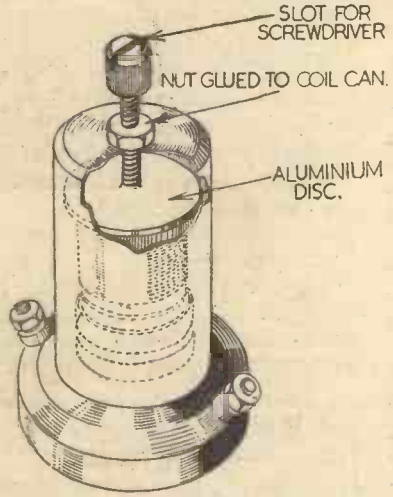
The romantic story of Miss Neagle's swift rise to world fame will be told in the "Star Gazing" programme, which is now being prepared by Leslie Baily and Charles Brewer. Her early days as a chorus girl in London musical comedies and cabarets will be recalled, and then her first starring film, "Good-Night, Vienna," in 1930. From this and her subsequent films, including "Bitter Sweet," "Nell Gwyn," "Peg of Old Drury," "London Melody," and "Victoria the Great," scenes and songs will be reproduced in the radiobiography. It is also hoped to include an advance scene from "Sixty Years a Queen," with Miss Neagle playing in a B.B.C. studio her part of Queen Victoria. Mr. Herbert Wilcox has given the B.B.C. access to the scenario of the new film so that a scene may be broadcast.

READERS' WRINKLES

A PAGE OF PRACTICAL HINTS

Auxiliary Trimming Adjustment

I HAVE a set which would not trim satisfactorily even with the aerial trimmer all out. Tests showed that I would have to decrease the inductance of the aerial coil. This I did by fitting a small disc of



A neat aerial trimming adjustment.

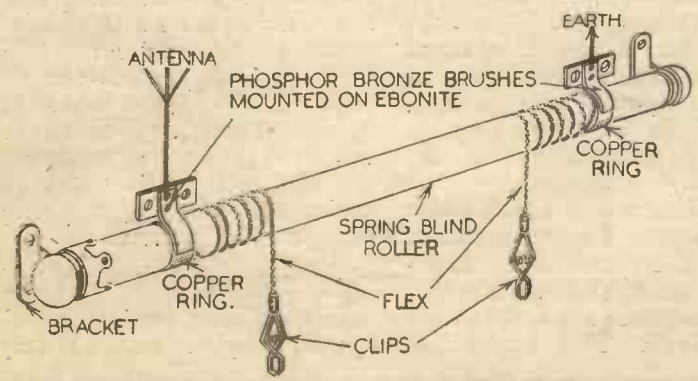
aluminium inside the aerial coil can in such a manner that it could be raised and lowered so as to come closer to the field of the coil, thereby decreasing its inductance and thus allowing the trimmer condenser to be used in this section. The accompanying sketch clearly shows the arrangement.—WM. NIMMONS (Belfast).

For the Service Bench

TO keep the back of my service bench free from wires running across it, I made use of the dodge shown in the accompanying illustration, which I rigged up from an old spring blind roller and a few odds and ends.

The roller I cut down to 1ft. 2in., and then made two copper rings and soldered a length of flex to each, with a clip attached to the ends. Black flex is used for the earth, and red for the antenna. The two supporting brackets can be made from any material, if none are to hand, and can be fixed to suit one's own requirements, under a shelf, or on the back of a bench.

To operate, simply pull the flex to the required distance, and the roller will lock. After use, just pull the flex, when the roller will wind them up out of the way.—M. CROSBY (Alvaston).



A method of fitting aerial and earth leads on a roller, to facilitate service work.

THAT DODGE OF YOURS!

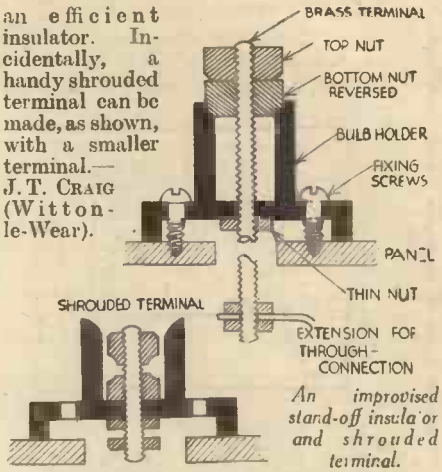
Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL AND AMATEUR WIRELESS," George Newnes, Ltd., Tower House, Southampton Street, Strand, 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.

SPECIAL NOTICE

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

Improvised Stand-off Insulators

I WANTED a small stand-off insulator in a hurry and made one up in the following manner: An old bakelite flash lamp bulb-holder was stripped of all metal parts—leaving just the moulding. From the junk box I obtained an old type brass terminal and fitted this as shown in the sketch, thus making up quite an efficient insulator. Incidentally, a handy shrouded terminal can be made, as shown, with a smaller terminal.—J. T. CRAIG (Witton-le-Wear).

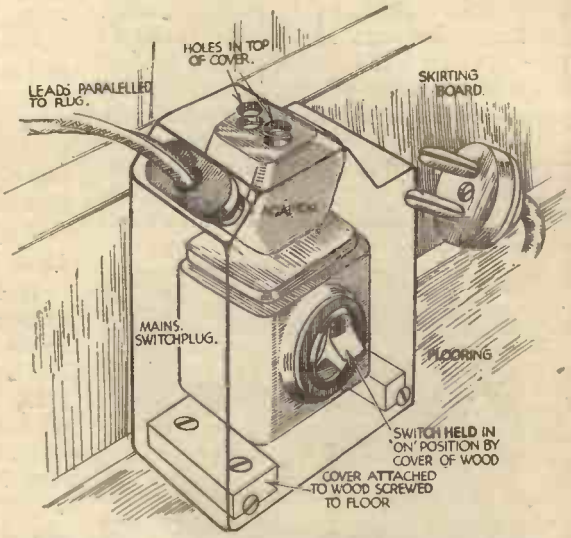


An improvised stand-off insulator and shrouded terminal.

A Three-way Mains Switch-plug

A MAINS switch-plug on the skirting board of a room is used for several purposes at once by using a three-way adapter from a multiple store, and a small wooden box shaped to fit over the switch-plug, as shown in the illustration.

An electric clock and lamp are paralleled to one plug utilising one side of the adapter in such a way as to prevent the plug at any time being withdrawn. The other side is left open for the insertion of a vacuum cleaner plug or electric fire, and by this arrangement I have the clock keeping regular time, the lamp being fitted with its own switch on one side. The cleaner can be plugged in without interfering with the other connections, the centre point being used for radio.—E. PARSONS (Highgate).



A neat mains switch-plug arrangement for a skirting board.

AUTO-TUNING

Details of the Automatic Methods of Tuning No Reference to the Receivers Now or Shortly to be

IN our issue dated October 30th last we gave preliminary details of certain forms of automatic tuning which have been on the American market for some time. As pointed out in that article the idea is by no means new, and in 1933 we described how the principle could be applied to any standard simple type of receiver, using, instead of push-buttons or similar devices, ordinary on/off or change-over switches. The feature which was then specified was the inclusion of pre-set condensers in place of the standard tuning condenser, each pre-set being adjusted to a station, and the pre-sets being selected

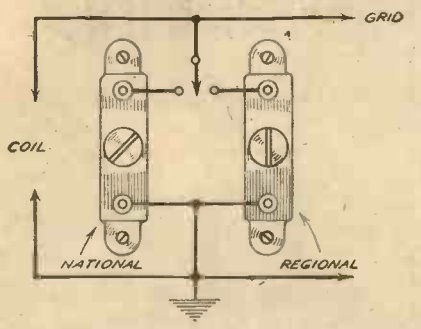


Fig. 1.—The fundamental arrangement employed in push-button tuning systems.

by means of the switches. The scheme is illustrated in Fig. 1, and it will be apparent that such a device is only of use in the very simple type of set. It will be seen later how it may be adapted to any receiver, including the modern superhet, but it may first be desirable to reply to a criticism which has been made on several occasions against this form of tuning. Many listeners have been heard to state that it is a lazy idea, and as such is not worthy of attention. Such a statement is far from the truth. A modern receiver is sufficiently powerful to enable at least twelve stations to be received at a good volume, but in spite of a dial bearing station names

Fig. 2.—This is the new Cossor "Teledial" receiver.

it is an undoubted fact that the fairer members of the sex, who are left at home during the day, hesitate to tune in to stations other than the local.

Difficult Tuning

Those of us who understand the receiver know that it is actually a simple matter to tune to a desired station, but although we may leave instructions at home as to the manner of getting those stations, it appears in the majority of cases that the housewife or other person using the set prefers it to be left to the locals, and although a good item may be obtainable on another station they would rather not try to get it. To this type of listener the push-button is an undoubted blessing. By merely pushing in a button engraved with the name of the station, that programme is instantly selected, and in a good receiver the tuning is *exactly* carried out, with the result that there is no distortion due to mistuning—such as may be met with in a sharply-tuned superhet. The dial-system is just as easy, everyone now being familiar with the method of using the automatic telephone. Thus there is at least one type of listener to whom the introduction of automatic tuning will be a welcome asset, but there are many other occasions when the quick selection of a station, merely by pushing a button or dialling will be found of value, and each listener will be able to see such cases for himself.

How It Works

It was mentioned in the opening paragraphs of this article that the switching-in of pre-set condensers is the simplest way of carrying out the idea, and where a number of tuned circuits have to be adjusted (such as the aerial and oscillator coils in a superhet) it is only necessary to duplicate the condensers and to gang the switching mechanism. The arrangement is shown in Fig. 6, and it will be obvious that further condensers are just as easily included. Interaction between leads and circuits will, of course, have to be avoided, but this is not difficult. This method of adjustment is adopted in the Decca and Invicta receivers, and in the first-mentioned, special steps have been taken to ensure that the adjustment will be entirely unaffected by temperature, climatic and similar changes. The pre-sets are, accordingly, of the ceramic type, one being included in the grid circuit and one in the oscillator circuit after the style of the circuit shown in Fig. 6.

It is obviously possible, with a scheme of this nature, to arrange the pre-sets in a convenient position so that they may be adjusted by the user or a local service man to bring in the best-received stations in the locality in which the set is employed, and by providing special replaceable name-plates any range of stations may be automatically selected. A push-button unit, built on this arrangement could, of course, be

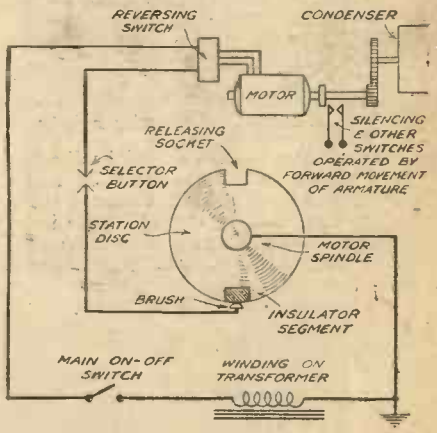


Fig. 3.—How the motor-tuning system works. This scheme is actually that employed in an American set.

fitted to any receiver, but at the moment no manufacturer has produced the separate unit, although we understand that one will be available in the near future. It will also be possible, by means of a unit of this type, to build a superhet-converter which could be added to any receiver and used as a remote tuning control device and would greatly improve many existing receivers.

Other Systems

In the Cossor receivers, which are operated by a dial as may be

SYSTEMS

ow in Common Use, with Especial available to the English Listener

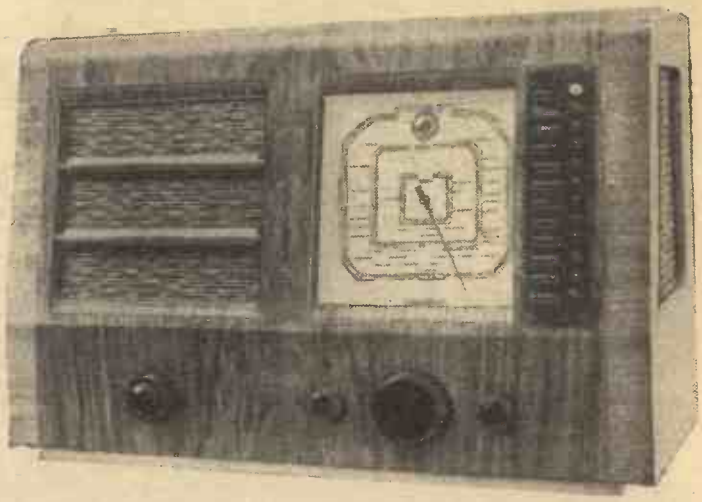


Fig. 5.—In this Ekco receiver pressure on the buttons starts an electric motor which turns the tuning condenser.

seen from Fig. 2, the movement of the dial turns the gang condenser, but when the finger is pushed into the hole it at the same time pushes in a button situated at the bottom of the hole. This brings into circuit a muting device and pushes forward a peg. As the dial is pulled round,

Fig. 4.—This is the Philco "Empire Nine" with automatic tuning.

the peg travels in a slot until arrested at the end of the travel provided on that particular peg, and when this resistance is felt the finger is removed, opening the muting device and enabling the station to which the condenser has been pulled to be heard. In the Philco arrangement a somewhat similar device is employed, the movement of the dial turning the gang condenser, and at the completion of the movement a special electrical circuit known as an automatic frequency control circuit compensates for any slight error in the adjustment which has been obtained. In these two receivers, therefore, there are two additional features introduced and these are of great importance in automatic tuning devices. The preset switching device provides a jump from one station to another, but when the main tuning condenser is turned it will obviously have to pass over one or more stations, and it is necessary to mute the receiver to avoid the clash of sound which would be heard as the various stations were passed over. The Cossor is a very simple but effective device for carrying out the muting, but in certain motor-operated receivers more elaborate muting devices are employed. Fig. 3 shows an arrangement adopted in an American receiver, and in the Ekco sets, where the slight forward movement of the rotor and spindle which takes place when the motor circuit is completed closes two contacts and silences the audio-circuit, and when the motor is switched off at the prearranged setting the contacts open and enable the station to be heard. On the Ekco receiver the pressure on a button carries out several different actions — firstly, it switches off the visual tuning indicator ; secondly, it mutes or silences the set ; thirdly, it starts the electric motor which rotates the gang condenser ; fourthly, it switches in the A.F.C. circuit ; the movement of the ganged condenser turns also the tuning pointer, and when the correct position has been obtained the muting device is open-circuited, and the visual tuning indicator "comes to life."

The Ekco control is effected in the following manner. At the back of the cabinet is a double semi-circular rail, adjacent to a slotted metal disc. At intervals round the rail, according to the stations selected, are small detachable contact clips, numbered to correspond with the buttons on the front of the cabinet. To adjust, say, the top button (No. 1) to London Regional, this button and the manual button are depressed together, and the set then tuned in the normal manner to that station. When correctly adjusted the clip marked 1 is lifted from the rail and replaced near the slot in the metal disc, and it is then moved slightly until a small pilot lamp goes out to indicate that the exact setting has been obtained. The remaining buttons are adjusted in exactly the same way, so that, if it is desired to change the setting given for any particular button all that is necessary is to depress that button and the manual button (so that the tuning condenser may be turned in the ordinary way), locate any station not already automatically provided for and adjust the appropriate clip as just mentioned. Thus the user of the set may make the adjustments if desired, and it will not be necessary to call in a service man.

Manual Tuning

In all of the receivers so far described there is one button or hole reserved for what is referred to as the "Manual control." When this is operated the automatic mechanism is thrown out of circuit and the receiver may be tuned in the usual manner.

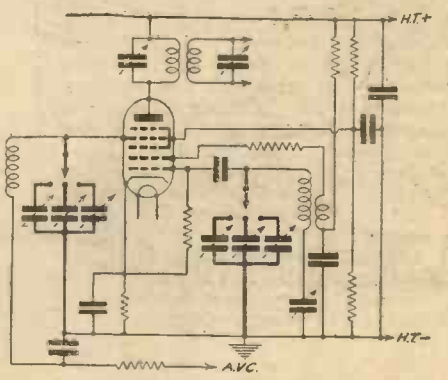


Fig. 6.—How simple superhets are automatically tuned on two circuits at once.

Practical Television

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A Question of Terms

NOW that so many scientific and public lectures are being given on the subject of television in addition to the spate of books being published, it is a matter of regret that greater uniformity is not shown between speakers and writers on the important point of terms and definitions. Some time ago, after a series of protracted meetings at which all interested parties sent representatives, the British Standards Institute published a glossary of terms and definitions in so far as they applied to cathode-ray tubes and television. As far as possible it was hoped that those engaged in the industry would use these terms, and so bring about an end to the "chaos" and uncertainty which had existed before. That this is not the case is very unfortunate, and misleading to the newcomer to the industry, and it is hoped that wiser counsels will prevail, and so bring those who continue to use the wrong expressions into line with the majority. For example, one term is "raster," used to express the field scanned on the screen by a cathode ray tube. The word is of Continental origin, and has no bearing on the process it is attempting to define. The accepted definition is "scanning field," which is explicit and definite. The same applies to the loose use of "time base." Correctly speaking, this is the trace of the spot of light on the screen of a cathode-ray tube, which spot of light moves with a pre-determined velocity for the purpose of imparting a time scale. The chassis or piece of equipment so often called the "time base" is really the time-base generator. The Institute in question has very carefully defined it as a device for producing a potential varying in a definite and periodic manner and used to impress on the beam of a cathode-ray tube a time scale deflection which is usually linear with respect to time. The distinction between the two terms is clear and definite, and if used would avoid that ambiguity which has so far existed among some of the television engineers.

From Which Side?

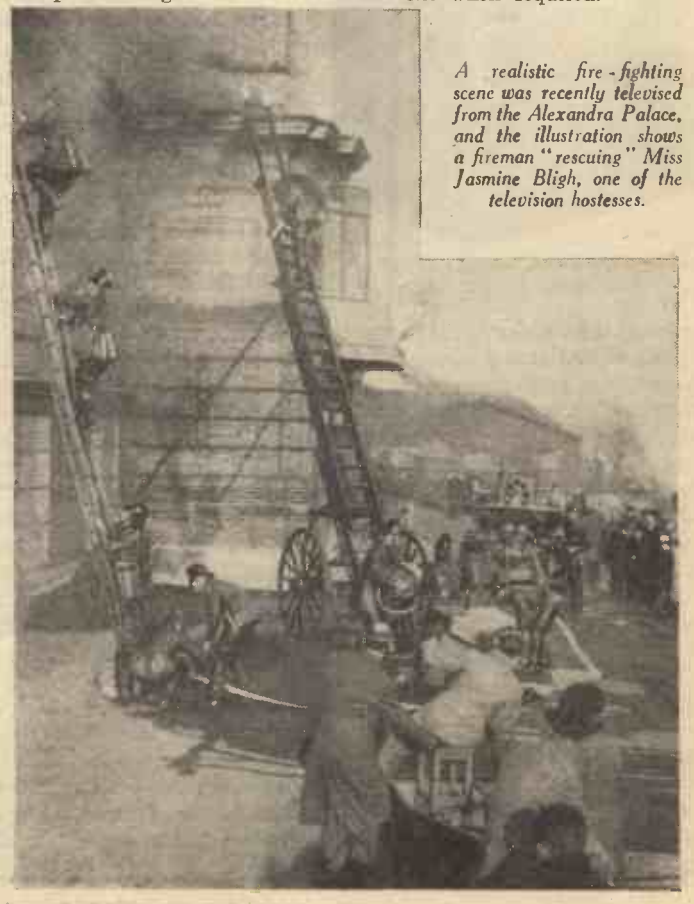
AT one of the Cinematograph Exhibitors Association meetings held recently in the provinces, members of the audience were assured quite definitely that when television came to the cinemas it would be by means of back projection. At this juncture it is absolutely impossible to adopt any hard and fast attitude on this important point. So far, two television firms have given demonstrations of big screen television and both methods are different. With the Scophony System the equipment is behind the screen, the light source, mechanical scanners and modulation equipment being accommodated in a relatively small amount of space remote from the screen by a distance sufficient to give satisfactory focus over the screen area. In the case of the Baird Company, however, although the projection tube apparatus can be adapted for either back or front projection the demonstrations given so far are all made from the front. The apparatus used appears to be little larger than a first class home cine outfit, so there will be little need to worry about the physical problems arising from providing space to accommodate the equipment. Viewing the problem from a normal analytical angle it would seem a natural development to use front projection, as by this means the pictures observed should be brighter to the assembled audience in any part of the theatre.

Practical Results

AT a lecture given recently by Mr. Bedford at the Institution of Electrical Engineers, the value of the cathode-ray tube both for radio and television purposes was shown very clearly as a result of the interesting demonstrations furnished. With one type of cathode-ray tube used, two separate and distinct electron beam traces could be made on the screen. This is useful for a variety of analytical radio purposes, and it would be interesting to find out whether this same type of tube could possibly be used for television picture reconstitution. One advantage that could arise in this connection would be the increased picture brightness for a smaller anode voltage. By arranging both spots to superimpose one on the other at all times the resultant picture trace would be brighter for a given accelerating potential. A similar kind of scheme was used in the days of low definition television when two modulated light beams from separate Kerr Cell devices were made to trace out the television picture as one spot on the translucent screen. Another particularly interesting visual effect that can be demonstrated with a cathode-ray tube, and its associated equipment, is the change brought about by altering the electrical constants of the receiver circuit employed for handling the television signals. With properly arranged oscillators a standing grill-type pattern with wide vertical bars can be observed on the C.R. tube screen. If any attempt is then made to improve the frequency response characteristic of the circuit, to enable the whole gamut of picture detail to be revealed, a point is reached where the pattern design has a throw off in the direction of scan. This is due to over-correction, and for want of a better analogy many television engineers regard this as being similar to the ringing effect produced in a bell when it is struck. The series of ghost images seen in addition to the primary picture are like the damping of the bell's sound oscillations. While a loss of picture detail is annoying, due to an incorrectly designed vision amplifier, it is, on the other hand, almost as bad to have a circuit which is over-corrected to give prominent echo effects.

A Step Forward

A STEP forward towards the day when television transmissions will be undertaken in the provinces has now been made through work starting on a new telephone repeater station in Leeds. Through this will pass the Post Office coaxial cable; the route to Leeds being from Manchester via Huddersfield. Other repeater stations are to be erected at Birstall and Harewood. The exact position of any television transmitting station site within that densely populated area is still a matter of conjecture, for further experience with the London station is essential, according to the Television Advisory Committee, before provincial planning can take any concrete form. The contour of the surrounding country will have to be the subject of careful study to ensure the widest possible service range of the television signals, but provided the run of the coaxial cable is finished, then programme problems need not be acute, since London can relay its signals to the Northern stations when required.



A realistic fire-fighting scene was recently televised from the Alexandra Palace, and the illustration shows a fireman "rescuing" Miss Jasmine Bligh, one of the television hostesses.

Impressions on the Wax

Decca

ARTHUR TRACY, better known to readers as The Street Singer, has chosen a hit tune of the moment, "Bei Mir Bist Du Schoen," for his latest recording on *Decca F* 6592. It is coupled with "There's a Goldmine in the Sky," from the film "Lovely to Look At."

Sam Browne, together with a male chorus, organ and orchestra, has recorded "Don't Forget the Old Folks at Home" and "Memory Valley."

Charlie Kunz adds Medley No. D11 to his piano medley records, and introduces all the popular tunes of the moment. It is *Decca F* 6582. Another medley of popular tunes also appears on *Decca F* 6570, but this time they are played by Donald Thorne on the organ.

A song that will appeal to youngsters—"Christopher Robin is Saying his Prayers," from the film "When We Were Very Young"—is sung by Robert Ashley on *Decca F* 6589. On the reverse he sings "My Heart Will Never Sing Again."

George Formby is as funny as ever in "The Fiddler Kept on Fiddling" and "I Do Do Things, I Do" on *Decca F* 5669.

Brunswick

A SONG which has been dedicated to all married men, "Remember Me," from the film "Mr. Dodd Takes the Air," has been chosen by Bing Crosby for his latest recording. He couples it with "There's a Goldmine in the Sky," on *Brunswick* 02534. Another popular crooner, Connie Boswell, has made a record of "Ebb Tide," from the film of that name, and "True Confessions," on *Brunswick* 02544. The Mills Bros. give their rendering of "Little Old Lady" and "Caravan" on *Brunswick* 02542, whilst the Andrew Sisters have recorded "Bei Mir Bist Du Schoen" and that popular tune "Nice Work if you Can Get It," from the film "A Damsel in Distress," on *Brunswick* 02552. The latter tune is also sung by Fred Astaire, together with "Things Are Looking Up," also from the same film, on *Brunswick* 02533.

Rex

GRACIE FIELDS, who has recently been honoured by the King, has chosen two tunes from the film "The Firefly" for her latest recording, on *Rex* 9195. They are "Sympathy" and "Giannina Mia."

Brian Lawrence links up with the Three Ginx in his recording of "Roses in December," from the film "Life of the Party," and "Waterlilies in the Moonlight," on *Rex* 9125.

Humorous sketches are well represented by Sandy Powell and Company with "Sandy's Happy Home," on *Rex* 9156, and "The Insurance Agent," by Rudy Johnson and Company on *Rex* 9212. Whilst on humorous records we have that popular comedian Bobby Comber telling us "I'm a Little Prairie Flower" and "Ain't Love Grand?" on *Rex* 9202.

Vocalion

JOHNNY MERCER and His Orchestra introduce a novelty record this month. —"Murder of J. B. Markham" and "Last Night on the Back Porch"—on *Vocalion* 577. Johnny Mercer's musical ability has never been better exemplified than in "Murder of J. B. Markham," which, in rhythmic phrasing, recounts a whole murder story. This record features interesting solos by trumpet and clarinet.

H.M.V.

ALL readers interested in folk dancing will be interested in the set of eight of the best known of the dances recorded on four H.M.V. records, which are sold complete in an album for 12s. They have been newly scored by Ronnie Munro. By introducing key changes a new interest is added to them as accompaniments for dancing. It should be noted that they are suitable for indoor and outdoor use, and were selected by the English Folk Dance and Song Society. The records are: "We Won't Go Home Till Morning" and "Steam Boat," *H.M.V. B* 8684; "Flowers of Edinburgh" and "Hunt the Squirrel," *H.M.V. B* 8685; "Merry, Merry Milkmaids" and "Sellenger's Round," *H.M.V. B* 8686; and "Newcastle" and "The Old Mole," *H.M.V. B* 8687.

"EVEN AS YOU AND I"

The Following Log is Reproduced from the *Radio News* of America, and will No Doubt Interest Listeners who Grumble at Conditions Over Here

A WELL-KNOWN manufacturer of radio equipment, apparently enjoying a "busman's holiday," submits the following record of one evening's indulgence, which he labels "The Log of a Methodical Radio Fan" or "Why Some People Go to the Movies":

The fan is seated before his radio with a hopeful expression on his face. Starts in at the upper end of the dial.

550 KC: Bad luck the first trial. Seem to be about a dozen stations on this wavelength so tries:

560 KC: Chatter about a gelatine.

570 KC: Here's couple of rough necks engaging in a verbal dog-fight. Next tries:

580 KC: Particularly vile brand of jazz with a background of heterodyne howl.

Getting Started

590 KC: Three politicians talking about Supreme Court, tenant farmers and other so-called downtrodden units of our population.

600 KC: This wavelength sounds promising, listens a moment but is disgusted to hear a fiddler playing a Russian Barcarolle that would sink the boat.

610 KC: Fine assortment of heterodyne squeals.

620 KC: Ditto.

630 KC: Ditto.

640 KC: Ditto.

650 KC: A female monologue about Dishwashing.

660 KC: Another female monologue—this time about her husband's many faults.

670 KC: Ditto.

680 KC: Ditto.

690 KC: Canadian Station. A country boy is speaking about hogs way down on the farm.

700 KC: Husband and wife in a daily misunderstanding.

Not So Good!

710 KC: Fairly good orchestra badly mixed with station in the background effectively spoiling an otherwise good programme.

720 KC: A blues singer and rotten at that.

730 KC: A fine assortment of heterodyne squeals, etc.

740 KC: Same scrap between husband and wife as on 700 KC.

750 KC: A jazz singer, male, and awful.

760 KC: Howls, Howls, Howls.

770 KC: Ditto.

780 KC: Ditto.

790 KC: Chatter about a gelatine same as on 560 KC.

800 KC: Ditto.

Time: 7.30 p.m.

Date: Any night

810 KC: A female announcer giving results of a coffee contest.

820 KC: A "Way down in the cellar" bass heterodyne.

Still Expectant

830 KC: Same as 810.

840 KC: Just a racket.

850 KC: A worse racket.

860 KC: Some more racket.

870 KC: Still more racket.

880 KC: A blues singer, with a background of French Folk Songs from another station or maybe it was Spanish.

890 KC: A Spanish foreign station heterodynes with a couple of American Stations.

900 KC: Only four stations on this frequency.

910 KC: Jazz ♯$%&(*?♯%&

920 KC: A soprano solo heterodynes with a blues singer background.

930 KC: A female crooner.

950 KC: Just a howl.

960 KC: A political speaker with a particularly hoarse and distressing voice.

970 KC: A male voice singing a Spanish Jazz Song to the accompaniment of a guitar the tune of which was a continuous repetition of a musical theme, repeated over and over.

Hope Grows Faint

980 KC: At last a good orchestra but ruined by bad fading.

990 KC: A howl.

1000 KC: A worse howl.

1010 KC: A still worse howl.

1020 KC: A heterodyne howl and a so-called popular dance number.

1030 KC: Dance orchestra being embellished by a sax player that would give a listener a bad case of heebie-jeebies.

1040 KC: Only three stations here.

1050 KC: Just a noise.

1060 KC: A couple of Caucasian boys trying to talk like colored boys.

1070 KC: Local Station. A couple of Caucasian boys this time chattering about their recent doings among the boy-scouts.

1080 KC: Same.

1090 KC: Howl. Howl. Howl.

Discouraged

1100 KC: We are down among the real squeals now.

1110 KC: A fine assortment of heterodyne squeals.

1120 KC: Another squeal.

1130 KC: Nothing.

1140 KC: A fine soprano ruined by heterodyne.

1150 KC: A fair orchestra spoiled by two competing stations in the background.

1160 KC: Ditto.

1170 KC: Another lousy heterodyne.

1180 KC: Sounds like next door neighbour's vibrator type battery charger.

1190 KC: A jazz band orchestra leader trying to boost the sale of cigarettes.

1200 KC: Racket. Racket. Racket.

1210 KC: We don't understand French.

1220 KC: Just noise.

1230 KC: A Spanish band.

1240 KC: A brass band playing a military march accompanied by an orchestra from another station on the same wavelength in the background.

1250 KC: A fine assortment of jazz.

1260 KC: More jazz.

1270 KC: Can't make out what this is.

1280 KC: Stung again.

1290 KC: A certain Major trying out a sacred soprano.

1300 KC: About 13 stations here.

1310 KC: More than 13 stations here.

1320 KC: The Major again. This time the soprano is making love to the Major by means of her song.

1330 KC: Male blues singer accompanied by an assortment of howls and squeals.

1340 KC: She still loves the Major.

ESTIMATING THE HARDNESS OF A VALVE

Translated from the French by C. W. Edmans, Hon. Secretary of The Radio, Physical and Television Society

ALTHOUGH every wireless technician knows how to measure the principal electrical characteristics of a valve, few have any idea how to set about estimating the degree of vacuum. Nevertheless, the vacuum is one of the most important factors controlling the quality of the valve.

Let us explain that the vacuum is not measured by making a small hole in the glass bulb and applying a sensitive manometer. It is not measured directly at all, but by measuring the grid current which is set up owing to the presence of infinitesimal quantities of gas which, in spite of all the care of the manufacturers, always remain inside the valve.

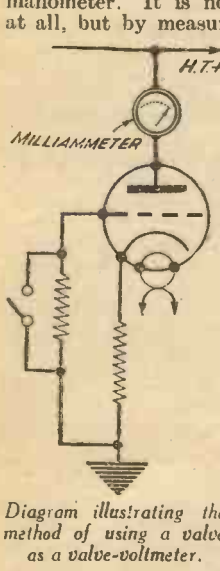


Diagram illustrating the method of using a valve as a valve-voltmeter.

Electron Bombardment

The electrons emitted from the cathode in bombarding these molecules of gas split them up into positive and negative ions. The negative ions are attracted by the anode which, of course, is at a positive potential and the plate current is thereby increased (this phenomenon is put to practical use in certain types of rectifying valves, in which, to increase the rectified current, some gas is deliberately introduced). As to the positive ions, they are attracted by the negatively charged grid. To neutralise the positive charge acquired by the grid, electrons pass through the grid circuit from the cathode to the grid. This grid current is set up in the opposite direction to that in which we usually consider grid current to flow.

It is this reverse grid current that is capable of giving quite a good indication of the degree of vacuum, as the greater the number of molecules remaining inside the bulb the greater will be the current. The difficulty is to measure this extremely feeble current (which is often only a fraction of a milliamp.) without the use of an expensive mirror galvanometer which the average man does not possess. The obvious way of overcoming the difficulty is to insert into the grid circuit a high resistance and, with the aid of a valve voltmeter, to measure the voltage developed. The principle is excellent, but again the snag is that everybody does not possess a valve voltmeter. All these difficulties can be overcome by a simple method which makes use of the valve under test as a valve voltmeter.

A resistance of one megohm (this value is chosen only to simplify our calculations)

(Continued on page 690)

ESTIMATING THE HARDNESS OF A VALVE

(Continued from page 689)

is inserted in the grid circuit while a milliammeter is placed in the anode circuit. The usual biasing resistance is included, or a battery may be employed to supply the necessary voltage.

A Simple Test

The actual procedure is very simple. First measure the anode current with the one-megohm resistance in the circuit, and then measure it with the resistance short-circuited. That's all!

The difference between the two anode currents in milliamperes divided by the mutual conductance gives the value of the reverse grid current in micro-amperes. If the vacuum is good the reverse grid current will not exceed one micro-ampere in the case of H.F. valves, or two micro-amperes in the case of L.F. valves.

Mutual Conductance

Perhaps you may ask why, by dividing the variation in the anode current in milliamps. by the mutual conductance the grid current in micro-amps. is obtained.

Let $\triangle Ia =$ the difference between the two anode currents (i.e., with and without R short-circuited), S the mutual conductance, Ig the inverse grid current, and Eg the voltage drop produced by the grid current flowing through R.

By the definition of mutual conductance $Ia = Eg.S$, but by Ohm's Law we know that $Eg = Ig.R$.

Substituting this value of Eg in the first equation, we have :—

$$Ig = \frac{\triangle Ia}{R.S}$$

$$R = 1{,}000{,}000$$

$$\therefore \quad Ig = \frac{\triangle Ia}{1{,}000{,}000.S}$$

Ia is expressed in milliamps., S in milliamps./volts, thus " milliamps." cancels out. The whole is, however, divided by 1,000,000, so we have in effect Ig expressed in micro-amps.

The condition for a sufficiently hard vacuum is expressed by

$$Ig/Ia < 0.04$$

The ratio Ig/Ia (but this time both expressed in the same unit—in milliamps., for example) indicates the ratio of the number of electrons having struck against a molecule of gas to the number of molecules having reached the anode in safety.

Suppose, for example, that Ig = 0.4 mA. and Ia = 12 mA. In this case Ig/Ia = 1/30,000. That is to say, that for every 30,000 electrons reaching the anode without hindrance only one collides with a molecule of gas on the way. We may conclude, then, that the length of unhindered journey of an electron inside a valve is 30,000 times greater than the distance from the cathode to the anode. If this distance is .5 cm., the unhindered path would have a length of $.5 \times 30{,}000 = 15{,}000$.

It is known that in air at normal atmospheric pressure (760 mm. of a column of mercury) the free path of an electron is only 0.000,053 cm. Consequently, by the law of inverse proportion between the pressures and the free electronic paths the pressure of gas inside a valve may be determined by the proportion :—

$$\frac{p.}{760} = \frac{.000{,}053}{15{,}000}$$

$$\therefore \quad p = .000{,}002{,}645 \text{ mm.}$$

A little over two-millionths of a millimetre of mercury, not an excessive pressure.

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).

"The Superhet's Rival"

SIR,—Please add my name to those readers who require a good straight set. I have made various experiments with the superheterodyne circuits on 110, 115, 117.5, 123 and 465 kc/s, but have found it impossible completely to eliminate second channel whistles unless preceded by a good S.F. amplifier circuit.

Also there is the oscillator hiss which alone condemns the superhet for high fidelity purposes.

About four years ago I assembled for experimental purposes a 2 H.F., v. 1 pent. output set, and I was able to get Berlin clear of Daventry, and that is a good test, but, of course, it was before Droitwich started up.—H. WALLERS (St. Helens, Lancs).

SIR,—I was very much interested in the article, "The Superhet's Rival," in a recent issue of PRACTICAL AND AMATEUR WIRELESS. The set as outlined, with the help of the amplifier, would, I think, be the set I require. Superhets are all right as regards selectivity, but I greatly object to the amount of mush they bring in. I, for one, would like you to describe a set suitable for A.C. mains. Thanking you for the very interesting articles which appear in PRACTICAL AND AMATEUR WIRELESS.—M. HARDING (West Denton).

"Down to Earth"

SIR,—In these days when we are continually being reminded of the necessity to keep our aerials well above earth and above earthed objects, it is rather "refreshing" to know that I am using an aerial of 100ft. in length which is *laid along the ground* in an approximate direction west-to-east from the house.

We have so often heard that "Necessity is the Mother of Invention," and it certainly was the Mother (or Father) of my earth aerial! My aerial mast having blown down, it occurred to me to try my luck by placing the aerial along the ground, and I am now getting nearly as good results on the broadcast wavelengths as I previously did with my shorter aerial "up the pole."

It is much too early to give more detailed particulars, except to say that during the first experiments the aerial *would not function in other directions* in which it was tried. I am apparently picking up wireless waves along the surface of the earth in an approximate west-to-east, or east-to-west direction. I have not yet tried it on the short wavelengths.

I must say that there is no question of re-radiation from an outdoor aerial, or from the electric-light mains, because there are none. Some distance away runs a railway line, but this hardly seems likely to have any bearing on the subject.—D'ARCY FORD (Exeter).

Logged with the "Corona" Four

SIR,—I have read PRACTICAL AND AMATEUR WIRELESS since October 29th, 1932, and am taking this opportunity of congratulating you for a fine magazine. I wonder if you noticed the good conditions on Saturday evening, February 19th, 1938. On the 20 m. band I logged the following amateurs between 8.10 p.m. and 10.15 p.m.:—W1HY, WF3HM, W2KCI, W1HYN, CY1J, W2IXY, W1TW, W1JFG, W2GUX, WG2NK, W2JK, FV1KE, W4EYK, W2JKK, G6TZ, W3ANH, W3BI, W2EOY, W1AJZ, GI2CC and W1AXA.—E. BIGGS (Swinton, Manchester).

A S.W. Log from Newcastle: Correspondent Wanted

SIR,—Not having seen a 14 mc. log from this district, I give mine, which is as follows: VU2BQ, 2CQ, 2FV, 2LJ; VK2TE, 4YL, 5RX; ZL2CI, 2CV, 4DQ; VP2CD and VP7AA, with the usual W's and VE's. After March 1st, 1938, all call signs in the Union of South Africa will be confined to the ZS group, and the groups ZT and ZU will no longer be used for amateur call signs. New calls have been issued for ZT and ZU stations. I would like to get in touch with an SWL in this district, and am also willing to exchange QSL's. Receiver in use here is a 1, v. 2, with an inverted L aerial 30ft. long and 18ft. high.—J. BATEY, "Blue House," North Road, Newcastle-on-Tyne 2.

CUT THIS OUT EACH WEEK.

Do you know

—THAT safety may be ensured by including fixed condensers in headphone leads when using a mains receiver.
—THAT when reproduction is too deep or "boomy" it may be improved by moving the speaker an inch or so behind the baffle.
—THAT an H.F. transformer will often enable stability to be obtained when a tuned anode circuit cannot be stabilised.
—THAT when reaction proves difficult to obtain or erratic in its effects a low resistance included in the reaction circuit may improve matters.
—THAT if several valves are used in a battery set it may prove worth while to fit an on-off switch in the dial-light circuit to reduce the total L.T. consumption.
—THAT it is possible to build an output stage using a single valve capable of delivering over 30 watts undistorted.

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 of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor,* PRACTICAL AND AMATEUR WIRELESS, *George Newnes, Ltd., Tower House, Southampton Street Strand, W.C.2.*

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

REPLIES IN BRIEF

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

P. T. (Brentwood).—The speaker is obviously an energised model, and the field will have to be included in the circuit to obtain the necessary energising current. If insufficient current is available you will have to use a separate mains unit. The resistance will have to be calculated in the second case, dividing the excess 100 volts by the total current of all the valves.

F. T. (Hounslow).—We believe the set is unsuitable for use with a pick-up. Write direct to the makers regarding the matter.

A. F. E. (Portland).—You could feed the 'phones through a 1/1 transformer from the sockets, provided they are intended for a high-impedance speaker. If they are for low-impedance an ordinary step-up speaker transformer should be joined between the sockets and 'phones.

R. B. (Wigan).—The speaker may be fed direct—provided that you have obtained the model having its own transformer fitted.

D. S. (Longton).—It is impossible to guarantee the reception mentioned. Even with a powerful multi-valve superhet, conditions are often such that atmospherics and other noises prevent the signals from being heard. On the other hand, under good conditions a two-valver will give you the results you require.

A. P. (Malta).—We regret that we do not issue details of the type you require.

A. S. (C.O.M., Manchester).—Chokes may not be necessary. Ordinary fixed condensers across each pole and to earth may be satisfactory. One hundred turns of 22 D.C.C. on a 1½in. diameter paxolin tube will suffice for each choke if you find that chokes are needed.

J. M. (Trim).—The coils have not been used by us and we are not familiar with the circuit and terminal numbering. You should therefore write to the makers for circuit details.

W. J. (Barrow-in-Furness).—The address is Bideford Avenue, Perivale, Middlesex.

J. V. G. W. (Fleetwood).—You could make the set but results would be very inferior. Owing to the lack of amplification a very good aerial would be essential, and we therefore do not recommend such a scheme.

A. C. (Colchester.)—A good Service firm should be able to replace defective parts and we suggest that you write to firms who specialise in this work or even call at a good local service workshop. We cannot supply blueprints and so far as we can trace the firm has not been taken over.

M. A. S. M. (Uganda).—It would appear that the oscillator winding on the band in question is defective and there is probably a break in it which opens at a certain temperature, or when a certain current is passed. The latter will depend upon the circuit employed. It would be necessary to have the set overhauled.

S. J. (S. India).—The receiver is probably in order and the poor results may be due to reception conditions on that waveband in your locality—or you may be listening at the wrong time of day. It is possible, however, for a faulty oscillator coil to produce inferior results and as the coil would be switched with the wave-change switch, this would account for the remaining good results.

C. T. L. (Bognor Regis).—The receiver does not appear to be one of our designs and we are accordingly unable to assist you in re-wiring it. We suggest you follow a standard circuit, and preferably obtain modern coils and other components.

J. A. (St. Andrews).—Messrs. Heayberd can supply a rectifier and transformer for use with your mains unit, and we suggest you write to them at 10, Finsbury Street, London, E.C.2.

B. W. (Wimbledon).—Full data regarding short-wave and other coils will be found in our latest book Coils, Chokes and Transformers, price 2s. 10d., by post.

C. B. S. (Great Doddington).—The switches may be obtained from Messrs. Wright & Weaire, 740, High Road, Tottenham, London, N.17. Give a description of your desired switching in order that the appropriate model may be supplied.

J. J. C. (Chiswick).—We do not recommend the omission of the rectifier. If you wish to restrict yourself to D. C. supplies we recommend the D.C. model receiver, but different valves are used and you would find difficulty in the event of your mains supply being changed.

R. R. (Leeds, 6).—The makers are no longer in business. We suggest you have the receiver examined by a good local service man. We cannot recommend one of our blueprints from which you could construct a receiver with the parts in the set.

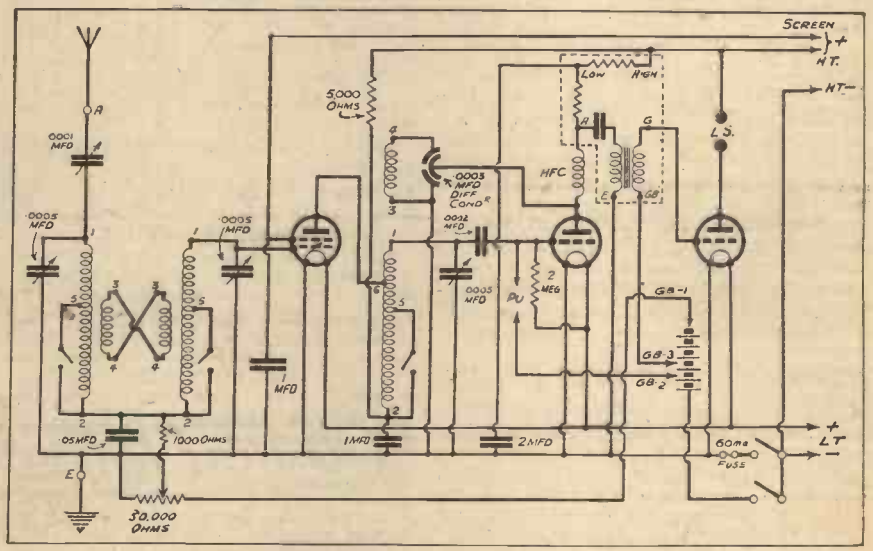
E. H. U. (Ballsbridge).—We could not supply you with details to reconstruct the unit. If the makers are unable to do so and state that it is obsolete, it would probably be inadvisable to endeavour to reconstruct it for satisfactory service.

B.L.D.L.C. The British Long-Distance Listeners' Club

A Useful Battery Circuit

MANY members find that, owing to their proximity to the high-powered B.B.C. local stations, great difficulty is experienced in receiving stations close to them from a wavelength point of view. For instance, in many parts of North London, the National and Regional stations spread sufficiently on the simpler type of battery set to prevent the reception of the Midland, and it is often found that programmes from the latter station are preferred to either of the locals. To overcome this difficulty the usual procedure (from the point of view of expense) is to use an indoor aerial, but then reaction has to be pushed in order to obtain sufficient volume from the Midland or other distant station, and quality accordingly suffers. Alternatively, a super-het is built, and owing to the economy question, doubtful or low-priced parts are used and the results are not all that can be desired. It should be remembered that in such cases a wave-trap forms a very effective form of selectivity device, although matters are complicated in certain areas, such as that mentioned, by the fact that there are two powerful stations to be eliminated.

The band-pass tuner provides a very high degree of selectivity and may be used very effectively, in a simple battery set, and obviously where distant reception is desired, a good H.F. stage would be employed. This means that three tuned circuits may be employed, and by using good iron-core coils a three-valver of really high efficiency may be built up. The accompanying circuit shows such a receiver arrangement, from which it will be seen that a variable-mu H.F. stage is employed so that the locals may be reduced to sufficient volume to avoid overloading the output valve, and if desired the latter could be a pentode or tetrode. All values of importance are given in this circuit, and the special L.F. coupling may, of course, be replaced by a simple transformer coupling or a parallel-fed transformer using standard resistances and condenser. Suitable values would then be 20,000 ohms for the load and 10,000 ohms for the decoupling resistance with a .01 mfd. coupling condenser. Use as much H.T.—up to the maximum rating of the valves—as possible, and you will find that this type of receiver will provide all the selectivity and range that is desired with such a simple scheme.



A useful 3-valver for battery use where high selectivity is desirable.

Card Exchanges

Some members, who collect QSL cards from a point of view of the pictorial value rather than as a proof of their listening activities, may desire to make exchanges of cards to complete their collection. Many members are prepared to do this, and a member in Connecticut will exchange cards with W1's. Those who wish to avail themselves of this offer should communicate direct with L. Robertson, Derby Road, Milford, Connecticut, U.S.A.

Contacts Wanted

The two following members are desirous of getting into touch with others in their districts with a view to exchanging ideas, etc., or forming a local branch. Will those who are interested also get into touch with them direct: L. D. Jeffery, Staddon, S. Brent, S. Devon; F. J. Fielder, Hillside, Mill Road, Epsom.

Egypt Radio Society

An Experimental Radio Society has been formed in Egypt and members who wish to send QSL cards to amateurs in Egypt, Palestine, Sudan and Iraq, and are unable to trace the full QSA may send their reports of reception to the Society's Bureau, at Catholic Club, Mustapha Barracks, Sidi Gaber, Egypt, from where they will be distributed. The Society publishes a Bulletin on the first day of each month, containing up-to-the-minute information on the activities of experimenters operating in the Near East. The operating times and frequencies of transmitters working in the countries mentioned are given and the Society will arrange schedules whenever possible

Radio Clubs and Societies

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

SOUTH LONDON AND DISTRICT RADIO TRANSMITTERS' SOCIETY

A SUCCESSFUL year's work was concluded with the annual dinner at the Half Moon Hotel, at which the guest of honour was H. Bevin Swift, Esq., A.M.I.E.E. An interesting summer programme has been arranged, including outings and field days. Meetings are held at the Brotherhood Hall, West Norwood, on the first Wednesday in every month, and anyone interested in short-wave amateur radio will be welcomed. Full particulars of the society can be obtained from the Hon. Sec., H. D. Cullen (G5KH), 164, West Hill, S.W.15.

THE CROYDON RADIO SOCIETY

THE Croydon Radio Society held yet another joint meeting in St. Peter's Hall, Ledbury Road, S. Croydon, on Tuesday, February 15th. The guests this time were members of the British Sound Recording Association, and no more popular choice of lecturer could have been effected than Mr. P. K. Turner. He demonstrated his new "B" type negative feed-back amplifier, and was soon explaining its theory and chief advantages. Briefly, it used tetrode output valves in push-pull, and operated on the negative feed-back principle. The result was that more power could be obtained with less H.T. voltage, than was the case with the older amplifier using triode valves. For the next meeting, the society is visiting the Short-wave Radio and Television Society of Thornton Heath, at St. Paul's Hall, Norfolk Road, Thornton Heath, on Tuesday, March 8th. The subject is a talk and demonstration on "Contrast Expansion on Gramophone Records," given by Mr. Nixon, of the General Electric Co., Ltd. Hon. Pub. Sec., E. L. Cumbers, Maycourt, Campden Road, S. Croydon.

BRAINTREE AND DISTRICT SHORT-WAVE CLUB

THE first meeting of this newly-formed club took place on February 17th, and the evening was spent in testing out an all-wave commercial receiver. After 9 o'clock the television programme sound part was received with good strength and quality. Also, 5-metre aerials were discussed, and an early application for an A.A. transmitting licence is to be made. Full particulars can be obtained from the Secretary, F. E. Smith, at the headquarters, 82B, Manor Street, Braintree.

RADIO, PHYSICAL AND TELEVISION SOCIETY

AT a meeting of the above society, held on Friday, February 18th, Mr. C. W. Edmans delivered a lecture entitled "The Generation of Alternating and Direct Current." Although, it will be admitted, a thorough grasp of this complex subject non-mathematically is neither possible nor desirable, by the liberal use of vector diagrams the lecturer was very successful in stripping the mathematical bogy of its terrors. Various types of A.C. generators were described, and details given of methods of synchronising alternators running in parallel. The construction of D.C. dynamos was gone into, particular attention being paid to generators and convertors suitable for supplying power to radio apparatus. The lecture was fully demonstrated, some fourteen different machines being shown to members present. Special thanks are due to Messrs. Joseph Sankey and Sons, Ltd., for the loan of a collection of samples of dynamo stampings of their manufacture, and to Dr. C. G. Lemon for the loan of a number of machines for demonstration purposes.

Meetings of the society are held at 72A, North End Road, West Kensington, London, W.14, every Friday evening at 8.15, when there are lectures and discussions on radio and other matters of scientific interest. New members are welcome, and readers interested in the society are invited to write for particulars to the Hon. Secretary at the society's headquarters, at the address given above.

INTERNATIONAL SHORT-WAVE CLUB (LONDON)

A VERY successful meeting of the London Chapter of the International Short-Wave Club was held at the Clubroom, 80, Theobald's Road, W.C.1, on Friday evening, February 18th. The meeting opened with a "Junk Sale" at which many radio bargains were secured. Then followed a lecture entitled "Around the World by Telephone" arranged by the G.P.O. and delivered by Mr. W. J. Nobbs, F.T.S., A.M.I.R.E. The lecture was illustrated by lantern slides showing the London Telephone terminal, the Rugby and Cupar Radio Stations, etc.

All readers of PRACTICAL AND AMATEUR WIRELESS are invited to attend the Friday evening meetings. The Clubroom is equipped with a short-wave transmitter, receivers and library, etc. The club also issues a "News Letter," a copy of which will be forwarded to any reader on the receipt of a postcard.—Arthur E. Bear, Secretary, 100, Adams Gardens Estate, London, S.E.16.

THE DERBY SHORT-WAVE RADIO AND EXPERIMENTAL SOCIETY

ON Tuesday, February 15th, a debate took place between members, the subject being Straight Sets v. Superhets. There was a good attendance of members, and many good points were raised on both sides. The voting at the end of the debate showed that the superhets had won by a narrow majority.—H. Turner, Secretary, Nunsfield House, Boulton Lane, Alvaston, Derby.

THE SLOUGH AND DISTRICT SHORT-WAVE CLUB

THE first part of our meeting held on February 15th was taken up by a continuation of Mr. K. Sly's lectures on "Fundamentals." On this occasion he dealt with both the practical and theoretical side of power supply from the mains. His lecture was illustrated with blackboard diagrams. A junk sale followed, at which good prices were obtained for members' components. The next item was in the nature of a surprise, and consisted of a demonstration by Mr. Bramhill (2BM1) of a complete battery-driven transmitter. This consisted of a T.N.T. locked to a crystal oscillator, modulated by a two-stage amplifier and a new type G.P.O. microphone. Signals from this TX were received by Mr. Bramhill's monitor and Mr. Sly's receiver, which was also operating. After a further discussion of the club receiver the meeting concluded, as usual, with morse practice.

Further details of the club may be obtained from the Secretary, J. H. White (2DAJ), 20, Chalvey Road East, Slough.

KINGSTON AND DISTRICT AMATEUR RADIO SOCIETY

THERE was a good attendance at the February meetings of the above society. On February 16th Mr. Kimpster of E.M.I. Service gave a most interesting lecture on "High Definition Television" by kind permission of The Gramophone Co. There was some interesting apparatus on view.

This society has grown considerably of recent months, and now has a membership of 50, of which 16 hold full licences, and 18 A.A. licences. Morse instruction is given every Friday by an ex-Army telegraph instructor. Full particulars from the Secretary, D. N. Biggs (G6BI), 44, Pooley Green Road, Egham, Surrey.

TORRINGTON AND DISTRICT SHORT-WAVE CLUB

THE above club had the pleasure of a visit from G8ML, of Cheltenham, and work on 56 mc/s reception and transmitting was discussed, which provided a very interesting evening.

Through the kindness of Messrs. Whiteley Electrical Radio Co., Ltd., one of their moving coil loudspeaker units was tested, which proved to be both sensitive and with good frequency response, and everyone agreed that it was the ideal speaker.

The club's first annual meeting was held on January 11th, 1938, when a review was made of the club's activities throughout the year, and satisfaction was expressed both on the experiments carried out and the constant membership maintained.

Re-election of officers took place at that meeting, when it was voted that Mr. R. W. Leate, of 2, Halston Road, Torrington, was to be the Secretary for the coming year.

BOOKS RECEIVED

PRINCIPLES OF RADIO, by Keith Henney. 495 pages. 311 Illustrations. Published by Messrs. Chapman & Hall. Price 17s. 6d.

This is another American text book, written by a well-known American radio engineer, and although it covers all the principles of modern radio, it also incorporates many American terms and data which may prove confusing to the English reader not acquainted with American practice. The opening pages contain average characteristics of a number of American valves, and there are nineteen chapters which cover the entire field of radio, from the fundamental descriptions of charged bodies and other electrical phenomena up to facsimile and television transmission. The subject is dealt with very exhaustively, and the book should be of the greatest value to the amateur who is anxious to obtain in one volume a complete treatise on the subject of modern radio. As this is the third edition it includes all the up-to-date features such as negative feedback circuits and other arrangements, and the formulæ which necessarily have to be included are not too difficult to follow by non-mathematical students.

Practical and Amateur Wireless
BLUEPRINT SERVICE

PRACTICAL WIRELESS	Date of Issue.	No. of Blueprint.
CRYSTAL SETS.		
Blueprint, 6d.		
1937 Crystal Receiver	9.1.37	PW71
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprint, 1s.		
All-wave Unipen (Pentode)	—	PW31A
Beginner's One-valver	19.2.38	PW85
Two-valve : Blueprints, 1s. each.		
Four-range Super Mag Two (D,Pen)	—	PW36B
The Signet Two (D & LF)	29.8.36	PW76
Three-valve : Blueprints, 1s. each.		
The Long-range Express Three (SG, D, Pen)	24.4.37	PW2
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2 LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow)	22.5.37	PW35
Summit Three (HF Pen,D, Pen)	—	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW39
Hall-mark Three (SG, D, Pow)	12.6.37	PW41
Hall-mark Cadet (D, LF, Pen (RC))	10.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D, (Pen), Pen) (All-wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans))	*June* '35	PM1
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	PW53
Battery All-Wave Three (D, 2 LF (RC))	—	PW55
The Monitor (HF Pen, D, Pen)	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P)	14.8.37	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen)	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	PW69
The "Colt" All-Wave Three (D, 2 LF (RC & Trans)	5.12.36	PW72
The "Rapide" Straight 3 (D, 2 LF (RC & Trans))	4.12.37	PW82
F. J. Camm's Oracle All-wave Three (HF, Det, Pen)	28.8.37	PW78
1938 "Triband" All-Wave Three (HF Pen, D, Pen)	22.1.38	PW84
Four-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P)	1.5.37	PW46
Fury Four (2SG, D, Pen)	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B)	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-mark 4 (HF Pen, D, Push-Pull)	—	PW48
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P)	26.9.36	PW67
All-Wave "Corona" 4 (HF Pen, D, LF, Pow)	9.10.37	PW79
"Acme" All-wave 4 (HF Pen, D (Pen), LF, Cl. B)	12.2.38	PW83
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen)	—	PW18
A.C.-D.C. Two (SG, Pow)	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow)	—	PW35C
D.C. Premier (HF Pen, D, Pen)	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen)	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	—	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2 LF (RC))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
All-World Ace (HF Pen, D, Pen)	28.8.37	PW80
Four-valve : Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	24.7.37	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	9.2.35	PW47
A.C. All-Wave Corona Four	6.11.37	PW81
SUPERHETS		
Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three-valve)	5.6.37	PW40
F. J. Camm's 2-valve Superhet	13.7.35	PW52
F. J. Camm's £4 Superhet	—	PW58
F. J. Camm's "Vitesse" All-Waver (5-valver)	27.2.37	PW75
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valve)	—	PW43
D.C. £5 Superhet (Three-valve)	1.12.34	PW42
Universal £5 Superhet (Three-valve)	—	PW44
F. J. Camm's A.C. £4 Superhet 4	31.7.37	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitone" Universal Four	16.1.37	PW73
SHORT-WAVE SETS.		
Two-valve : Blueprint, 1s.		
Midget Short-wave Two (D, Pen)	—	PW38A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2LF (RC and Trans))	7.8.37	PW63
The Band-Spread S.W. Three (HF Pen, D (Pen), Pen)	29.8.36	PW68
PORTABLES.		
Three-valve : Blueprints, 1s. each.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)	—	PW65
Parvo Flyweight Midget Portable (SG, D, Pen)	19.6.37	PW77
Four-valve : Blueprint, 1s.		
Featherweight Portable Four (SG, D, LF, Cl. B)	15.5.37	PW12
MISCELLANEOUS.		
S.W. Converter-Adapter (1 valve)	—	PW48A

AMATEUR WIRELESS AND WIRELESS MAGAZINE		
CRYSTAL SETS.		
Blueprints, 6d. each.		
Four-station Crystal Set	12.12.36	AW427
1934 Crystal Set	—	AW444
150-mile Crystal Set	—	AW450
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprints, 1s. each.		
B.B.C. Special One-valver	—	AW387
Twenty-station Loudspeaker One-valver (Class B)	—	AW449
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans)	—	AW388
Full-volume Two (SG det., Pen)	—	AW392
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans)	—	AW388A
Lucerne Minor (D, Pen)	—	AW426
A Modern Two-valver	—	WM409
Three-valve : Blueprints, 1s. each.		
Class B Three (D, Trans, Class B)	—	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	—	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher; Baseboard Model (SG, D, Pen)	—	AW417
1934 Ether Searcher; Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
Mullard Master Three with Lucerne Coils	—	AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All-Britain Three (HF Pen,D,Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM318
Simple-tune Three (SG, D, Pen)	*June* '33	WM327
Economy-Pentode Three (SG, D, Pen)	*Oct.* '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	—	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen)	*June* '35	WM389
Certainty Three (SG, D, Pen)	—	WM393
Minitube Three (SG, D, Trans)	*Oct.* '35	WM396
All-wave Winning Three (SG, D, Pen)	*Dec.* '35	WM400
Four-valve : Blueprints, 1s. 6d. each.		
65s. Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal Four (2 SG, D,Pen)	16.9.33	AW402
2HF Four (2 SG, D, Pen)	—	AW421
Crusader's A.V.C.4 (2HF,D,QP21) (Pentode and Class B Outputs for above : Blueprints, 6d. each)	18.8.34 25.8.35	AW445 AW445A
Self-contained Four (SG, D, LF, Class B)	*Aug.* '33	WM331
Lucerne Straight Four (SG, D, LF, trans)	—	WM350
£5 5s. Battery Four (HF, D, 2LF)	*Feb.* '35	WM381
The H.K. Four (SG, SG, D, Pen)	*Mar.* '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	*Apr.* '36	WM404
Five-valve : Blueprints, 1s. 6d. each.		
Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
Class B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344
New Class B Five (2 SG, D, LF, Class B)	*Nov.* '33	WM340
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.	—	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C.-D.C. Two (D, Pen)	—	WM394
Three-valve : Blueprints, 1s. each.		
Home-Lover's New All-electric Three (SG, D, Trans) A.C.	—	AW383
S.G. Three (SG, D, Pen) A.C.	—	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF Pen, D, Pen)	23.6.34	AW439
Mantovani A.C. Three (HF Pen, D, Pen)	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	*Jan.* '36	WM401
Four-valve : Blueprints, 1s. 6d. each.		
All-Metal Four (2 SG, D, Pen)	*July* '33	WM326
Harris' Jubilee Radiogram (HF Pen, D, LF, P)	*May* '35	WM386
SUPERHETS.		
Battery Sets : Blueprints, 1s. 6d. each.		
Modern Super Senior	—	WM375
Varsity Four	*Oct.* '35	WM395
The Request All-Waver	*June* '36	WM407
1935 Super Five Battery (Superhet)	—	WM379
Mains Sets : Blueprints, 1s. 6d. each.		
1934 A.C. Century Super A.C.	—	AW425
Heptode Super Three A.C.	*May* '34	WM359
"W.M." Radiogram Super A.C.	—	WM366
1935 A.C. Stenode	*Apl.* '35	WM385
PORTABLES.		
Four-valve : Blueprints, 1s. 6d. each.		
Midget Class B Portable (SG, D, LF, Class B)	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Two H.F. Portable (2 SG, D, QP21)	*June* '34	WM363
Tyers Portable (SG, D, 2 Trans)	—	WM367
SHORT-WAVE SETS—Battery Operated.		
One-valve : Blueprints, 1s. each.		
S.W. One-valve converter (Price 6d.)	—	AW329
S.W. One-valve for America	23.1.37	AW429
Rome Short-Waver	—	AW452
Two-valve : Blueprints, 1s. each.		
Ultra-short Battery Two (SG det., Pen)	*Feb.* '36	WM402
Home-made Coil Two (D, Pen)	—	AW440
Three-valve : Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW433
Experimenter's Short-waver (SG, D, Pen)	*Jan.* 19, '35	AW463
The Carrier Short-waver (SG,D,P)	*July* '35	WM390
Four-valve : Blueprints, 1s. 6d. each.		
A.W. Short-wave World-Beater (HF Pen, D, RC, Trans)	—	AW436
Empire Short-Waver (SG, D, RC, Trans)	—	WM313
Standard Four-valver Short-waver (SG, D, LF, P)	*Mar.* '35	WM383
Superhet : Blueprint, 1s. 6d.		
Simplified Short-waver Super	*Nov.* '35	WM397
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Two-valve Mains Short-waver (D Pen) A.C.	—	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C.-D.C.	—	WM368
"W.M." Long-wave Converter	—	WM380
Three-valve : Blueprint, 1s.		
Emigrator (SG, D, Pen) A.C.	—	WM352
Four-valve : Blueprint, 1s. 6d.		
Standard Four-valve A.C. Short-waver (SG, D, RC, Trans)	*Aug.* '35	WM391
MISCELLANEOUS.		
Enthusiast's Power Amplifier (1/6)	*June* '35	WM387
Listeners' 5-watt A.C. Amplifier (1/6)	—	WM392
Radio Unit (2v) for WM392	*Nov.* '35	WM398
Harris Electrogram (battery amplifier) (1/-)	*Dec.* '35	WM399
De-Luxe Concert A.C. Electrogram	*Mar.* '36	WM403
New Style Short-Wave Adapter (1/-)	*June* '35	WM383
Trickle Charger (6d.)	*Jan* 5, '35	AW462
Short-wave Adapter (1/-)	—	AW456
Superhet Converter (1/-)	—	AW457
B.L.D.L.C. Short-wave Converter (1/-)	*May* '36	WM405
Wilson Tone Master (1/-)	*June* '36	WM406
The W.M. A.C. Short-Wave Converter (1/-)	—	WM408

These Blueprints are drawn full size.

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

Issues of Practical Wireless	4d. Post Paid
Amateur Wireless	4d. " "
Practical Mechanics	7½d. " "
Wireless Magazine	1/3 " "

The Index letters which precede the Blueprint Number indicate the periodical in which the description appears: thus P.W. refers to PRACTICAL WIRELESS, A.W. to *Amateur Wireless*, PM to *Practical Mechanics*, W.M. to *Wireless Magazine*.

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

QUERIES and ENQUIRIES

Cossor Melody Maker

"Please could you help me in my small difficulty? I have a Cossor Melody Maker—I think it is one of the first circuits, as it has one coil—a long cylinder type. Could you let me know where I can get a blueprint for same?"—M. C. (Streatham).

THE receiver is certainly one of the early models and you will probably find that the coil is not ideal for present-day requirements. We cannot supply a blueprint of it in its present form, but the receiver was modified by us to enable the Lucerne type of coil to be used. A blueprint for the receiver in this form may be obtained from us and is number A.W. 423, price 1s.

Volume Control Defects

"I have a superhet (commercial model) and the trouble is that when I move the volume control (on-off switch, volume control combined) to about half-way, there is a loud sound like sandpaper being rubbed together. Past halfway there is no noise."—G. B. (Bromley).

THE trouble is, no doubt, due to a defect in the control. The majority of controls of this type employ a wiping arm moving over an element which is usually of the chemical type, although in certain models a wire-wound element is employed. After some period of use the wiping arm removes the chemical deposit, giving rise to variable resistance effects and sometimes noises, whilst with the wire-wound type the wire sometimes breaks, giving the same effect. As a remote possibility the valve may be defective, with the result that at a certain current distortion sets in, but we think that if you have the volume control examined you will find that it is faulty and needs replacing.

Accumulator Rating

"I have an accumulator which is marked '70 A.H. on slow discharge and 42 A.H. at 100 hour rate.' Can you explain the meaning of this or give me the date of any articles dealing with the subject?"—W. W. (S.W.1.)

ACCUMULATORS often bear a similar marking, although the wording adopted is often varied. Thus you may find a cell marked at so-many ampère hours at ignition rate and so-many continuous. In the case of the cell in question the slow-discharge period is rated at 1,000 hours, and it means that if the accumulator is put on discharge over a period of 1,000 hours a current of .7 amps would be given continuously for that period. On the other hand, if discharged over a period of only 100 hours the current given would be .42 amps. It is thus possible from these figures to obtain a rough idea of the hours of service you will be able to obtain from the accumulator with your receiver, the total current drain being, of course, the total consumption of all the valves you are using.

The Length of a Metre

"I am a beginner and there are several little points which continually worry me. For instance, it is stated that a certain station is on so-many metres. Has this anything to do with the French measure of length, and if so, how is it related to the wireless transmission? I hope you will not mind my asking what may be a very simple question, but I have not yet seen an explanation of this in your paper."—G. C. (Cambridge).

WE have explained the point on more than one occasion, and you may be a new reader and thus have not read the articles in question. Briefly, the signal radiated from a transmitting aerial travels outward in the form of a wave, just as in the case of a wave in water. The rate of oscillation, and thus the distance from the crest of a wave to the next, will vary according to the tuning-adjustment of the transmitter. The distance between successive waves is, obviously, the wavelength and is measured in metres (1 metre equals 3.28ft.). The rate of the oscillations is measured by the unit of time of one second and thus on the broadcast medium and long-wave the frequency is rated at so-many kilocycles per second. A kilocycle is one thousand cycles, and a cycle is the period from one oscillation to the next.

RULES

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

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

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

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

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

7-Pin Valve Connections

"I recently bought a set and when I was examining it with a friend who claims to be a keen amateur he drew my attention to one of the valves which he said was not a standard component. It is a 7-pin valve, but has no cap on top, and he says that only valves with a top cap are provided with 7 pins or more. Can you confirm this, and if the valve is standard tell me the type. There is no marking on the valve which can be read clearly as the metallised surface is very dirty or grubby and the marks are obliterated."—A. H. T. (Gloucester).

SO far as we can trace there is no valve of the 7-pin type without top cap and with a metallised surface. The indirectly-heated pentode is available with 7 pins and no top cap, whilst the Class B valve and the double pentode are also made in the same form. It would, therefore, appear that your friend is correct and that the valve is non-standard.

Transmitting Condenser

"I am building a transmitter and need a series gap condenser suitable for use in a high-voltage circuit. I have looked through a number of catalogues, but cannot find one of suitable type. The circuit is taken from an American paper and I should be glad if you could recommend anything suitable on the English market."—G. E. (Highbury).

A CONDENSER for your purpose was at one time on the market as a standard line, but the makers no longer supply home-constructor parts. The condenser may, however, be obtained from the Raymart people at Holloway Head, Birmingham, price 5s. It consists of two rigid brass sections mounted on a ceramic base, suitable for use at 1,000 volts, or as a split stator at 500 volts. Each section has a capacity of .00015 mfd.

Television Tuning

"I am experimenting with a television receiver, and have built the sound section. I now wish to add a vision section, which, if it proves satisfactory, I shall use with a modern cathode-ray tube. What is the best method of tuning the two sets, so that it is simple to adjust and simple to operate, without too many panel controls?"—G. M. (Hornsey, N.8.).

THE simplest plan is to use a common input valve feeding a frequency-changer, and to adopt ganged tuning in the oscillator section. A split condenser may be used for the purpose so that the tuning of the sound section automatically tunes the vision set to the correct wavelength. In this way no additional controls will be needed for this part of the circuit, although you will have to fit a gain control in the vision receiver to regulate the picture strength.

The coupon on page iii of cover must be attached to every query.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," Tower House, Southampton Street, Strand, London, W.C.2.

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shows dozens New Short-wave Components. **1½D** *Post Free.*

RADIOMART

44, HOLLOWAY HEAD, BIRMINGHAM, 1

HEADPHONES.—Brown, Ericsson, G.E.C., B.T.H., Standard Telephones, Nesper, Western Electric, Sterling, etc., 2,000 ohms, 2s. 6d.; 4,000, 5s. Postage 6d. **SPECIAL.** Ericsson, 4,000 ohms, as new, 7s. 6d. Telefunken, lightweight, adjustable, 7s. 6d. **CRYSTAL SETS**—Burne-Jones. Complete, Guaranteed, 5s. 6d. Ditto, double circuit, 8s. Sensitive permanent detectors, 1s. 6d. Crystal Detectors, complete, 1s. Crystals with silver cat's-whisker, 6d. Postage 1½d.—Post Radio, 2, Copenhagen Street, London, N.1.

CONVERSION UNITS for operating D.C. Receivers from A.C. Mains, improved type, 120 watt output at £2/10/0. Send for our comprehensive list of speakers, resistances and other components. **WARD**, 46, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

ALL goods previously advertised are standard lines, still available. Post card for list free. **VAUXHALL UTILITIES**, 163a, Strand, W.C.2. Over Denny's the Booksellers. (Temple Bar 9338.)

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PLESSEY 3-valve Battery Sets, complete in sealed cartons with three Mazda valves, moving coil speaker, Pertrix batteries and accumulator, in exquisite walnut cabinet, 57/6.

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TELSEN A.C./D.C. Multimeters, 5-range (tests anything radio or electrical), 8/6; loudspeaker units, 2/6, Ace (P.O.) microphones, complete with transformer ready for use with any receiver, 4/6; headphones, 4,000 ohms, 3/- pair.

VALVES.—Full range for American receivers, 6/- each.

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BARGAIN Parcels of Assorted Components, including coil, resistances, condensers, chokes, wire, circuits, etc., value 21/-; 5/- per parcel.

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SOUTHERN RADIO, 323, Euston Rd., London, N.W.1 (near Warren St. Tube). 'Phone: Euston 3775.

FERRANTI AF5, AF6, AF7, 10/6; AF5C, AF11C, 16/-. Cash or C.O.D.—Grigg, 70, Peel Road, Wealdstone, Middlesex.

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UTILITY PROFESSIONAL 4" MICRO-CURSOR DIALS. Direct and 100 : 1 ratio, 3/9 each.

BATTERY VALVES, 2 volts, H.F., L.F., 2/3. Power, Super-Power, 2/9. Var-mu-S.G., 4- or 5-pin Pentodes, H.F. Pens, V-mu-H.F. Pens, 5/-. Class B, 5/-. Freq. Changers, 7/6.

EUROPA MAINS VALVES. 4 v. A.C. Types, A.C./HL, A.C./L., A.C./S.G., A.C./V.M.S.G., A.C./H.P., A.C./V.H.P., A.C./P., and 1 watt D.H. Pentodes, all 4/6 each. A.C./Pens. I.H., 5/6; A.C./P.X.4, 6/6; Oct. Freq. Changers, 8/6; Double Diode Triodes, 7/6; Triode Hex. Freq. Ch., 8/6; Tri. Grid. Pen., 10/6; 3½ watt I.H. Triode, 7/6.

UNIVERSAL TYPES. 20 v. .18 a. S.G., Var.-Mu. S.G., Power, H.F. Pen, Var-Mu. H.F. Pen., 4/6 each; G.P. Triodes, 7/6; Pentodes, 7/6.

13 v. .2 a. Gen. Purpose Triodes, 5/6; H.F. Pens, and Var.-mu. H.F. Pens., Double Diode Triodes, Oct. Freq. Changers, 7/6 each. Full-Wave and Half-Wave Rectifiers, 5/9 each.

AMERICAN VALVES. We are sole British Distributors for TRIAD High-grade American Valves. All Types in stock. Standard types, 5/6 each. All the new Octal base Tubes at 6/6 each. 210 and 250, 8/6 each; 81 and 2A3, 8/- each.

PREMIER TRANSFORMERS, wire-end type with screened primaries, tapped 200-250 v. Filaments. Guaranteed one year. **H.T. 8 & 9 or H.T.10** with 4 v. 4 a. C.T. and 4 v. 1 a. C.T., **10/-. 250-250 v. 60 m.a. or 300-300 v.**, 4 v. 1 a., 4 v. 2 a. and 4 v. 4 a., all C.T., **10/-. 350-350 v. 120 m.a.**, 4 v. 1 a., 4 v. 2 a. and 4 v. 4 a., all C.T., **13/-.** With engraved panel and N.P. terminals, **1/6 extra. 500-500 v. 150 m.a.**, 4 v. 2-3 a., 4 v. 2-3 a., 4 v. 2-3 a., 4 v. 3-4 a., all C.T., **21/-. 500-500v. 200 m.a.**, 5 v. 3 a., 4 v. 2 a., 4 v. 2 a., 4 v. 3-5 a., all C.T., 25/-.

NEW 1-VALVE SHORT-WAVE RECEIVER OR ADAPTOR KIT. 13 to 86 metres without coil changing. Complete Kit and Circuit, 12/6. **VALVE GIVEN FREE!**

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Special Speaker for above, fitted Pentode Transformer, 600 ohm Field, 7½" cone, etc., **12/6 each.**

Aerodyne 5-valve Battery Superhet, a really magnificent job, listed at 8½ gns. The Chassis is contained in a handsomely finished walnut cabinet of upright design. The Dial is really attractive and is station named. Tuning is indicated by means of a rotating light. The Valves used are as follows: FC2A, VP2, 2D2, PM2B, and Cossor 220 PA. Speaker large type P.M. Rola. **Our price to clear, £4 4s. each.**

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All Windings Centre Tapped.

Bryce Mains Chokes.

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Practical and Amateur Wireless

AND PRACTICAL TELEVISION

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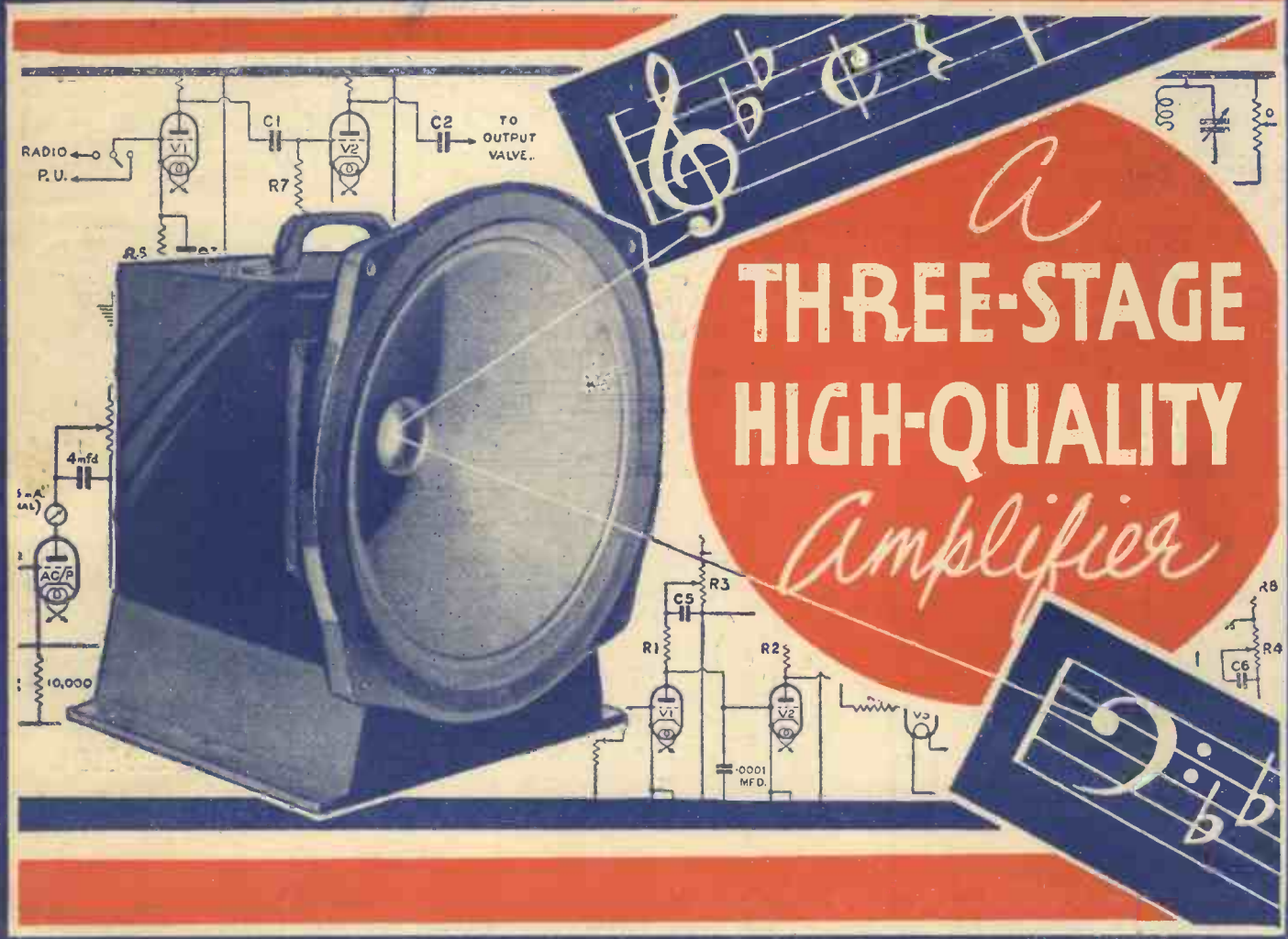

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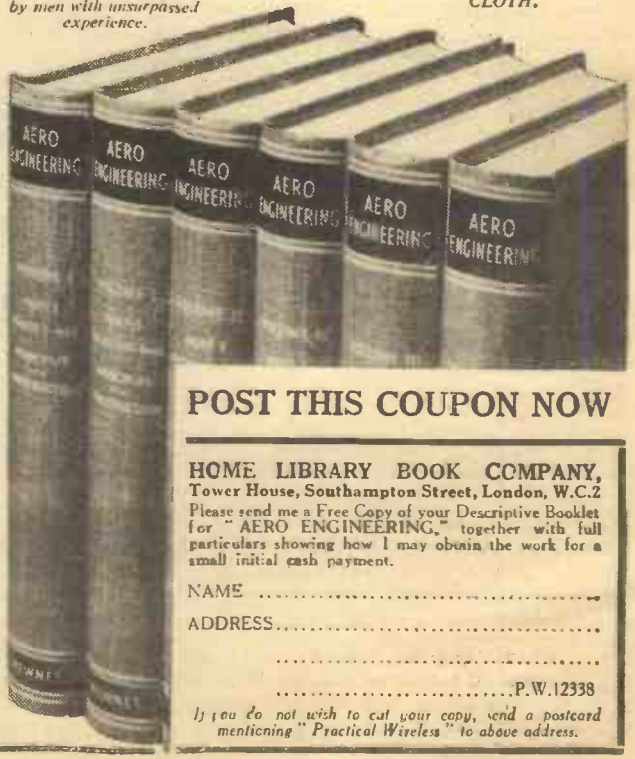

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TRIMMING SUPERHETS—See page 705

Practical and Amateur Wireless

Edited by F. J. CAMM

Technical Staff:
W. J. Delaney, H. J. Barton Chapple, Wh.Sch., B.Sc., A.M.I.E.E., Frank Preston.

VOL. XI. No. 286. March 12th, 1938.

ROUND *the* WORLD *of* WIRELESS

Quality Amplifiers

ONE of the greatest problems which confronts the ordinary listener is that relating to the design of the amplifier. The term "high quality" is often applied to an arrangement which in the opinion of one listener is far from ideal, but which to another cannot be excelled. It is often forgotten that the amplifier design alone is not the most important factor in the complete apparatus, and it is essential to consider also the loudspeaker, method of mounting, and the room in which the apparatus is to be employed. We have before pointed out that a room filled with heavy fabric-covered furniture will remove all "life" from reproduction—in effect "soaking up" the high notes. The principle of draping a studio to avoid reverberation is, of course, well known, and is based upon a similar principle. On the other hand, a room with a minimum of furniture, or with wooden or hide furniture will sound much more brilliant, and it is therefore necessary to bear in mind the type of room in which the apparatus is to be used when designing the amplifier. Devices to increase brilliancy or to remove the top notes are easily fitted, and therefore, provided that a really complete range of frequencies are reproduced, a tone control will enable the amplifier to be used in various rooms without trouble. In this issue we describe a new type of circuit which will appeal to the amateur who is interested in the design of quality apparatus, and there are some interesting new features to be found in the circuits given on page 699.

Radio Advertising

AT the International Communications Conference in Cairo a proposal has been put forward that on wavelengths from 200 to 1,875 metres no country shall broadcast advertising matter in a language other than its own. We understand that the proposal has been unanimously adopted by the technical sub-committee of the conference.

All-British Spelling Bee

THE first all-British Spelling Bee will be held on March 20th, the rival teams being composed of "over forties" and "under twenties," and the broadcast will take place in a London studio with Thomas Woodrooffe as compère.

Listening to Music

DR. E. NORMAN HAY will end his series of talks on Listening to Music in the Northern Ireland programme on March 24th. In it, this distinguished critic has sought to offer the average listener an approach to the great amount of music which fills the air to-day. He has shown the difference between hearing and listening, and he has illustrated his words with excerpts on the piano and the gramophone. His last talk, sub-titled "The hearing ear and the understanding heart," will be in the way of a summing-up of the ideas he has offered in previous talks.

ON OTHER PAGES

New Philips Factory

THE foundation stone of a new factory at Whitebirk, Blackburn, will be laid by the Mayor of Blackburn on March 16th. This factory is to be built to accommodate approximately 5,000 people on the pay-roll of Philips Lamps, Ltd., and occupies a site of approximately 32 acres.

Decca Trimmers

IN our article on Automatic Tuning last week we mentioned that the Decca Company had produced some new trimmers which were totally unaffected by heat or cold and thus tuning would not be upset. It is now stated that these trimmers will hold their exact capacity even when placed in a refrigerator or with a blow-lamp playing on them.

New Type of Valve?

IT is stated that at a recent French trade exhibition some valves of a new type were displayed. Although full details have not yet come to hand, it is explained that these enable the entire electron stream to be employed with a consequent gain in output, but the description which has been given would apply equally to the valves now commonly referred to as "beam power" triodes or tetrodes.

Fire at Oxford Street

THE well-known West End of London street is again in the news with another fire at a radio store. Readers will remember that at Christmas time the burning-out of the H.M.V. premises was a big feature in the news, and now the premises of A. Imhof, the well-known radio and gramophone store situated in the same street, has also been the scene of an outbreak. In this case it was due to a boiler in the basement becoming overheated and some wood near by caught alight. The outbreak was quickly subdued and only slight damage was done.

G.E.C. Fire

THE General Electric Company also entered the news with a fire, this time at the factory at Witton. Although tremendous damage was done, in this case the radio side of the business is not interfered with, as this is concentrated in the G.E.C. factory at Coventry.

"Over to Paris"

PLANS are now nearly complete regarding the proposed broadcasts from Paris. Archie Campbell is now in Paris making the necessary arrangements to produce a show early in May, in which listeners will be taken from one place to another, hearing broadcasts from cabaret, music-halls and similar places of entertainment. It is possible that later in the year the B.B.C. may arrange an outside broadcast direct from a Paris night-club or music-hall.

ROUND the WORLD of WIRELESS (Continued)

The B.B.C.'s Travelling Exhibition

SIR STEPHEN TALLENTS, B.B.C. Controller of Public Relations, recently opened the new Travelling Exhibition at Charing Cross Underground Station, where it will be on view until March 24th.

By means of an interesting display of photographic enlargements and working models listeners are taken behind the scenes of British Broadcasting in a way that explains clearly and simply the story of B.B.C. activities, and the evolution and development of radio. One interesting model, seen in the accompanying illustration, consists of an ingenious arrangement of inter-connected cog-wheels, and shows clearly how the team work of each department of the Corporation builds up the programme before it goes on the air. Specimens of work carried out by the B.B.C. Recorded Programmes Department at Maida Vale are displayed, and visitors can see for themselves the three types of recording system employed—steel tape, film and disc.

Val Gielgud for U.S.A.

WE understand that Mr. Val Gielgud, Director of Features and Drama, has sailed for the United States on extended leave.

He is going to Hollywood, where he will

Jack White, whose "Collegians" dance band is often heard on the radio.

be the guest of his old friend and colleague, Mr. Eric Maschwitz. Before his return to England at the end of May, Mr. Gielgud will produce two radio plays in New York at the invitation of the National Broadcasting Company and the Columbia Broadcasting System.

Good Friday Concert

WE are informed that the annual Good Friday Concert at Queen's Hall, on April 15th next, will consist of a performance of Elgar's "The Dream of Gerontius," with Muriel Brunskill, Parry Jones and Harold Williams as the soloists. The B.B.C. Symphony Orchestra and the B.B.C. Choral Society will be under the direction of Sir Henry J. Wood.

INTERESTING and TOPICAL NEWS and NOTES

New Film Music

MIDLAND and Regional listeners will hear a programme entitled "General Release" on March 12th. This is devised and will be conducted by Reginald Burston and consists of new music from the films and the musical comedies. The players will be the Midland Revue Orchestra with Marjorie Westbury (soprano) as vocalist. The show will be compèred by Martyn C. Webster.

Ketelbey to Broadcast

ALBERT W. KETELBEY, master of melody, whose best-known composition is probably "In a Monastery Garden," is coming to the B.B.C. studios on March 27th to conduct a half-hour gramophone record programme of his own works. The recital will be broadcast on the National wavelength.

Bournemouth Municipal Orchestra

A CONCERT by the Bournemouth Municipal Orchestra, led by Harold Fairhurst, and conducted by Richard Austin, with pianoforte solos by Smeterlin, will be broadcast from the Pavilion, Bournemouth, on March 17th.

Variety from Leicester

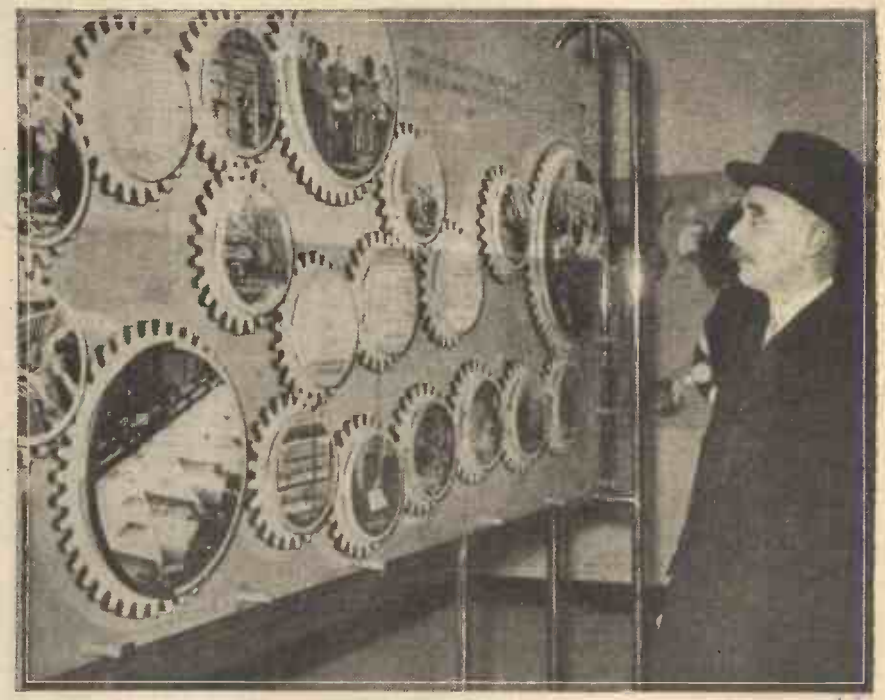
THE Leicester Opera House is now added to the number of theatres co-operating in Midland variety outside broadcasts. The artists appearing at the theatre on March 17th include Turner Layton, Lucan and McShane and Teddy Brown.

Short-wave Station for Ireland

IT is reported that the Irish Department of Posts and Telegraphs has ordered from Standard Telephones and Cables a 1.5-kW. short-wave transmitter to be erected near the Athlone medium-wave station.

Parade of Northern Halls

FIVE well-known Northern Music Halls figure in the Northern Music Hall Parade in the Regional programme on March 18th, when the bill will include variety from the Argyle, Birkenhead.



Sir Stephen Tallents, Public Relations Officer of the B.B.C., is here seen inspecting the "Wheels Within Wheels" exhibit at the B.B.C. Travelling Exhibition at Charing Cross Underground Station.

SOLVE THIS!

PROBLEM No. 286.

Smithson had a three-valve A.C. mains set which had given good results for some considerable time. One evening he decided to carry out a slight modification of one of the stages, and accordingly removed the set and made the modification desired. He switched on and results were fair for a moment or two and then signals suddenly ceased, the rectifier valve glowed with a brilliant blue light and then all sound ceased from the speaker. What had gone wrong? Three books will be awarded for the first three correct solutions opened. Envelopes should be addressed 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. 286 in the top left-hand corner, and must be posted to reach this office not later than the first post on Monday, March 14th, 1938.

Solution to Problem No. 285.

In Williams' receiver the G.B. battery was very run down, and when the negative plug was removed the automatic removal of the load of the potentiometer enabled a higher bias voltage to be applied to the output valve which resulted in the lowering of the total anode current.

The following three readers successfully solved Problem No. 284, and books have accordingly been forwarded to them:—K. G. Baker, 8, Chiminage Close, Marlborough, Wilts. E. Newman, 40, Kenmore Gardens, Palmer's Green, N.13. J. C. Ward, 40, Station Approach, Wembley, Middlesex.

A Three-stage High-quality Amplifier

A Practical Article in which an Amplifier of Outstanding Performance is Described

By NOEL BONAVIA-HUNT, M.A.

IT is generally agreed that if it is desired to design an amplifier capable of reproducing the original sounds with the nearest possible approach to fidelity, it is difficult to improve upon resistance-capacity coupling in push-pull. Quite a number of amateur constructors have tried this particular system of coupling and, to my personal knowledge, have found the results disappointing for various reasons. The fault lies partly in the system, but mainly in the difficulty of obtaining accurately-matched components for either side of the push-pulling circuit in each of the stages thus coupled. The chief snag presented by the actual system is found in the fact that no definite capacity of coupling condenser can be chosen to deal satisfactorily with all frequencies amplified, and as a result the frequencies above 4,000 cycles are extremely liable to amplitude distortion. I have yet to hear an amplifier designed on these lines that can satisfy my very sensitive ear for quality reproduction.

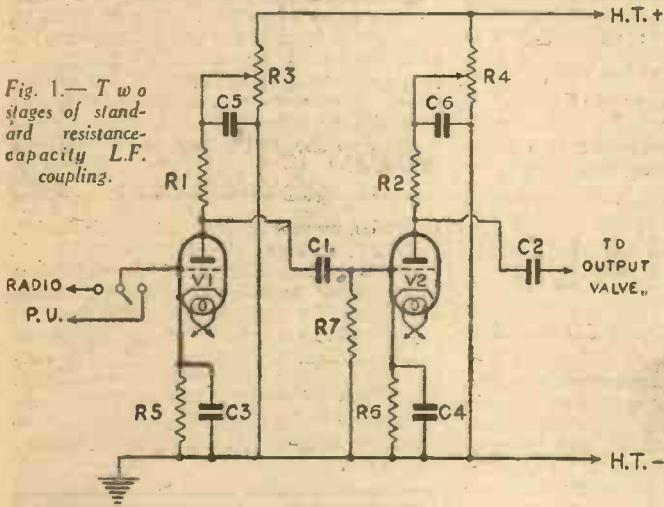


Fig. 1.— Two stages of standard resistance-capacity L.F. coupling.

Direct Coupling

It occurred to me some months ago that if the coupling condenser could be eliminated from the system there would be a far better chance of overcoming the kind of distortion referred to. The only solution, in other words, was to introduce direct coupling. It is fairly obvious to the student of radio quality that this latter method of amplifying the audio-frequency signals must be the ideal one, *if* it can be accomplished without recourse to the extremely high voltages which designers have hitherto considered essential in order to obtain the requisite amplification.

Fig. 1 gives a very usual example of two low-frequency amplifying valves resistance-capacity coupled to an output valve with auto-biasing resistances in their respective cathodes. The anodes of each are supplied with high-tension voltages by means of potentiometers. The usual values for the various resistances will be: R1, R2, 50,000 ohms; R5, R6, 1,000 ohms; R7, .025 megohm. For the condensers they will be: C1, C2, 0.2 mfd.; C3, C4, 50 mfd.; C5, C6, 4 mfd. The valves will be of the MHL4 type. It is a simple matter to push-pull both stages by adding the necessary pairs of valves with their associated coupling network in opposite phase. But instead of doing this, let us try to dispense with the coupling condensers C1, C2. This we can do by shorting each condenser. In order to get our amplifier to work under these new conditions (connecting the plate of the first valve to the grid of the next), we shall be obliged to increase the value of the bias resistance in each stage and also to reduce the anode voltage and current. It will be found that if a low-reading milliammeter be placed in series with each of the anodes we shall obtain the result aimed at by reducing the anode current reading to 0.1 milliampère for V1, and to 0.3 milliampere for V2. In order to secure this result we can increase the value of R1, R2 (anode resistances) to 0.25 megohm, and of R5, R6 (bias resistances) to 20,000 ohms and 50,000 ohms respectively. Fig. 2 gives the complete circuit thus changed from its original resistance-capacity coupling to direct coupling.

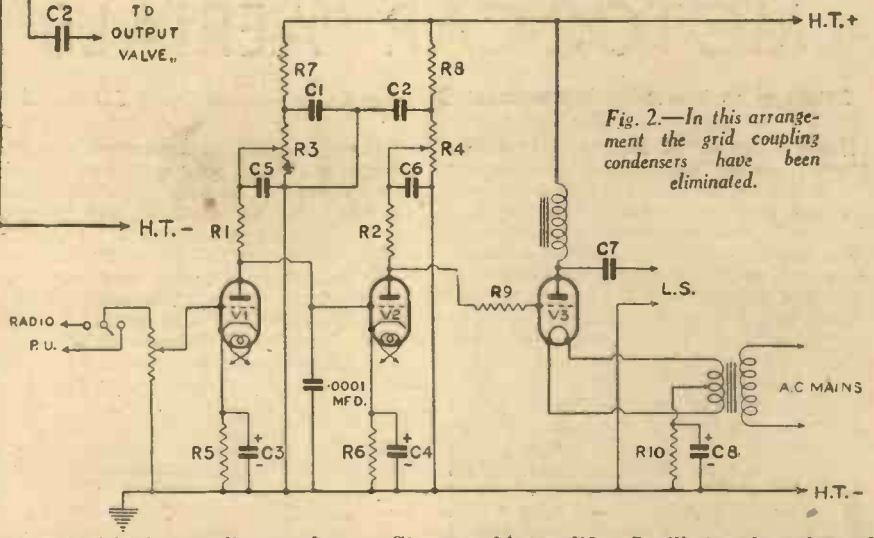


Fig. 2.—In this arrangement the grid coupling condensers have been eliminated.

Component Values

For the sake of those who would like to try this amplifier, I will give the values of all the components. R1, 2, 0.25 megohm; R3, 4, 50,000 ohms; R5, 20,000 ohms; R6, 50,000 ohms; R7, 8, 50,000 ohms; R9, 5,000 ohms; C1, C2, 4 mfd.; C3, 4, and 8, 50 mfd.; C5, 6, 2 mfd.; C7, 8 mfd.; V1, AC/P; V2, MHL4; V3, PX4. For V1 two AC/P valves may be used in parallel with even better result.

The output valve (PX4) will require a high-tension voltage of 300, or if the newer type of PX4 be used, 350 volts may be applied. Since the input voltage to its grid will have the effect of increasing the anode current, as will be discovered immediately a signal is tuned in, it is desirable to allow

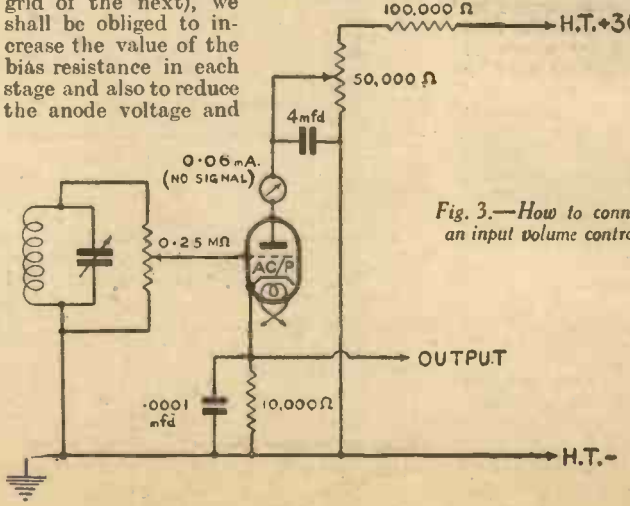


Fig. 3.—How to connect an input volume control.

(Continued on next page)

A THREE-STAGE HIGH-QUALITY AMPLIFIER

(Continued from previous page.)

for this increase by introducing a suitable value of biasing resistance in the output stage. The value of R10, which so far has not been given, should therefore be 1,750 ohms.

Those who prefer to employ a valve of the PX25 class, working on 400 volts, may, of course, do so. In this case, the biasing resistance should be 2,000 ohms exactly, with a high-tension voltage of 480. The anode current passed will be 55 milliamperes with no signal input to grid. The capacity of C8 may be increased to 96 mfd. by connecting three 32 mfd. high-voltage type electrolytic condensers in parallel across the bias resistance. The latter component should also be capable of carrying the required voltage and current, and should not be less than a 50-watt working type, though a 20-watt type may be used for tests.

Anode Bend Rectification

It will be seen that when the amplifier is employed for radio the first valve functions as an anode bend detector. Since this is direct-coupled to the following valve, there is no objection to anode bend here, always provided that the input voltage to its grid is kept within reasonable limits. It will be found that the maximum input allowable is of the order of two volts for linear rectification. Should it be possible to tune the incoming signal to two separate resonant points on the dial, this will be clear proof that the detector is being overloaded, and the input must be reduced accordingly till the resonant spot occurs at only one point of the dial. It is necessary to connect a 0.0001 mfd. fixed condenser between the anode of the detector and earth to ensure efficient rectification. The current passed at the anode must be adjusted by means of the potentiometer, R3, and it must not exceed 0.1 milliampere with no signal. It is permissible to employ a Westector or a negative feed-back detector in place of V1, which then becomes the first low-frequency valve fed by the preceding detector output. The negative feed-back detector circuit is shown in Fig. 3. This is capable of handling a larger input without distortion. The anode current passed on V2 of Fig. 2 is 0.3 milliampere.

High Frequency Response

As one watches the output valve at work one can imagine it functioning as a giant anode bend detector rather than as a mere amplifying valve fed by the stages preceding it. Be that as it may, the quality result is such that it is extremely unlikely that any system of thermionic amplification will be found to equal it for many years to come. Not only is the transient response phenomenal, as would be expected from direct coupling, but the upper register is characterised by a softness of quality, and an absence of peakiness, due to the uniform response maintained up to and even beyond 10,000 cycles, that marks a new era in high-quality reproduction. Nor is there any lack of bass, so that the balance is well preserved. Using a well-designed pick-up, gramophone records are reproduced with a surprisingly low level of surface noise owing to the absence of peaks in the frequency response curve; in fact, the entire reproduction is so smooth and agreeably free from coloration that a new thrill is in store for the gramophile who adopts this amplifier, especially if a PX25 output valve is chosen. The volume, in the case of both radio and gramophone, is best controlled by means of a quarter-megohm potentiometer connected across the tuned detector circuit or the pick-up, as required, the slider being taken in the usual manner to the grid of the valve as shown in Fig. 3.

MOTOR-CAR AERIALS

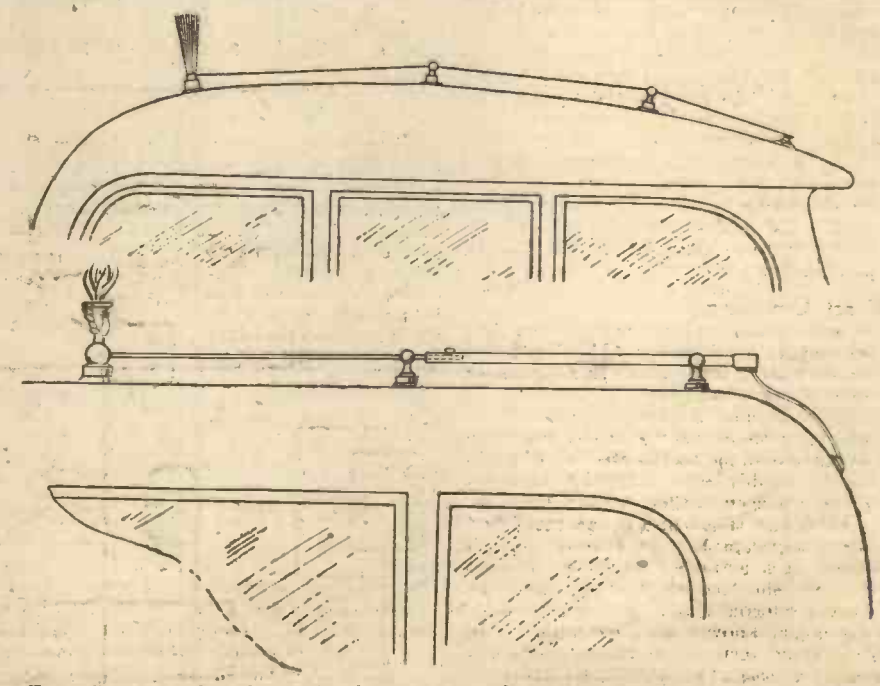
Details of an Interesting Improvement Over the Usual Type of Small Car Aerial

IN our issue dated February 12th, we gave some suggestions for making various types of aerial for use in conjunction with car radio equipment, and have received from a reader an interesting improvement over the designs therein shown. The accompanying illustrations show the type of device adopted by this reader, and it should be noted that these have been given Patent protection. The inventor has pointed out that with existing types of aerial there are two main drawbacks—firstly, the roof has to be drilled to accommodate the mounting blocks, and secondly, the aerial of simple design generally in use is directional. This means that as the car proceeds on a journey the continued change of direction which takes place will result in fading, and even if a receiver is fitted with some form of A.V.C. it may be found that in certain circumstances the changes of direction are so rapid that the A.V.C. circuit cannot operate at maximum efficiency.

These two drawbacks are overcome by the invention in question, in the former case attachment being provided by means of suction blocks, and in the second case by means of a more or less vertical aerial arrangement. In place of the usual type of stand-off insulator the inventor specifies an insulated fixing device provided at the lower end with a suction cup. This may be attached to the car in any position, will hold firmly, and has the advantage that should it be desired to dispose of the car, the aerial may be removed should the new owner not require the aerial.

Important Advantages

Such a fitting will also have the advantage that experiments may be carried out with a view to finding suitable positions, and the top of the car may not always be the best position. The lead-in cable may also be held in place by means of fittings of this nature, and eventually taken into the car through a ventilating louvre, round a window, or at some point on the windscreen where a hole is already provided. Two types of aerial are specified, one being of the rigid type, made up from jointed sections of rod which may be adjusted for length to suit various car lengths, or for various wavelengths. The end of the lead-in is attached to some form of capacity device, consisting of the inventor's "brush-type" aerial as shown in the first illustration, or, where a neater appearance is desired, a mascot built up round this device. This will enhance the appearance of the car, and various designs may be utilised to embrace the capacity device. One form, consisting of a hand holding a flambeau, is shown in the second illustration, but many other designs, such as a bird with outstretched wings, etc., may be employed. This type of aerial will be found non-directional and will provide greater volume than the simple rod which is commonly employed.



These illustrations show the new aerial arrangement. In the upper diagram a simple capacity is shown, but in the lower picture a mascot or similar arrangement takes the place of this. An adjustable rod is here shown in place of a wire lead-in.

THE FOURTH ARTICLE OF A NEW SERIES

Transmitting Topics

Notes on Doubling and Further Details of Construction of the Rack for a 10-watt Transmitter Are Given in this Article. By L. ORMOND SPARKS

A SURPRISING number of readers have written to stress the case of the beginner to Transmitting. They have mentioned the fact that quite a lot of them are breaking fresh ground by entering the transmitting field of radio activities, though most of them are quite experienced constructors and S.W. enthusiasts.

As they raise a point of general interest, I feel that I should mention that these articles are intended for both the beginner and those rather more advanced, and, to endeavour to cater for both sections, I stated in the second article of this series that the first half of each article would be devoted to elementary subjects while the remaining half would deal with constructional or more advanced matters. There is no need for the beginner to feel that it is a subject beyond his depth, as he will find that his general receiving and constructional experience will form a sound foundation for the new subject.

The best way to make sure that everyone is quite happy is by the very simple procedure of co-operation. Don't keep your troubles or discoveries to yourself. That is not the way to make progress or to maintain the spirit of co-operation which is one of the vital factors to the welfare of amateur transmitting. Drop us a line, and let the matter be passed round. You know the quotation "A troubled shared . . ." so from now on support and take part in what I am going to call the Co-operation Circle.

"Doubling"

It was mentioned last week when dealing with the "electron-coupled" oscillator, that the circuit possessed the advantage of being able to give a worth-while output on frequencies which were a multiple of the fundamental, and that a name or term is given to such features.

One cannot get very far with transmitting without coming across the expressions "doubling," "doublers" and "frequency multipliers." To the uninitiated these may seem rather terrifying, but they really define that which is expressed in the previous paragraph. In other words, when a valve is so arranged that its anode output is twice the frequency of its input, it is usually referred to as a "doubler" while the process is known as "doubling." The remaining term "frequency multiplier" can be so used if so desired, as that is what really happens, but it is a term which is not widely used over here. At the risk of boring the more advanced amateur, I want to make it quite clear that when one speaks of "doubling" the frequency it must be appreciated that the wavelength is *halved*, or, to carry it a stage further, if the anode output circuit is tuned to the third harmonic (multiple) of the input frequency, the wavelength will correspond to a third of that of the original. This point, while being obvious to many, often misleads the beginner.

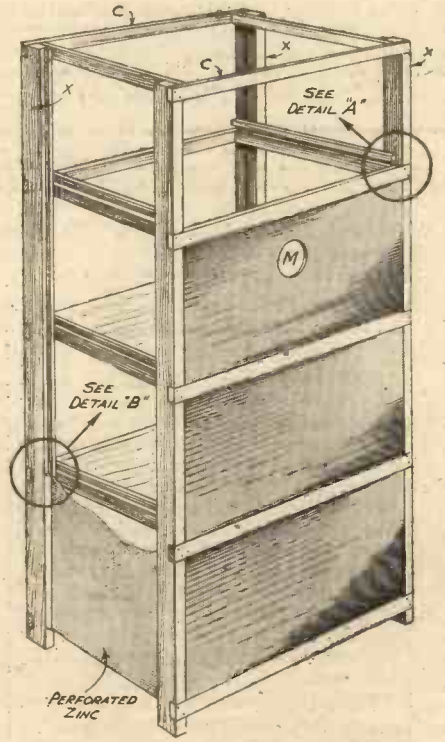


Fig. 1.—View of the completed rack, showing front panels.

I mentioned that the anode circuit might be tuned to the fourth harmonic; well, there is nothing to prevent it being tuned to any harmonic except the fact that the higher the harmonic to which it is tuned the lower becomes the efficiency of the arrangement; therefore, it is more usual to make use of a chain of doublers if it is required to multiply the original frequency many times. For example, the first doubler would, to use simple fictitious figures, double the frequency from 50 to 100, the next from 100 to 200, and so on.

With a simple oscillator the plate and anode circuits are coupled together, either by induction or capacity, so that sufficient energy is passed back from the anode to the grid to maintain oscillatory currents in both circuits. A common example of this is the reaction effect in a receiving circuit. When this state of oscillation is reached, the power generated is of a definite frequency—remember it is an alternating current—and the frequency of the oscillations depends on the characteristics of the grid and anode circuits, i.e., the crystal and/or the tuned circuits. If both the input (grid) and the output (anode) are tuned to the same frequency it is only natural that the oscil-

(Continued on next page)

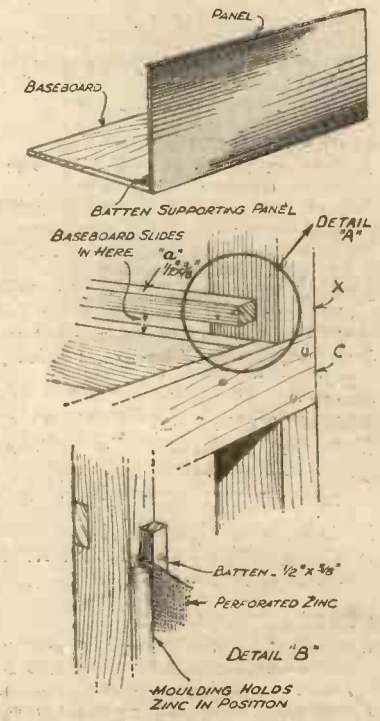


Fig. 2.—Constructional details of framework and method of fixing panel to baseboard.

TRANSMITTING TOPICS

(*Continued from previous page*)

lations in both circuits will be identical so far as frequency is concerned, and that the anode circuit will obtain a kick or impulse every oscillation of the grid circuit. Supposing, however, the anode circuit is so arranged that it can be tuned to, say, the second harmonic of the input frequency; then, instead of obtaining an impulse every cycle it will only do so every second, but providing conditions are suitable, the impulse will maintain oscillations in the output circuit at a frequency to which it is tuned, namely, in the case of the second harmonic, twice that of the input. That, in a nutshell, is what happens when we speak of doubling or frequency multiplying.

There is one more point which cannot be overlooked. I mentioned that the efficiency decreases the higher one goes up the harmonic scale, and this should be more clearly understood now in view of the remarks above about the output circuit only receiving impulses on the hit and miss basis when considering the second harmonic.

Well, so much this week for the newcomers, except a reminder about the Co-operation Circle. Let us hear from you.

The 10-watter

Assuming that you have carried out the instructions given in the previous articles, you should have a structure looking like Fig. 1, except for the panels and the perforated zinc sides which will be described herewith.

If detail "A" (Fig. 2) is examined, it will be seen that some side members are shown which have not yet been mentioned. This is quite in order as they cannot be fixed until the thickness of the baseboards has been settled.

With the original model, 5-ply board was used, and to avoid any errors the strips were located in position by allowing them to rest lightly on the actual baseboards, and then securing by two panel pins in each end, as shown in the sketch.

Before fixing these strips see that their surfaces are smooth, using fine sandpaper to remove any blemishes, thus ensuring that the baseboards will slide in and out easily. The object of these strips above each side member is to prevent the baseboard and panel from tilting downwards when they have to be partially withdrawn to allow tests or examinations to be made. The next thing to see to, so far as the rack is concerned, is the fixing of the perforated zinc sides, and the method of doing this is clearly shown by detail "B" (Fig. 2).

The zinc can be purchased at any ironmongers, though I must admit I obtained mine from a well-known low-price store, and I found that by careful cutting I was able to have a solid edge at top and bottom, a join being made in the centre.

Don't forget to polish the zinc before fitting. It is better, actually, to polish the whole sheet before cutting, as it is then easier to lay it down on a few sheets of newspaper and apply ordinary metal polish and "elbow grease" without the metal cocking up as it tends to do in smaller pieces. The polish thus obtained lasts for ages, and adds a smart appearance to the completed rack.

Four baseboards and four panels will now be required. The baseboards are standard throughout, namely, 12 by 9¾ inches, while the panels are, *three* 12 by 8 by ¼ inches, and *one* 12 by 6 by ¼ inches. Even if 5-ply board is used, it is advisable to use the supporting strip across the upper side of the front edge, as indicated, as it does prevent the possibility of poor panel fixing, Smooth off all edges and surfaces of the boards, and finish off with a coat of stain to suit individual requirements.

Polishing gives a smart appearance, but is not essential. As regards the panels I was fortunate enough to obtain some Government surplus ebonite which, being Grade A material, was just ideal for the job. Dry seasoned wood can, of course, be used but, bearing in mind all factors, I would suggest that the purpose of the assembly is well worth the slight extra cost of the ebonite, apart from its better appearance.

If ebonite is used, be careful with the drilling and cutting (if necessary) so that no errors are made and to make sure that the *edges* and *corners are square*. A badly fitting panel will ruin the look of the whole thing.

Before fixing the last of the larger panels to its baseboard, the meter hole "M" must be cut although, as many constructors have suitable meters on hand, I do not think it is necessary for me to tie that particular item down so far as an exact specification is concerned. A flush or projecting type will do equally well, but it is advisable to use one of a good make and having a maximum reading of not greater than, say, 50/60 milliamps. What is better is one of the multi-range type, so if one having a maximum reading of 1, 5, or 10 milliamps is to hand, then I would suggest that that is embodied together with suitable shunts to allow higher readings to be taken if and when necessary.

Many readers will, no doubt, be wondering what I intend doing with the four shelves the rack provides. Well, here is the layout which will be followed. The bottom shelf will carry the Power-pack, the second the Modulator, the third the Tritet oscillator doubler, and the fourth, *eventually*, a P.A., or Power Amplifier stage, but enough for the present.

Important Broadcasts of the Week

***NATIONAL* (261.1 m. and 1,500 m.)**

Wednesday, March 9th.—B.B.C. Symphony Orchestra visits Nottingham: a concert from the Albert Hall, Nottingham.
Thursday, March 10th.—Orchestral programme: Music of George Gershwin.
Friday, March 11th.—Concert Party programme.

***REGIONAL* (342.1 m.)**

Wednesday, March 9th.—Variety from the Winter Gardens, Morecambe.
Thursday, March 10th.—Steeplechasing at Cheltenham: a commentary on the Cheltenham Gold Cup, from Prestbury Park, Cheltenham.
Friday, March 11th.—The Scottish Country: an impression of the Island of Mull and its Life, from Tobermory.
Saturday, March 12th.—Dance Band programme.

***MIDLAND* (296.2 m.)**

Wednesday, March 9th.—Variety from the Theatre Royal, Worcester.
Thursday, March 10th.—Symphony concert.
Friday, March 11th.—Band programme.
Saturday, March 12th.—General Release: orchestral programme.

***NORTHERN* (449.1 m.)**

Wednesday, March 9th.—The Dream of Gerontius (Elgar), from the Town Hall, Leeds.
Thursday, March 10th.—Variety from the Gaiety Theatre, Manchester.
Friday, March 11th.—Swiss Yodellers programme.
Saturday, March 12th.—Orchestral concert from the Milton Hall, Manchester.

INTER-VARSITY SPORTS

THE Oxford and Cambridge Inter-Varsity Sports will be televised, conditions permitting, from the White City on March 12th, beginning at 2.30 p.m., and continuing at intervals until 4 p.m. It is hoped to show the 100-yards race, the pole vaulting, the 120-yards and 220-yards hurdles races, the half-mile, the high and long jumps, and putting the weight. Two items which have never before been featured in the Inter-Varsity sports will be televised, namely, the discus throwing and javelin throwing. It is hoped also to show the mile race.

Philip Dorté, who is in charge of production, anticipates no difficulty in coping with those events which take place in a fairly small area, such as the jumping and the sprints, but how to televise the half-mile and the mile races is a bigger problem which he hopes to solve with the aid of a camera tower, enabling the races to be followed from a central point so that the whole lap can be covered. Actually, there will be more than an hour of television from the White City, the approximate schedule being 2.30 to 3.10 p.m., 3.20 to 3.30 p.m., and 3.40 to 4 p.m.

***WELSH* (373.1 m.)**

Wednesday, March 9th.—Choral programme.
Thursday, March 10th.—A recital of Welsh ballads.
Friday, March 11th.—Rugger Night: Speeches from the annual supper, from the Park Hall, Swansea.
Saturday, March 12th.—Choral programme.

***WEST OF ENGLAND* (285.7 m.)**

Wednesday, March 9th.—They Made the West: a chronicle of English history, 8—The Nineteenth Century, Progress and Poetry, a talk.
Thursday, March 10th.—At the Court of King Prempeh, a talk.
Friday, March 11th.—Flowers from Cornwall, a discussion.
Saturday, March 12th.—Western Salon: Instrumental programme from the Manor Hall, University, Bristol.

***SCOTTISH* (391.1 m.)**

Wednesday, March 9th.—Scottish Dance Music.
Thursday, March 10th.—Stage Parade: Memories of the Glasgow Theatre, 1931-33.
Friday, March 11th.—The Scottish Country: an impression of the Island of Mull and its life, from Tobermory.
Saturday, March 12th.—The Sweet o' the Year: a springtime serenade in music and the spoken word.

ON YOUR WAVELENGTH

By Thermion

Where is the Skilled Labour?

NOW and then I receive letters from readers asking me if I can locate some nice soft job with lashings of money, little work, short hours, long holidays, and requiring not much ability. At least, I gather that that is what they expect, because some of the letters say that the writers have no experience but are willing to learn, that they are prepared to work for as little as £5 a week, provided that they do not have to work on Saturdays because they are employed in the local band.

The public estimate of what an employer wants seems to be pretty low. Applicants for jobs merely tender as their qualifications what salary they require, and seem to imagine that they are conveying some favour on the employer in offering their services at all. In my callow youth it was the object of myself and all other boys of similar age to spend a number of years as apprentices, learning a particular trade, before we considered how much we should earn. In many cases our parents paid considerable sums of money in order that we might be taught, and the indentures, duly signed and witnessed in the solicitor's office, bound us for the full period of seven years not to absent ourselves from our masters, neither night nor day for the full period. For the first year we earned the large sum of 4s. per week, and so on by yearly increments of 2s. up to 16s. a week. Nowadays, a youth wants to idle his time away until he is 23 or 24, and then requires a big salary for being able to do very little.

Of course, my remarks do not apply to everyone that wants a job. There are plenty who matriculate or who obtain a general school certificate, and who are prepared to learn before they earn. There are others who say that they are out of a job and are prepared to do anything. That is just what they cannot do; they cannot do one thing really well. If I had my way I would compel every boy upon leaving school to learn some particular trade or profession, so that he could become a really useful citizen, and not a drag upon the State. Here we are in the middle of a good peace, and there is not enough skilled labour to go round. What would happen in time of war? I would give every boy his choice so that as far as possible he could follow his inclinations. When you have made yourself qualified for a job you will usually find that there is one waiting for you. Unfortunately, the fantastic sum paid to band-leaders, drummers, saxophonists and other comic parasitic appendages to civilisation has taken away the ambition to do an honest job of work at a reasonable salary.

The Almighty B.B.C.

A FRIEND of mine opined, averred, declaimed, pronounced, in other words, expressed the opinion that we should appreciate radio if we had less of it—say, on two evenings a week. I am somewhat inclined to agree with this, because with wireless every night you are likely to get tired of really good turns, and constantly desire something better when you are already getting the best. This friend also thought that the B.B.C. conducted itself as if it were the axis upon which the world revolves, instead of being just an entertainment body, the same as a pierrot troupe or a variety show. I agree again. The B.B.C. takes its job and itself far too seriously. It regards itself as of greater importance than Parliament or Commerce. I certainly object to a party of Scots and Welsh being appointed as a B.B.C. committee to decide how we should pronounce the English language.

Those Bands

MOST of the bands on the air or on the road include that unnecessary refinement, a conductor. It is his job to convince the audience that when he waggles his baton, or dances like a jackanapes from one side of the stage to the other twiddling his hand at the drums, or the flutes, or the saxophones, that he is really producing the music. The band could play just as well if the conductor was not there at all. The only use for a conductor is that of a man who starts a race. He merely fires a revolver, when the race remains with the competitors, and as so much of the music merely amounts to a firework display it is appropriate to refer to the firing of a gun. I suggest, therefore, that in future all conductors should merely fire a gun, preferably at the nape of their own necks, and then walk off the stage. It does not matter what happens to the band. Whatever is the result of the lack of a conductor the public will think that it is a new style in swing music, or "ridm." Excuse me breaking into nigger pronunciation, but it is a waste of English to use that language on nigger music.

That Grid Bias Problem

D. M., of Caithness, writes: "J. W.'s problem in last week's PRACTICAL AND AMATEUR WIRELESS would probably be helped if he connected G.B.— to the secondary of his transformer. My copy reads: 'I happened to pull the G.B.+ plug *leading from the transformer* out of its socket.'

"If you're not tired of jokes, here's another, first-hand. Two elderly ladies, neighbours of ours, asked me to have a look at their radio, which 'wouldn't go.' I found that their set had an external loudspeaker, and that when the cord had got accidentally broken, they had simply knotted it together and expected the beastly thing to go!

"I am looking forward to some new cracks about crooners."

R. H. W. (Highsted) also writes: "*Re* article on J. W.'s three-valve short-wave set in last week's issue. I have found that a short-wave set on similar lines which I have built to work perfectly here (two miles from the town) has played the same trick in two different houses in the town. In each case we found the Relay Company's wires were running across the gardens, in one case parallel with the aerial, and in the other at right-angles, but it made no difference in our case whether the coil was in or not.

"I have also had the same G.B. trouble and found changing the valve did the trick."

Some Facts About Batteries

SOME facts which clear up one or two points which may have been puzzling our readers have been elucidated by Mr. E. C. McKinnon, chief engineer to the Chloride Electrical Storage Co., Ltd., makers of Exide Batteries.

He points out that the specific gravity of the electrolyte in any battery, e.g., a starter battery, is an excellent criterion of the relative condition of the cells. If frequent hydrometer readings show that the specific gravity is consistently low in one cell compared with that in the remaining cells, it can be assumed that the cell in question is out of condition. Maybe the cell contains an internal short-circuit or there may be a puncture in the outer wall of the container which results in loss of acid, and low specific gravity when this loss is made good by the addition of water. In any case, the battery should be given immediate attention at a Service Station because a defect, however slight, if not rectified promptly, may develop to a chronic stage.

The sequence of events in the case of an internal short-circuit are in almost invariable order. First the neglected cell gradually runs down to complete exhaustion. In this stage any discharge from the battery as a whole is tantamount to a charge through the exhausted cell in the wrong direction. The reverse charging is the quickest way to complete destruction.

On the other hand, if the trouble is located and the cause of the short-circuit removed, the cell will quickly respond to special charging and any permanent damage will be obviated.

"Topping-up."

THERE is perhaps a common misunderstanding that the necessity to top up a battery with water is solely due to evaporation and that there should therefore be no need to top up a battery during winter. Actually, the evaporation in a starter battery is very small at all times and can be practically ruled out in winter. Apart from evaporation, however, there are several other causes for lowered acid level, including :—

(*a*) Contraction through cold temperature.

(*b*) Electrolysis through excessive overcharging.

(*c*) Dispersal of electrolyte through excessive charging rates or through splashing.

Contraction and expansion are very appreciable factors in an extremely deep cell, such as one used on submarines, but they are almost negligible in the ordinary shallow automobile battery. As an example, the difference in level of electrolyte in an Exide XC13 battery at 40 deg. F. compared with that at 70 deg. F. is $^{3}/_{32}$ in.

Electrolysis is only measurable in its effects if charging is continued after the plates are fully charged and can absorb no more current.

Car Batteries

FOR every 100 ampere-hours passed into a car battery after the plates are so fully charged that they cannot absorb the current, 2.1 cubic inches of water in the electrolyte are split up into hydrogen and oxygen. Or, expressed another way, for every 100 ampere-hours excess charge expended in electrolysis, the level of the electrolyte in a standard Exide XC13 car battery would be reduced by $\frac{1}{4}$in.

The higher the rate of charge, the greater the loss of water. For instance, when passing 6 amperes (normal charge rate) through a fully charged XC13 battery, the acid level would be lowered $\frac{1}{4}$in. with 17 hours' running. If the current be increased to 18 amperes the level would drop $\frac{1}{4}$in. with $8\frac{1}{2}$ hours' running.

Dispersal of acid through excessively high charging rates might occur with unsuitable generator-brush adjustment, but this, and also spilling due to vibration, are very unusual causes for lowered level.

A starter battery requires little attention and very often gets it, but the main essential is observance of the rule that nothing but pure water, preferably distilled, should be added to the battery, but this should be done sufficiently frequently to ensure that the plates are always covered with electrolyte.

Acid should never be added.

In the event of a mishap the battery should be taken round to one of the many Service Stations set up throughout the country.

Notes from the Test Bench

Chassis Return Leads

IN some receivers difficulty is experienced when adopting the principle of making all earth return leads via the chassis. With some steel chassis the H.F. resistance between certain points may be sufficient to prevent the maximum performance from being obtained, whilst in other arrangements the chassis may be oxidised or sprayed and it may be found difficult to obtain a really clean connection at these points. Copper will give lower resistance between such points and will be easy to connect as the leads in question may be soldered to the chassis direct, but for strength the copper will have to be placed on a wooden support. In some types of receiver it may even be preferable to use an ordinary wooden chassis and take certain earth return (or low-potential) leads direct to cathodes, condensers and other points in the interests of efficiency.

Metallised Valves

IT still appears to be difficult for some constructors to realise that the metallised coating of a valve can give rise to troubles. In the majority of battery-type valves the metal surface is internally connected to the filament, and this also applies to some mains-type valves. There are valves, however, where the metallic coating is taken to a separate pin and this must be earthed direct. In some cases, therefore, should the metallic coating come into contact with a direct earth it may be possible to damage the valve, due to the fact that a bias circuit may be short-circuited or to some other cause. It should therefore be made a point that on no account should any outside earthing lead be permitted to touch the metal coating of a valve.

Reaction Condensers

A PECULIAR fault came to our notice the other day and which has since been found to be fairly common. An amateur had built a simple set which had failed to work properly, the reaction circuit appearing to be dead. Various suggestions had been made regarding H.T. voltages, etc., and eventually it transpired that the builder had used an ordinary reaction condenser in place of a differential component. The particular condenser used had alternative terminals for the fixed vanes and a single terminal for the moving vanes, and he had so connected these that the condenser was short-circuited. We also understand that in some cases amateurs have used an ordinary two-terminal reaction condenser in this way, making use of the locking nut or eyelet on the fixed vanes as a connecting point in addition to the normal fixed vane terminal.

A Complaint

I HAVE received a first-class grumble from L. R., of Leeds. Here it is : "I decided to build one of your receivers last August. I ordered the coils through a local firm, and in four days the coils arrived. After assembly I could get no results from the long waves, and tracked the trouble to one of the coils. My dealer returned it to the makers, and after a fortnight it was returned. Instead of the correct coil, however, they had sent another, so I returned this, and since then there has been silence and emptiness. I am looking forward to the suicide of the makers"

TRIMMING SUPERHETS

A Practical Article Explaining the Alignment of Multi-valve Superhets Without the Aid of a Modulated C.W. Oscillator

NORMALLY, in trimming the various circuits of a modern superhet the assistance of expensive precision instruments is required—and great experience. The foremost manufacturers employ oscillographs to record visually the actual response curves of the various tuned circuits, and a signal generator is used in conjunction with the oscillograph to provide a modulated C.W. note at the required frequency. The circuits are first brought roughly into "step" by using a pair of 'phones on the output of the receiver, and trimming the circuits for maximum response from the 'phones; then the 'phones are replaced by a calibrated output meter and the circuits accurately tuned. In conjunction with an oscillograph the characteristics of the response curves can be altered, and this is done by adjusting the coupling between I.F. tuned circuits.

It will be obvious that the method described of "ganging" a receiver will not attain as high a standard of accuracy as could be reached by the methods outlined above, but by the method explained a receiver may be "ganged" sufficiently well to meet all practical purposes without the aid of a single test instrument!

The accompanying three figures show the different effects of response curves, as it is an advantage that the reader should have an insight into what is actually taking place. In Fig. 1 a typical response curve of a very sharply tuned I.F. circuit is shown, and although selectivity in this case is "knife-edged," the frequency response is very poor, nothing above 4,000 cycles being reproduced at all—and this effect is brought about by using extremely loose coupling. If very tight coupling (approaching 100 per cent.) is employed the resultant "resonance curve" should be similar to that illustrated in Fig. 2. This curve is almost flat topped, and covers a wide range of frequencies, *i.e.*, it has a large bandwidth, and therefore there will be practically no attenuation of high notes up to 15,000 cycles: the selectivity, however, is not nearly sufficient. It will therefore be seen that neither of these two effects may be successfully used in practice.

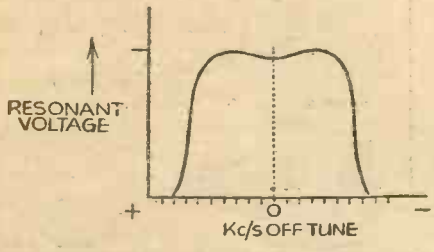


Fig. 2.—A "resonance curve" resulting from tight coupling.

Out of this arises the necessity for a compromise between Figs. 1 and 2. This compromise is provided by the curve shown in Fig. 3, where both selectivity and frequency response are excellent. This type of curve can be quite easily reproduced by the manufacturer with his cathode-ray oscillograph. But we, unfortunately, must work without one, though if rigid attention is paid to all the details under the heading "I.F. coupling," we may well approach the results obtained with the oscillograph.

I.F. Tuning

For clarity of explanation we will, in the following example, take a receiver with three I.F. stages as being standard, and will assume that the tuned circuits of the superhet receiver on our work bench are completely out of alignment, to such an extent that no signal whatsoever is obtainable from them. We are now confronted with the task of adjusting the alignment of the receiver to enable it to work at its utmost efficiency.

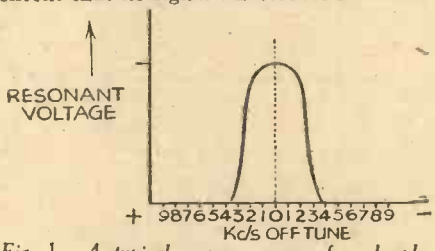


Fig. 1.—A typical response curve of a sharply-tuned I.F. circuit.

Second Detector

We must begin at the 2nd detector, which should be either a diode or anode-bend-operated triode. The secondary of the last I.F. transformer will be connected between grid and earth (or diode anode and earth, according to the type of valve being used). The primary of this I.F. transformer will be connected in the anode circuit of the last I.F. amplifier, and the aerial should be connected to the anode of this valve for our basic tuning. Both the primary and secondary trimmers must be pre-adjusted to a midway position after which we can now connect up the power supply and commence the "trimming." Having switched on, the trimming of the secondary circuit should be varied until some background noise is audible in the 'phones. Since it is unlikely that any station will be operating on the I.F. frequency, background noise must necessarily be used for our first rough adjustments, and it is preferable that 'phones be employed at this stage for trimming, instead of a loudspeaker.

The primary circuit should be similarly tuned, though it will undoubtedly be very flat due to aerial damping. The next step is to obviate this damping by disconnecting the aerial from the anode of the last I.F. valve, and connecting it to its grid, which allows the circuit to be sharply re-tuned.

We must now postpone further operations of the last I.F. transformer until later.

Second I.F. Stage

Transfer the aerial again. And this time connect it to the anode of the 2nd I.F. valve. The secondary of the I.F. transformer may now be tuned for maximum "mush" in the 'phones. Here also the aerial must be taken to the grid to enable the primary circuit to be tuned. When this is done we shall have four tuned circuits roughly "in step," and by this time the background noise in the 'phones should be so great that in all probability it will be necessary to turn down the L.F. volume control.

First I.F. Circuit

The 1st I.F. transformer couples the frequency-changer to the 1st I.F. valve, since its primary is connected in the anode circuit of the frequency changer, and its secondary between grid and earth of the 1st I.F. valve. In this stage similar use is made of the aerial as in the 2nd and 3rd I.F. circuits: that is, we connect it to the anode of the frequency changer in order to tune the secondary circuit, but we must connect the aerial in series with a condenser of the order of .0001 mfd. capacity. This condenser removes most of the aerial damping, and we may now tune both the primary and the secondary circuits of this I.F. transformer.

All the I.F. circuits are now roughly aligned to the same frequency, so we are ready to leave temporarily the I.F. stages and can consider the signal-frequency stages.

Signal-frequency Stages

This brings us to the most delicate part of our task. Although we have already trimmed the I.F. stages to the same frequency, the actual frequency to which these stages are tuned is not known, but this can be found by experimenting with the frequency-changer stage. The aerial is now connected to its proper terminal, and the tuning scale scanned until some signals are heard in the 'phones. The set should then be tuned to the lower end of the medium waveband, and the trimmers on the ganged condenser adjusted to a midway position. The trimmer connected to the grid coil of the oscillator section of the frequency-changer should next be sought, and when this has been found the trimmer must be adjusted for maximum mush (the set still being tuned to the bottom of the medium waveband). Having obtained the maximum amount of mush by varying the oscillator trimmer, the remaining trimmers on the ganged condenser should be altered to provide an even greater background noise. It may be noted that these are just preliminary adjustments, and require no exactitude. If we proceed to scan the tuning dial we will find that such stations as London National, Radio-Normandie, etc., can be picked up at a good strength, whereas the top end of the dial will be quite dead. We must endeavour to remedy this variation in signal strength, and this we can do by adjusting the medium-wave oscillator tracking. The "tracking" or "padding" condenser may easily be traced out, and

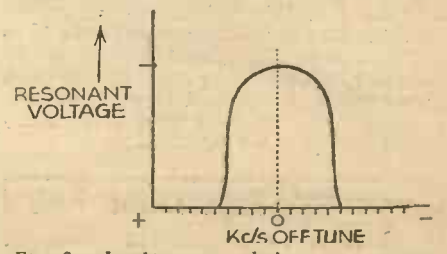


Fig. 3.—In this curve, which is a compromise between those shown in Figs. 1 and 2, the selectivity and frequency response are excellent.

TRIMMING SUPERHETS

(*Continued from previous page*)

will be found associated with the oscillator grid coil and tuning condenser. A few minutes' careful manipulation of this control with the tuning pointer in different positions will enable the correct amount of tracking to be found, thus developing a constant signal strength over the entire medium-wave tuning range. We have purposely avoided any mention of the long waveband, since this can be left to the last. Our receiver is now partially aligned, and the next step is to bring the I.F. stages on to their correct frequency. This is undoubtedly the most delicate part of the whole tuning, and requires a certain amount of deft handling. We are all familiar with the position of the main tuning condenser when tuned to different stations, and we can tell, for instance, whether London National or Regional is too high or too low. If the dial is calibrated in frequency or wavelength this will be easy, but if the dial is calibrated in degrees the reader must use his own judgment in ascertaining the correct position of the various stations covered by the scale. Suppose we choose London Regional for this purpose, and that this station is nearer the top end of the scale than it should be, this will indicate that the I.F. is too low, and all the trimmers should be slightly loosened so that the I.F. is increased. This increase in frequency must be found by experiment, and when it is found the London Regional will be on its correct setting.

Should the London Regional have been too near the bottom end of the medium waveband, indicating that the I.F. was too high, then all the I.F. trimmers should be screwed down slightly. After bringing the London Regional to its correct position the I.F. trimmers will be slightly out of tune, and will require a little readjustment to bring the signal strength up to its maximum. It should be realised that although we have now actually found the I.F. in figures, we do know that the I.F. stages are tuned to the correct frequency. Having correctly positioned the London Regional, all the other stations will automatically be in their respective positions.

I.F. Coupling

We are at last in a position to adjust the frequency response and the selectivity of the set as mentioned earlier. The acuteness of the selectivity desired depends upon the constructor. The present selectivity can be increased by loosening the coupling between the primary and secondary winding of one or more of the I.F. transformers, and decreased with a subsequent improvement by tightening this coupling.

Long Waves

All that remains now is to tune the long-wave range, and this is only a matter of adjusting the long-wave padding condenser for the best results.

Having fully observed all the points discussed in this article, the reader will find he has satisfactorily negotiated all the difficulties of "ganging" a multi-valved receiver without the aid of precision instruments, and will, I hope, agree that he has overcome even what seemed the most insurpassable obstacles.

A Single-valve Pre-selector

A Novel Unit for Improving the Selectivity of a Receiver

FOR short-wave reception there are very few receivers in use nowadays with a performance which would not be improved by the addition of a pre-selector, such an addition greatly improving both selectivity and signal-to-noise ratio.

The unit to be described is capable of providing amplification down to below 10 metres, and is provided with reaction by the use of a special circuit (Fig. 1) incorporating a triode-pentode valve. The two sections of this valve are used as a pentode H.F. amplifier, and separate reactor valve respectively. A separate H.F. pentode and triode could be used, but the cost would be greater and connections would not be so short.

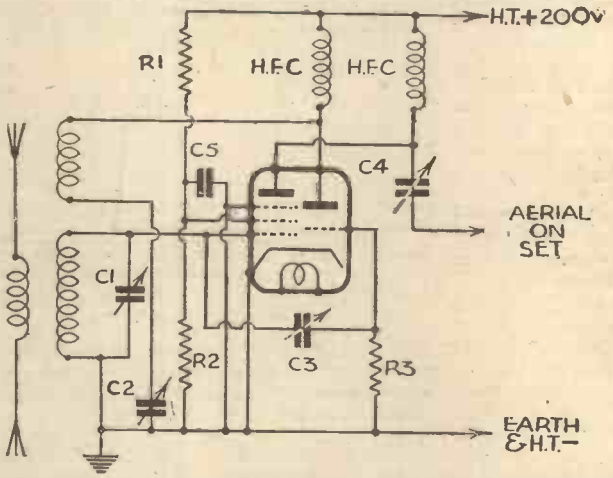


Fig. 1.—Circuit diagram of the pre-selector unit. Component values are: R1—25,000 Ω, R2—100,000 Ω, R3—500,000 Ω, C1—160 m.mfd., C2—200 m.mfd., C3 and C4—30 m.mfd.

Either a mains or a battery valve may be used, the choice depending on the facilities available to the constructor. A mains type valve will, of course, give greater amplification, but if such a valve be used, care must be taken to see that the H.T. supply is well smoothed.

Construction

The construction of the unit is a simple matter, but it should be noted that in choosing a layout, care must be taken that interaction does not take place between the two H.F. chokes. They should be mounted at right angles to each other, or a screened type may be used.

The layout is by no means criticial, provided that the usual precautions with regard to short wiring are taken; the layout shown in Fig. 2 has been tried, and found to give excellent results. It must be remembered that the top cap of a triode-pentode is the control grid of the pentode section.

Operation

The operation of the unit is simple. The aerial is removed from the receiver and connected to the appropriate terminal on the pre-selector. The output terminal of the unit is then joined to the aerial terminal of the receiver with a short piece of wire. Signals may now be tuned in on the receiver, and the pre-selector tuning dial is then rotated until maximum strength is obtained. Both signal strength and selectivity may then be improved by advancing the reaction control on the pre-selector.

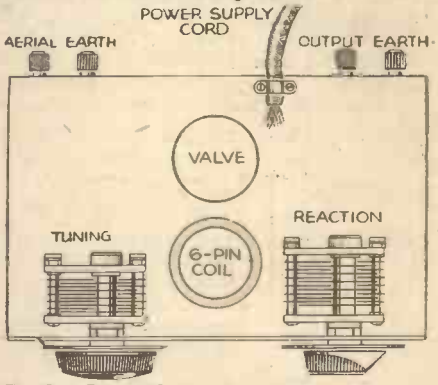


Fig. 2.—Suggested layout for the pre-selector unit described in the text.

PROVINCIAL TELEVISION

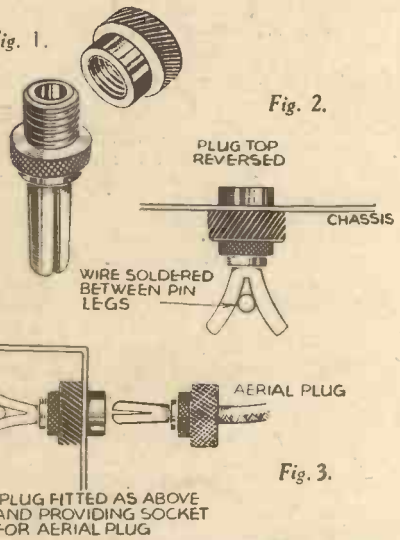
AT a recent function in the Midlands, when the question of provincial television was raised by an after-luncheon speaker, it was reported that discussions between the B.B.C. and the Post Office had delayed the introduction of television into Birmingham via the medium of the London to Birmingham co-axial cable. This has now been denied, and it is stated that the commencement of any television service in Birmingham or elsewhere is dependent on the results of the experimental transmissions in the London area, and the experimental period in question is not yet complete. The question of rental charges will, of course, have to be settled between the B.B.C. and the Post Office, but since the former is such a good customer of the latter there is little doubt that satisfactory terms to both sides will be arrived at. With the combined effort that is now being made to expedite television's growth it is quite conceivable that television in the provinces will come sooner than is expected, but organised on lines somewhat different from those laid down in the original television committee's report, owing to the increased knowledge on the main issue in question, namely, station service area coverage.

A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA — READERS WRINKLES — THE HALF-GUINEA PAGE

Improved Wiring Connectors

EFFICIENT midget stand-off insulators for supporting under-chassis wiring, resistor and condenser-ends, etc., can easily be made from the type of wander-plug



Midget stand-off insulators and wiring connectors made from wander plugs.

shown in Fig. 1, which is obtainable very cheaply.

The head is taken off and reversed, and the pins are opened wide enough to accommodate the wire to be supported (Fig. 2). A hole is drilled in the chassis about the same size as the head, which is then fitted. This can be tapered in order to fit tightly, or the chassis can be heated and the head pushed in.

As the diameter of the hole at back, for the wire, is about the same as the diameter of the pins, they may be used as sockets for the aerial and earth plugs, etc., in the manner shown in Fig. 3.—J. W. HORWOOD (Stones Green, Harwich).

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, Strand, 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.

SPECIAL NOTICE

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

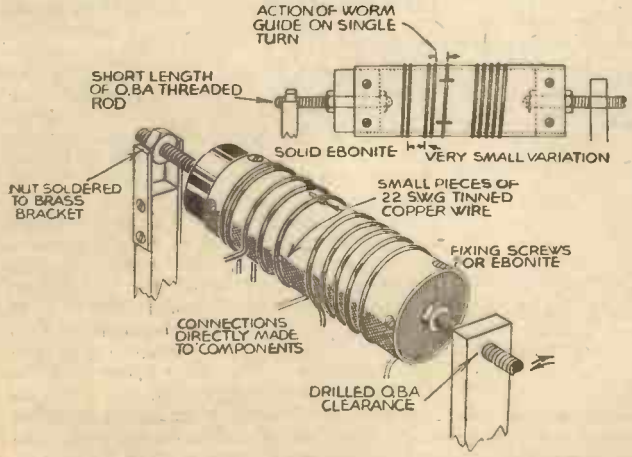
A Micro-inductance Adjuster

I HAVE often found it necessary to adjust the coupling of various coils by altering the spacing of one or more end turns only adjacent to the other inductance, and it occurred to me that by constructing the simple arrangement shown in the sketches, I should be able to make tests on the higher frequencies without the tedious hand adjustment previously required.

The coil assembly shown is slightly exaggerated to clarify the action, but it will, no doubt, prove sufficiently explanatory.

The worm guide pieces were made by threading lengths of 22 tinned copper wire into the former, cutting off short as illustrated; these serve very well for the small adjustment necessary, but it is advisable to connect the coil to be controlled as direct as possible to the condenser or components, not only for the reduction of H.F. impedance, but for extra rigidity.

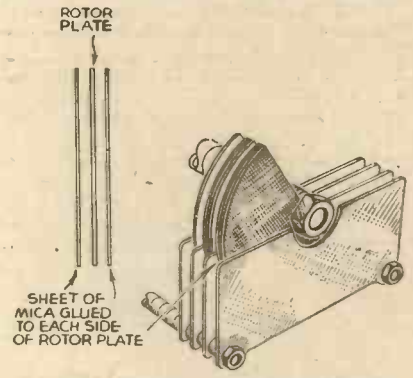
A maximum and minimum stop should be arranged in the panel control, otherwise the coil turn may slip.—L. A. WRIGHT (Southend).



A novel coil assembly to facilitate the fine adjustment of inductances.

Increasing the Capacity of a Condenser

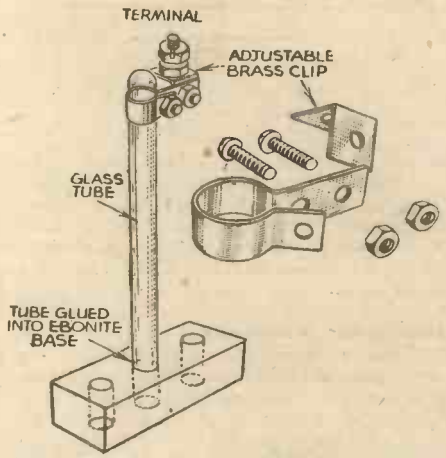
THE accompanying sketches illustrate an idea for increasing the maximum capacity of a variable condenser. A thin sheet of mica is glued to each side of the rotor plates, and of course, as the rotor plates are turned between the stator plates, the mica plates are turned with them. It may only be necessary to treat one rotor in this manner, although each plate can, of course, be treated if required. Naturally, the minimum capacity is also raised, but the range of the condenser can, in this manner, be suitably adjusted.—A. E. STAPLETON (Derby).



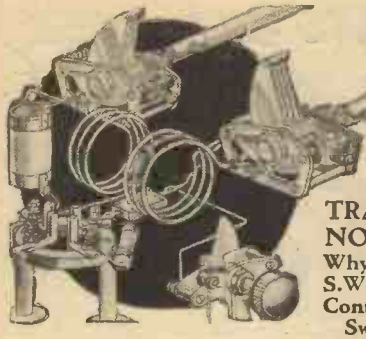
A simple method of increasing the capacity of a condenser.

Stand-off Insulating Pillars

THE accompanying sketches show a novel form of adjustable stand-off insulating pillars which are made as follows: Pieces of ¼in. diam. glass tubing are cut to the required lengths by filing gently with a three-cornered file. The ends of the tubing are sealed by heating over a gas jet, keeping the tubing rotating while the heat is being applied. The brass strip for forming the clips was obtained from old flash-lamp batteries, and the nuts and bolts and pieces of ebonite for the bases were taken from old receivers.—G. BROOKS (Darwen, Lancs.).



Pieces of glass tubing, and a few odds and ends are used for making these efficient stand-off insulating pillars.



Short Wave Section

TRACING AND CURING UNUSUAL NOISES IN SHORT-WAVE RECEIVERS

Why Background Noises are More Pronounced in S.W. Sets: A Surprising Case: "Dry Joints: Bad Contacts in the Tuning Condenser: Condenser Drives: Switch Faults. By THE EXPERIMENTERS.

SOME of our more experienced readers will perhaps be inclined to scoff at the title of this week's article. They will say that noises in a short-wave set (or should it be "from the speaker attached to a short-wave set"?) are caused by precisely the same factors as those affecting a broadcast receiver. Up to a point, we are bound to agree with that idea, but the matter cannot be dismissed as easily as that. Many of the apparently minor faults that produce ear-splitting noises when listening on the short waves are insignificant when the same set is tuned to the medium- and long-wave bands.

The main reason is that the high frequencies representing short-wave signals are both elusive and acute, if such words can be used. That is, a capacity of a very few micro-microfarads in the H.F. circuits of a S.W. set is sufficient to allow the bulk

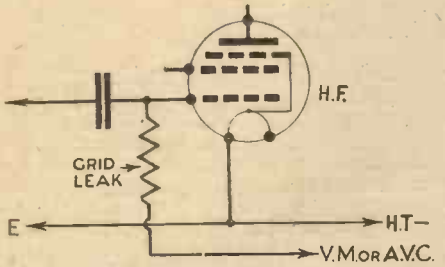


Fig. 1.—When bias is fed to a valve in this manner a faulty leak can cause a noisy background.

of the signal energy to leak away. But put the same capacity in a series circuit—between the aerial and the aerial terminal, for instance—and it will probably have no apparent effect. This is because it offers so little impedance to the high frequencies.

Resistance Variation

Another example is to be found in the grid leak of a normal detector circuit. Suppose that the resistance value of the leak varies within a few per cent. because of a slight defect. It would be unlikely to make any difference when the set was tuned to the broadcast bands, whereas on short waves it would cause impaired reception and, in all probability, a constant crackling noise. A fault of this nature is often still more troublesome when the grid-leak resistor is used for variable-mu or A.V.C. feed in the grid circuit of an I.F. or H.F. valve, as shown in Fig. 1. The noise caused generally takes the form of a low-pitched "sizzling," but it can vary considerably, according to the seriousness of the component fault and the exact nature of the circuit.

Then the background noises caused by bad contacts between valve or coil pins and their sockets can attain serious proportions. An example of what is meant was afforded in a fairly simple all-wave set that we recently had on test. Reception of the broadcast bands was just impossible, unless you count a very faint and distorted signal that could be heard from the local station. On 31 metres the same set gave a fairly good account of itself, apart from a constant crackling noise that was unaffected by disconnecting the aerial. Systematic test showed that the only fault was a dirty grid pin on the H.F. pentode. The short-wave signals were able to "jump" the unintentional insulation, but the resistance of the dirt film varied and so gave rise to the noise.

Believe It or Not

A far more unusual cause of noise was discovered some time ago by one of our number who was using a sensitive short-wave superhet in the drawing-room. It was on a small wooden table near the window, and gave a very good account of itself when everything was quiet. But immediately anybody walked across the room or a heavy lorry passed by on the main road just outside there was a terrific crackling noise. You will probably say that was obviously a case of a loose contact inside the set. We thought so, too, but it wasn't, because when the set was taken into the workroom for thorough test its behaviour was exemplary. The cabinet was bumped, the whole set shaken—without upsetting reception in the slightest.

When we tell you the reason you will probably be incredulous. Nevertheless, it was eventually found that the whole trouble was caused by a beaten-copper fruit dish and a pair of nutcrackers! Yes, it's true. You see, the fruit dish was on the shelf underneath the occasional table on which the set was originally placed, and the nutcrackers were inside it. The slightest vibration caused the crackers to move slightly inside the metal dish, with the result—presumably—that a small voltage of varying degree was produced. If you doubt this, you can make a fairly simple test by placing your S.W. set, preferably without earth connection, on a metal-topped coffee table; then touch

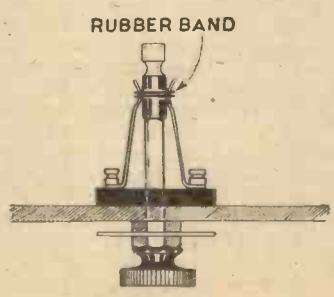


Fig. 3.—An old push-pull switch may be adjusted as shown here to remove noises due to imperfect contact.

the table top with a coin and listen for the interference.

Soldered Joints

It is not unusual to find that badly-soldered or so-called "dry" soldered joints are responsible for pronounced background noises. That is why we always advise those few who never seem to be able to master the simple knack of soldering to rely on tight terminal connections. A properly-soldered joint looks clean and white after being wiped over with a duster; if it is dirty, or if the surface of the solder appears to be cracked, the joint is probably "dry," which means that the two parts soldered together were not perfectly clean before the iron was applied, or that the flux was unsuitable. Any properly-soldered joint should withstand a firm pull, and a good test is to grip the wire and pull hard, without bending or kinking it. If it breaks down under this treatment, re-solder.

Noises When Tuning

The tuning condenser can produce weird noises if the connection between the moving vanes and the corresponding terminal is not perfectly sound. There is little likelihood of trouble when using a modern condenser of reputable make, because there is generally a good rubbing contact, a spring-loaded contact, or a point contact by means of an adjustable pointed end-screw. But if you are using an old component and crackling is noticed when tuning, check over the method of making connection. If there is a springy

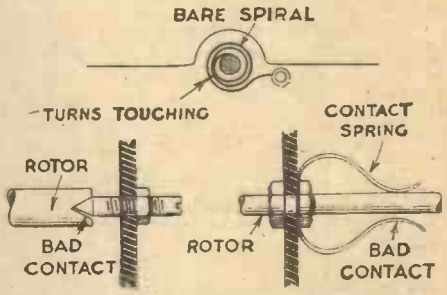


Fig. 2.—Condenser faults are illustrated in the above diagrams.

plate pressing against the rotor, see that it really does press against it, and that both surfaces are clean. If an end connection is used, see that the tip of the adjusting screw is clean and free from grease. If possible, without causing the vanes to touch, tighten it slightly.

Where a pigtail connection is used, there is not much probability of the electrical connection being other than good, but if the pigtail consists of a bare spiral of brass strip another form of trouble might present itself. This is due to the turns of the spiral touching each other when the rotor is turned. One remedy is to shorten the spiral, making it a single coil, and another is to replace the bare strip with a short length of insulated flex. In every case, the connection should be as short as it can be made without its being strained at the full-out or full-in position of the vanes. Some of the points referred to above are illustrated in Fig. 2.

Another possible source of trouble that is so well known as to be neglected is dirt between the condenser vanes. On the longer waves this has little or no effect in dry weather, but on short waves it can be troublesome, especially in damp weather when the dust is lightly moistened. An

(Continued on page 711)

VALVE CHARACTERISTICS—6

Valve Curves and Undistorted Output are Dealt With in this Article.

VALVE manufacturers publish at least one characteristic curve for each valve they manufacture, and it is a continuous source of amazement that in 1938, more than fifteen years after the birth of home construction, a valve curve is looked upon by many as a device for estimating values of grid bias.

A moment's reflection must show that no manufacturer would use such a ponderous method as a curve when a grid bias table would be so much more convenient. It is not suggested that readers of PRACTICAL AND AMATEUR WIRELESS are so misinformed, but there is a wealth of information to be read from a valve curve, and this article has been specially written with a view to showing really what can be learnt from a curve and the best way of making full use of it.

Small Power Valve

Fig. 1 shows a typical curve, and portrays the characteristics of the Cossor 220 P; with no other information at our disposal, let us see what may be learnt from it. The nomenclature of the valve includes the expression "220," generally speaking, the first figure is the voltage, the second the amperage, while the nought in the third place indicates that there is a decimal point before the second figure, thus we may assume that the valve is rated at 2 volts .2 amp. Admittedly this form of coded rating does not always hold good, but it does in perhaps nineteen cases out of twenty.

A glance at Fig. 1 will show that the Va 100 curve strikes the 0 grid-volt vertical line at 15 milliamps, so the valve obviously falls into the small power valve class. To ascertain the slope it is necessary to find the change in anode current brought about by making the grid—1 volt (keeping the anode voltage constant at 100 volts). This was fully discussed in an earlier article. To note the change brought about by the addition of 1 volt bias would be rather impracticable, but as the curve is sensibly straight between —2.5 and 0, this change will serve our purpose very well. It may be seen that with the addition of this bias the valve passes approximately 9.5 milliamps which, subtracted from 15 milliamps, gives a change of 5.5 milliamps; slope is found by dividing the change in anode current by the change in grid volts which gives us 2.2 mA/v, which is substantially correct, the published figure being 2.25 mA/v.

Readers who have followed this series will remember that impedance is measured by taking the anode current at 90 volts and 110 volts; as curves are not given for these voltages, the 75 volt curve, and 125 volt curve, must be employed. It will be noted that at 0 bias the change in anode current between Va 75 and Va 125 is 12.5 milliamps; the change in voltage is 50, which divided by 12.5 equals 4. As the current is in milliamps the answer will be in thousands of ohms, thus we have worked out the impedance to be 4,000 ohms, which is correct.

Undistorted Output

As the valve under discussion is a triode, the number of characteristics is, of course, limited, but there is the question of undistorted output. This cannot be read directly from this type of curve, but a reasonable estimate can be formed in the following manner: 120 volts is the normal operating condition for a battery set, so the 125-volt curve will suit our purpose, and the grid bias must be decided upon; 4.5 volts would give the most output but the anode current would be too high. The same may be said of 6 volts bias, so the next practical tapping would be 7.5 volts, at which condition the valve will pass 6 mA. 6 mA × 125V= 750 milliwatts. Now the efficiency of a triode is about 20 per cent., so the undistorted output will be 20 per cent. of 750, which is 150 milliwatts. Undistorted output estimated in this way is necessarily very approximate, but is nevertheless a useful guide.

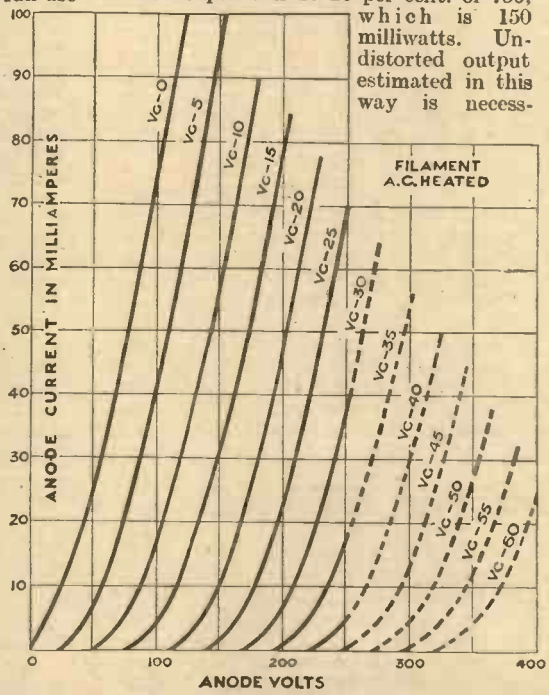


Fig. 2.—A typical anode-volts/anode-current curve of a large triode output valve.

The curve at Fig. 1 is plotted between grid volts in the horizontal direction, and anode current in the vertical direction, and is known as grid-volts/anode-current. The curve at Fig. 2 has a radically different appearance because it is plotted with anode volts instead of grid volts in the horizontal direction; it is referred to as an anode-current/anode-volts curve, and is very much more informative.

For the measurement of slope it is inconvenient to approximate the position of the Vg—1 curve, so we will measure the slope by applying —5 volts; it is conventional to measure slope at Va 100, and reference to Fig. 2 will show that the application of—5 volts gives an anode current of 40, and zero bias (Vg 0) gives an anode current of 75 milliamps. The change in anode current is thus 35 milliamps for a change of 5 volts on the grid; 35 ÷ 5 equals 7 mA/v, which is the slope.

Impedance

Impedance is measured in exactly the same way as described above, values of anode current for two values of anode voltage being read off the Vg 0 curve. It will be noted that part of this family of curves is shown dotted, the explanation of which is that it is conventional to show curves in this way which exceed the maximum anode voltage rating of the valve, thus it is possible to see from the curve that the maximum anode rating for this particular valve is 250 volts.

Anode-volts/anode-current curves plotted for pentodes and output tetrodes may be read in exactly the same way, with the exception of impedance, which would be quite meaningless as the curve is taken under D.C. conditions and the static value shown bears no relationship to the working impedance, which is very greatly influenced by the behaviour of the screening grid when under A.C. conditions.

Screen-grid Valve

Fig. 3 shows the curve of a typical screen-grid valve. Though this class of valve has been almost entirely replaced by the H.F. pentode, it is nevertheless worthy of inclusion owing to the peculiar traits of the class of valve that it represents. The most informative method of approach is a "tour" along one of the curves starting from the left-hand side, bearing in mind very carefully that the screen is fixed at

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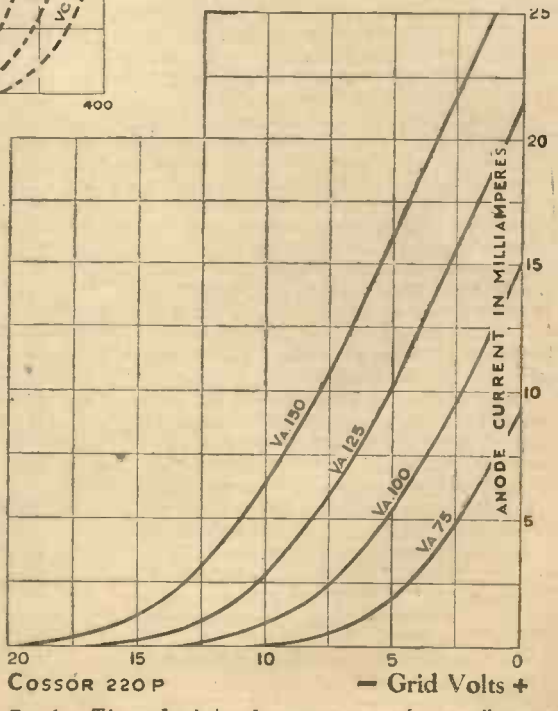


Fig. 1.—The grid-volts/anode-current curve of a small power valve.

VALVE CHARACTERISTICS—6.

(Continued from previous page)

60 volts irrespective of any other voltages. The curve plotted for Vg —.5 will suit our purpose admirably. Commencing at 0 Va no anode current passes, as would be expected, but as Va gradually increases to 10 V a very rapid rise in anode current takes place until it reaches just over 1 mA, after which a further *increase in anode voltage* brings about a fall in anode current until at 40 volts the anode current has fallen to zero. A further increase to Va 55 causes a flow of anode current to recommence, but in the reverse direction; in other words, the anode is giving off secondary electrons instead of acting as a collector of primary electrons. The whole of that portion of the curve between Va 10 and Va 55 is known as the negative resistance characteristic because an increase of voltage brings about a decrease in current.

Grid Voltage

After the Va 55 mark has been passed the reverse current gradually falls off until at 60 volts it reaches zero, after which it begins to increase in the normal direction so rapidly that the increase from Va 60 to Va 90 brings about a large increase of 3.6 mA. This sudden increase denotes that the valve has a low impedance on this part of the curve, and if it is measured in the manner described above at Va 77 it will be seen that this valve working at Va 77, Vsg 60 and Vg —.5 has the astoundingly low impedance of 8,000 ohms, which is an interesting comparison with the impedance at Va 200, which is 200,000 ohms, the voltage on the two grids being the same in each case.

Continuing our "tour" from Va 90, it will be seen that a further increase of anode voltage brings about a gradually decreasing change in anode current until the curve flattens out at about Va 115.

Anode Swing

If the valve is worked at Va 200 it will permit an H.F. swing of 85 volts in each direction, assuming that the anode load is infinity, but in practice this is greatly decreased by the comparatively low value of the anode load. If a really high impedance coil is used allowing the valve to develop a gain of, say, 500, it is obvious that the maximum input to the grid will be 1/500 of the permissible anode swing; thus it is apparent that the valve easily overloads. With such a coil the permissible anode swing would be about 100 volts, therefore the valve would commence anode rectification when the input to the grid exceeded ⅕ of a volt. Admittedly the valve is intended to be worked at —1.5 grid volts, but this is to prevent the valve from passing grid current when the grid swings in the positive direction. The anode swing is, however, slightly increased, and under this, the proper working condition, the grid acceptance would be increased to about ¼ of a volt. Note particularly the condition which would obtain a Va 150 when the handling capacity would be less than half, owing to the proximity of the working point to curvature.

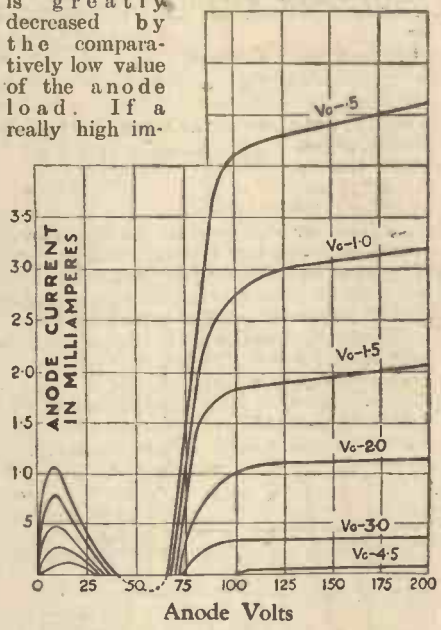


Fig. 3.—A typical screen-grid valve curve, the peculiar shape of which is fully explained in the accompanying article. It is not usual to draw a curve when it falls below zero, but the negative current of the Vg —.5 curve is shown dotted.

The H.F. pentode has no dip in its characteristic, and can handle a very much greater anode swing under both static and actual working conditions. Furthermore, the curvature when it does commence is very gradual, and rectification is not, therefore, troublesome until the valve is handling a really large anode swing.

Variable-Mu

There are two other types of curve met with in general practice which are not illustrated. The first of these is the grid-volts/anode-current curve of a variable-mu valve, about which a great deal has been written in past issues of this journal; it is sufficient, therefore, to say that its significance is the same as that of any other grid-volt/anode-current curve, except that it shows the gradual way in which the anode current is controlled by the grid voltage, and that grid bias may be raised to a very high value for the purposes of volume control, without reaching the point where anode current stops.

The other type of curve is that associated with the frequency changer, which brings in a number of external considerations not derivable from the curve; consequently, this will be dealt with in a future article dealing with the correct usage of this class of valve.

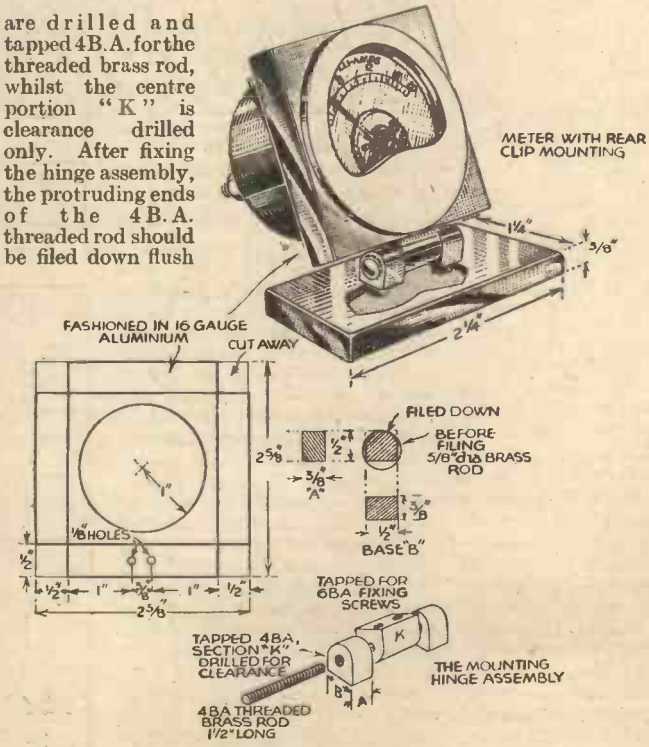
AN ADJUSTABLE METER STAND

THIS meter stand may be constructed entirely out of 16 or 18 gauge aluminium or brass, or alternatively, the meter mounting may be fashioned out of aluminium, whilst the base can be of brass either solid or filled with lead.

In the first instance the base will have to be designed along the same lines as the meter mount, allowances being made for the flanges shown in the pictorial representation as ⅜in. in depth, and as in this case also, lead or any suitably heavy metal will have to be incorporated in the base, these flanges should be made with an extra 3/16th inch on the depth for "turning in" to secure the weight piece. If brass is to be used, the same will apply, unless, of course, this is solid, when it's own weight will be found sufficient.

After cutting and bending the parts, they should be squared and filed, removing the burrs particularly liable to occur with aluminium.

It will be seen from the illustrations that the hinge assembly is modelled from a length of ⅜in. brass rod, and a little extra care should be taken here to ensure a neat finish. Two 6B.A. csk hd. screws secure the section "K" of the hinge assembly to the bottom flange of the meter plate, these being fixed through the two ⅛in. holes shown, and the end pieces of the hinge, both of which are drilled and tapped in their respective bases "B" for fixing to the meter base with 6B.A. screws . . . are drilled and tapped 4B.A. for the threaded brass rod, whilst the centre portion "K" is clearance drilled only. After fixing the hinge assembly, the protruding ends of the 4B.A. threaded rod should be filed down flush and then soldered, again filing away excess solder and obtaining a smart finish. Another way, of course, is to use a long 4B.A. round-headed brass screw including a spring washer, but this is not quite as satisfactory as it is liable to work loose. This method is shown in the illustration.



Details of a useful stand for test instruments.

Although the meter shown is fitted by means of the "back strip" principle, with the ends slightly straightened out to grip the flange channels, in the event of the use of meters with fixing holes, the mounting plate may have to be made slightly wider to permit the fixing of the clamping nuts, or, again, the screws may be soldered where brass is used.

The hole measurements for the meter will be found to suit average requirements, but they can be altered as desired.—W. R. H.

SHORT WAVE SECTION

(Continued from page 708.)

obvious method of cleaning is by means of a pipe cleaner, but this might be too thick for some compact condensers with closely-placed vanes. For them, a strip of rag can be used, whilst a strip of thin card is better than nothing.

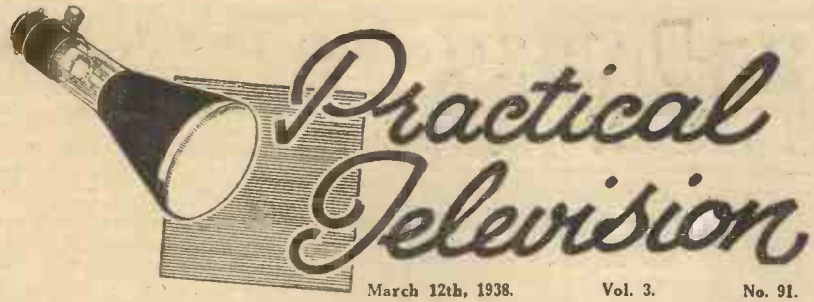
Friction Drive

It should be pointed out that the condenser itself might not always be responsible for noises that are heard when tuning. Sometimes the drive sets up an "interference signal" due to a form of electrolytic action between two metal friction discs, or between the brass pulleys and the steel endless band that passes over them. A test can easily be made by temporarily removing the drive and operating the condenser directly by means of a knob on the rotor spindle. If the drive is responsible, the first step should be to clean the rubbing parts as completely as possible. After that they may be lightly lubricated with a thin oil containing colloidal (very finely divided) graphite. A small quantity of this can be bought for a penny from any garage, and it is sold under the name of graphited upper-cylinder lubricant.

Switch Trouble

Switches are always potential sources of noise, whether they are used for wave-changing, radiogram change-over or on/off switching. If any of these is suspected an easy method of checking is by short-circuiting the switch with a short length of wire. When the faulty component has been found it might be possible to repair it, or a replacement might be required. There is usually very little that the constructor can do with a defective Q.M.B. component, but if it is new the makers will generally replace free of charge. When the contacts are exposed any strained arms can usually be bent back into their original positions or even replaced. A useful tip that can be applied to certain push-pull switches is to wind a rubber band round the contact arms, as shown in Fig. 3. Before repairing it is as well to clean the contacting surfaces with a piece of the finest glasspaper; a "tool" that is often useful in this respect is one of those glasspaper strips used for manicuring. In this case the glasspaper is glued to a thin strip of stiff card.

There is on the market a preparation that is claimed to clean contacts without rubbing, simply by putting a drop on to the dirty surfaces. Many service engineers use it with success and would probably sell a small quantity to a customer. It is fairly expensive when bought in the quantities in which it is packed, so the average constructor would not find it worth while to buy a full bottle.



March 12th, 1938. Vol. 3. No. 91.

An Interesting Experiment

AS part of the television programme transmitted recently from the Alexandra Palace was an excerpt from the play, "The Melody That Got Lost," now running at the Phoenix Theatre, London. The whole of the cast, as well as part of the scenery, went to the B.B.C. station to give a Saturday afternoon broadcast, with the result that the normal theatre matinée was cancelled. The theatrical management, however, arranged with the Baird Company to stage a demonstration in the theatre itself, and an announcement in the programmes made it clear that any member of the public desirous of watching the reception could apply at the Box Office for free tickets which, however, were strictly limited. A reflector-type dipole aerial was erected on the roof of the Phoenix Theatre, and the feeder cable passed down one of the wings to be linked to two standard T5C home receiving sets. These were positioned in the front row of the stalls, one on each side of the centre gangway, so that members of the audience seated in the stalls were able to watch the received pictures in comfort. The experiment proved most successful, and it was interesting to see reproduced in miniature on the television screens the full play action which normally occurred on the stage of the theatre itself. No trace of interference was observed, while the cathode-ray tube brilliance was of such a high order that part of the auditorium lighting was left on during the whole of the programme.

Set Standardisation

AS was pointed out in these columns recently, the television standard now used by the B.B.C. at Alexandra Palace is to remain substantially unaltered until the end of 1940. This fact not only embraces the degree of picture definition which now stands at 405 lines, and the pictures per second (50 frames interlaced to give 25 complete pictures per second), but also the ratio of the full carrier modulation given to synchronising and vision signals (30 per cent. and 70 per cent. respectively), together with the nature of the vision signal, that is, an increase of modulation corresponds to a change from low to high picture brightness intensity, while D.C. light is included in the radiated picture signal. It must not be inferred, however, that at the expiry of this three-year period television sets then in use will not be operable. There seems little likelihood of any sweeping changes for some time to come, and any modifications or improvements carried out at the transmitting end will only necessitate slight receiver adaptations to enable them to accommodate the alterations. This knowledge should reassure any potential television set purchasers or builders, for even the period of time mentioned may in some cases have been thought too short to cover the expenditure involved in television receiver costs. The points just mentioned, however, should allay any fears in that connection.

Bright Pictures

BEFORE the development of modern cathode-ray tubes enabled really brilliant television pictures to be reproduced on their screens, several schemes were suggested and tried in an effort to increase the picture light value. In one of these the C.R. tube was purposely operated at a relatively low anode voltage so that the picture traced out was quite dim. This image was then focused through the medium of an appropriate lens on to a photo electrically sensitive surface. The resultant electron image formed at this surface was in turn multiplied or electronically intensified through the agency of multipliers and an electron optical system, to be projected finally on to a second fluorescing screen surface. In this plane the final picture is very bright and suitable for all normal viewing purposes. The main advantage of the scheme was said to lay in the saving of the initial cathode-ray tube auxiliary equipment owing to the low operating voltages required. It seems certain, however, that this would be offset by the additional complication of the alternative arrangement, and the added cost of the extra electronic apparatus. On the other hand, any scheme which brings about a form of light intensification needs careful study as it may be applicable to big screen television. Inadequate screen brilliance is one of the prime difficulties that have to be faced in this work, although the present pictures are a vast improvement on those seen a few months ago.

Television at the B.I.F.

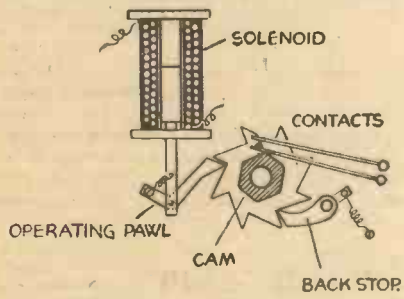
ALTHOUGH the attendance of visitors at this year's British Industries Fair seemed to be less than last year, the two firms showing television sets—Bairds and R.G.D.—were always crowded during the periods that television transmissions were on the air. In spite of the enormous number of television demonstrations which have been staged in exhibitions and radio stores since the Alexandra Palace opened, there were still people calling on the stands and stating that they had not yet seen television, and they departed amazed at the results achieved with present equipment. A reflector type dipole aerial with a quarter-wave spacing was erected on Olympia's roof, the supporting mast being strongly stayed in the same position as that employed for Radiolympia in 1937. A feeder cable ran directly to the Baird stand, and from here another feeder link was taken to the R.G.D. stand. Since the exhibition embraced the operation of nearly every form of electrical device, traces of interference could be seen on the cathode-ray tube receiving screens, but the pictures were of excellent quality. Three types of sets were featured on the Baird stand, while R.G.D. had two; one of the latter being the new sensitive superheterodyne receiver priced at 75 guineas, giving sound and vision only, and whose design is based on the reception experiments carried out at the R.G.D. works at Birmingham. Another new product shown for the first time was the short Baird "cathovisor" cathode-ray tube type 12.M.W.2. This has almost the same electrical characteristics as the 12.M.W.1, but is very much shorter, although the screen diameter is maintained at 12in. This is a distinct advantage for incorporation in sets using direct viewing for a 10in. by 8in. picture size, and being all magnetic in operation, and marketed separately, should prove of value to set manufacturers engaged on the new season's designs.

The Baird Colour Television Transmitter being used to transmit a 'close-up' portrait.

The British Long-Distance Listeners' Club

Remote Control

THE subject of remote control of a receiver is one which is continually arising, and many are the ingenious ideas which are from time to time suggested for carrying out the operation. The main requirements are to switch a set on and off from a distance, but even such an apparently simple matter is not easily carried out. The use of relays is one method of operating a circuit from a distance, but this is sometimes expensive and very often troublesome to adjust, whilst the current flowing through the relay after it has been operated in either one direction or the other may sometimes be difficult to supply. Automatic trip mechanisms and so on are out



A simple remote control device.

of the question for the ordinary constructor, and probably the simplest scheme is that illustrated in the accompanying sketch. Here a simple solenoid, which anyone can wind easily on an ordinary bobbin such as that supplied with standard wire, is used to cause an iron plunger to travel in either a vertical or horizontal direction depending upon the general design of the apparatus. This, by means of a pawl, rotates a toothed wheel upon which is an ebonite cam. In the illustration, this is an ordinary hexagonal nut, and alternate movements close and open the two spring contacts shown near it. These contacts may be joined to mains leads or to ordinary L.T. leads, and thus by means of an ordinary bell push or similar contact a current may be passed momentarily through the solenoid to switch a set on or off at a distance. A component built on these lines was at one time on the market, but the ordinary handyman should not find it difficult to make up a similar device, and when properly made and adjusted it works very nicely.

Auto. Tuning

THE idea may be duplicated for tuning automatically to either of two stations, the contacts in an open position leaving two pre-set condensers in parallel across a coil tuned to one station, and the contacts closed shorting one of the condensers and providing the other station. Such a scheme could be duplicated by using more than one solenoid, or by employing an oddly-shaped cam which would operate different contacts, the selection of the appropriate contact being carried out according to the number of impulses given to the solenoid. Thus, one push would provide the Regional, two pushes the National, three pushes another station, and so on. Carrying the idea further, a motor could be utilised for rotating the gang condenser, on the lines mentioned in the article on push-button tuning in last week's issue, and pressure on a button could be made to start the motor, using a slow drive, and with a remote volume control in circuit. The stations could thus be heard as the condenser rotated, and when a desired station was heard the pressure on the button could be released to leave the set tuned to that station.

Gramo. Faults

MANY members appear to experience difficulty when building a mains radiogram, one of the main troubles being hum and instability. There are several causes of this and it appears almost impossible to lay down a definite rule regarding the method of curing the trouble. In some cases the pick-up leads and all leads associated with them inside the receiver may be screened (with the screening connected to earth), whilst in other cases this will prove ineffective. The casing of the gramophone motor should be earthed, and in some cases it may be desirable to place a large sheet of iron immediately under the motor board to screen the motor from the pick-up. Even then it may be found that it is impossible to remove hum. It should therefore be borne in mind that one cause of hum which we think has not been mentioned before in these pages is that arising from the use of a motor-board made from wood which is too thin. Some constructors imagine that because plywood is employed it is sufficiently strong, but if this is not sufficiently thick the vibration from the motor itself will be transmitted to the board carrying it and in this way the pick-up and record will all vibrate at a low frequency, in most cases the frequency of the mains supply. The same thing will then occur as in the case of a loudspeaker reproducing hum, namely the hum will be fed back to the set, will affect the motor board (which is, of course, vibrating at the same frequency) and thus the hum will rise to quite a high level. Floating the motor by means of large slabs of thick rubber between the casing and the motor-board may be a help, but a thick motor-board is desirable.

TELEVISION TOPICS

A Cable Development

IT has been stated quite freely for a long time that the extension of television to the provinces is very dependent upon the service inauguration of the Post Office coaxial cable which is now spreading through the centre of England, and branch linking many of the important industrial cities. This point of view may have to be modified, however, if it is found that the capacity of the cable is overtaxed by the rapidly increasing use of telephonic communication between the large cities. The cost of leasing the cable to the B.B.C. may then prove uneconomical to the Corporation, which is always pleading about the leanness of its finance. Because of this, added interest is lent to the experiments now being undertaken by Post Office engineers in connection with what has been termed the twin-wire cable. This has been employed for "outside broadcasts" within a well-planned London boundary area. It is known that this cable costs much less than the co-axial cable, and that its technical capacity to carry all the electrical frequencies needed for television pictures has been abundantly proved. It may well be found to be the means by which potential viewers outside London will ultimately receive television programmes from Alexandra Palace. Any extension of the service could certainly begin on these lines, and later, when television becomes widely popular, regional programmes will be started, and a link with London needed for use on national occasions.

Any scheme which will cheapen programme distribution costs is a valuable asset to television, which already absorbs a considerable sum of money for maintenance and running costs. The ultimate method of providing wider programme facilities is, of course, by no means settled, and this accounts for the delay in the provinces, where people are showing such a marked interest, and undertaking many experiments in an effort to achieve reliable long distance ultra-short-wave reception.

For Army Purposes

THE value of television signals is becoming very apparent to certain Army units, especially those responsible for maintaining communication between corps during manœuvres, or in time of war. Much time will be saved by the development of equipment of a transportable, but reliable character, which will enable visual messages to be flashed over ranges of a few miles between generals and divisional commanders. Complete messages can be televised instead of sending them by dispatch riders, while the directional nature of the ultra-short-wave radio link when used in conjunction with the right type of aerials will add to the freedom from jamming. Maps, troop movements, and other vital information will be televised if the work now being undertaken reaches the anticipated degree of finality. The value of this new "arm" is fully realised by the authorities responsible for the work, and although the research work must be of a secret character, a situation which is of a parallel nature to that existing in Germany, since England is so far ahead with its television service it is certain to solve the problems associated with this aspect of the science.

RADIO CLUBS AND SOCIETIES

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

THE CROYDON RADIO SOCIETY

"LATEST Valve Topics, and their Application to Television" was the attractive title which ensured a good attendance for the Croydon Radio Society's meeting in St. Peter's Hall, S. Croydon, on Tuesday, February 22nd. The lecturer was Mr. H. L. Bowen of the Mullard Wireless Service Co., Ltd. One problem, he said, in short-wave work was tied up in the space charge of a valve. What happened was that when any attempt was made to change the bias on a grid, a peculiar de-tuning effect took place. On very low wavelengths a difference in tuning of a million cycles took place. One solution was to have a broader resonance curve, so that de-tuning could be tolerated. Factors determining the space charge capacity were dealt with very thoroughly, Mr. Bowen being helped by some excellent lantern slides. Transit time damping was an equally interesting topic, and like the space charge capacity was bound up in the valve's construction, and he indicated the transit time of an electron. As a cure, valves of a smaller construction had been designed and were obviously useful in short-wave work. Thanking him, the Chairman, Mr. G. A. Hoskins, said that a particularly good idea of what improvements in valve technique were to be expected had been given, and members had been encouraged in a better understanding of Television. For the next meeting on Tuesday, March 15th, the hon. librarian, Mr. R. P. Jonas, is giving a talk and demonstration on quality reproduction, with the aid of his Voigt Loudspeaker and a quality amplifier. —Hon. Pub. Secretary: E. L. Cumbers, Maycourt, Campden Road, S. Croydon.

RADIO, PHYSICAL AND TELEVISION SOCIETY

ON Friday, February 25th, the society held a sale at which members' disused apparatus was sold by auction, a small commission being charged and this paid into the society's funds. The sale was well attended, and several members were able to purchase instruments at extremely moderate prices.

Meetings of the society are held every Friday evening at 8.15 at 72A, North End Road, West Kensington, London, W.14. The advantages of membership include Morse Instruction, Expert Advice on most scientific matters, Technical Translations from and into various languages, and Calibration of members' apparatus.

New members are welcome any Friday evening, or further particulars may be obtained by writing to the Hon. Secretary, C. W. Edmans, at the headquarters of the Society.

THE MAIDSTONE AMATEUR RADIO SOCIETY

A VERY enjoyable evening was passed when the M.A.R.S. presented their film social in the clubroom, 244, Upper Fant Road, Maidstone, on Wednesday, February 23rd. First of all, the Radio Society of Great Britain films of National Field Day, 1937, and British amateur stations were shown, and after the interval for refreshments a series of sound films were shown, including "The Scoop," a full-length comedy-drama of newspaper life, and a "Mickey Mouse" cartoon.

Future important lectures to be given in the clubroom are:

Tuesday, March 22nd, 1938: "The Cathode Ray Tube and its Applications," by Mr. Parr, of the Ediswan Electric Co.

Tuesday, April 5th, 1938: A lecture, and a demonstration of the Voigt loudspeaker, and other high-fidelity apparatus, by Mr. O. P. Lowther, of the Lowther Manufacturing Co., Ltd.

Tuesday, April 19th, 1938: A lecture on transmitting valves and servicing sets by Messrs. Mullard.

New members are earnestly invited, and are requested to refer to previous issues of PRACTICAL AND AMATEUR WIRELESS, or to get in touch with the Hon. Secretary for any further information about the society. Hon. Sec., P. M. S. Hedgeland (2DBA), "Hill View," 8, Hayle Road, Maidstone, Kent.

THE DERBY SHORT-WAVE RADIO AND EXPERIMENTAL SOCIETY

WILL those readers of this paper who are experimenting with 5-metre rigs please get in touch with us as we shall be fixing our summer programme shortly, and this will include a number of 5-metre field days. H. Turner, Secretary, Nunsfield House, Boulton Lane, Alvaston, Derby.

WIRRAL AMATEUR TRANSMITTING AND SHORT-WAVE CLUB

"MY Transmitter—and Why," was the subject of a talk given by Mr. Will Rogers, G8OC, at the club meeting on February 23rd, when the members followed a custom of choosing the subject and speaker's name from a hat.

Mr. Rogers, describing his transmitter, a 47 crystal oscillator, 46 doubler and 10 power amplifier, explained an interesting regenerative doubler circuit he is trying and also advocated the use of Faraday shields between the final tank and the aerial for the curing of spurious radiation and interference with broadcast listeners.

The talk was followed by a discussion on aerials and impedance matching.

Headquarters: Beechcroft Settlement, Whetstone Lane, Birkenhead.

Meetings: Last Wednesday evening each month, 7.30 p.m.

Secretary: J. R. Williamson, 13, Harrow Grove, Bromborough, Birkenhead.

THE EXETER AND DISTRICT WIRELESS SOCIETY

AT the meeting of the Exeter and District Wireless Society, held on Monday, February 21st, a most interesting talk was given by Mrs. Rumball, entitled "Electricity in the Home."

The principal points of her talk were the efficiency, cleanliness and economy of electricity. Mrs. Rumball also demonstrated many pieces of apparatus, and also compared the cost of electricity with that of other means of heating, power and light.

Mr. Rumball then followed with a demonstration of small electrical accessories, such as heating pads, fires, multi-way switches, etc.

At the next meeting a lecture was given by Mr. D. R. Barber, B.Sc., on "Radio and the Stars," and an important date to be remembered is March 14th, when a demonstration will be given on the Hammond organ. This demonstration will be given by Mr. R. C. Lawes, and is open to members of the public. It is interesting to note that this is the first time that this organ has been demonstrated publicly in this part of the country.

Meetings are held each Monday at No. 3, Dix's Field, Exeter, and all those interested should get in touch with the Secretary, Mr. W. J. Ching, 9, Sivell Place, Heavitree, Exeter.

THE EAST DORSET AND WEST HANTS RADIO CLUB

THE next meeting of the above club will be held at headquarters on Wednesday, March 9th, at 8 p.m., when G5OH will demonstrate an American "Hana" superhet. Another meeting will be held on March 23rd at 8 p.m., when there will be a debate on "Servicemen" which promises to be of great interest.

The meeting on the 9th will be open to the general public, but there will be a small charge for admission in aid of club funds.—David M. Williams, Hon. Secretary, "Amberley," Cornwall Road, Poole, Dorset.

PUBLIC TELEVISION DEMONSTRATIONS

ONE of the outstanding features of this year's *Daily Mail* Ideal Home Exhibition, which opens on April 5th, will be the television demonstrations which are to be staged there. These will afford the public the first open invitation to see how under exact working conditions programmes are televised and transmitted from the studio, and simultaneously to see their reception in the most up-to-date receivers.

Glass-walled Studio

The exhibit, which is being arranged with the co-operation of the B.B.C. and many of the leading manufacturers of television receivers, will include a glass-walled studio, 2,100 sq. ft. in area, which will permit the closest view possible of the artistes in action as they are televised. Make-up rooms, and control rooms will also be seen.

Demonstrations of the Alexandra Palace transmissions will be given on a number of receivers, and there will also be continuous programmes televised in the glass-walled studio, so that visitors will be able to enjoy television for nine to ten hours daily.

From April 14th to April 21st the B.B.C.'s Mobile Unit will be located at Olympia. It will radiate some of the programmes from the glass studio to Alexandra Palace, whence they will be re-radiated back to Olympia to be viewed by the public on the demonstration receivers.

German Public Address Service

ACCORDING to a recent report six thousand loudspeaker kiosks are to be erected in large towns throughout Germany during the course of the next six years. A larger number of small P.A. speaker stations are to be installed in villages and small towns.

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).

Radiation Interference

SIR,—I received last week my first copy of PRACTICAL AND AMATEUR WIRELESS, and I think it is "the goods."

I have pottered around quite a lot with "odds and ends," without knowing the "whys and wherefores," so I ask your more advanced readers not to "tear me to pieces" if I attempt to solve, or partly solve, J. W. of Wigan's problem.

A short time ago I made a one-valve set, using a plug-in coil, but with no reaction.

Well, on testing (with earphones) I heard Wales O.K.—but only. Wales—then I thought I would try a different coil, so, leaving the set switched on, I pulled out the coil to insert another and I immediately heard two stations (with the coil out) as in J. W.'s case, and tuning made no difference again. But putting back the coil I again heard Wales.

This left me quite puzzled, and I gave it up as a "bad job" and decided to listen to some "real music" on the "family set," but somehow I could not settle down, and after a while I was again "pottering"; but as the "family set" was switched on I could not hear anything, so I decided to take the one-valver upstairs. This I did, and on switching on I could not hear a thing. "Now what's wrong?" I said to myself. "No aerial." I then found a piece of wire and decided to push it through the floor to connect it to the indoor aerial downstairs. This I did, but again no result, so I pulled out the coil to see if the "two-station phenomenon" was still there, and was nearly deafened by the volume, but only one station this time.

I went downstairs to discover that the wire I had hooked to the indoor aerial had fallen down and had got twisted very obligingly round the L.S. leads of the "family set." The programme was the same as I had just been listening to on the one-valver, so I wondered if the "family set" was affecting it in any way, so, changing the programme, I again dashed upstairs, and "Lo and behold!" the same programme was coming through.

Well, to cut a long story short, I discovered in the end that the interference was from the "1s. 3d. a week wireless system," the wires of which run along the outside of the house, and the "eddy-current," as it were, was being picked up by the aerial and passed on direct to the grid of the valve when the coil was out, whereas when the coil was in these were tuned out.—A. G. MALINS (Liverpool).

From a Reader in South Africa

SIR,—I hope you can find a little corner in your weekly to publish this letter, or the appeal contained herein.

A glance will show that I live a few thousands of miles from England, although I lay no claims to being one of England's heroes existing on a "far-flung outpost of the Empire." I am a member of the British South Africa Police, but am stationed at Salisbury, the capital, and I'm afraid that I get none of the bush life one reads about in popular fiction.

I have been a keen reader of PRACTICAL AND AMATEUR WIRELESS for the past year, and have learnt a great deal from the articles therein. Unfortunately, I have never been lucky enough to find anyone in Salisbury who is sufficiently interested in radio to help me out with the numerous problems that are always cropping up in wireless. There are a few amateur transmitters here, but they are all too preoccupied with their own experiments to bother with a raw novice like myself.

My object, therefore, in writing to you is if possible to find out if amongst your thousands of readers there are any who would care to write to me with a view to "swapping" ideas and experiences. I must point out that I am the veriest tyro and so far have not got past the Det. 1 L.F. stage of construction. I am very keen, however, and if anyone would care to "help a lame dog," I would be eternally grateful.

I own an eight-valve commercial super-het., but although the results obtainable are quite good for this country, I get far more of a thrill with DX work on the little two-valver. Rhodesia is not well situated for distant reception, but I have succeeded in logging GSD, GSB, GSP, and GSA (England), DJC (Germany), PHOHI (Holland), COCH (Havana) and W3XAL and W2XAF (U.S.A.). All of these stations have been received at good 'phone strength.

I will not take up any more of your valuable time, but I would like to express my appreciation of your fine magazine. Long life to PRACTICAL AND AMATEUR WIRELESS and its contributors. Incidentally, if any of your readers are policemen I would be only too pleased to "swap ties" with them.—J. DUNCAN (c/o Box 1284, Salisbury, S. Rhodesia).

Do you know

—THAT the potentiometer method of supplying the S.G. voltage is preferable to a series resistance scheme.

—THAT in variable-mu H.F. valves the bias control potentiometer should form part of the S.G. voltage circuit.

—THAT the high frequencies from a speaker are directed in a straight line, or beam.

—THAT the low notes radiate and may thus be heard where the higher notes are not perceptible.

—THAT the efficiency of an A.V.C. circuit may be tested by using a short aerial and moving this about near a bare earth lead.

—THAT a milliammeter in the anode circuit of a "controlled" valve will also enable the A.V.C. action to be seen.

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 of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor,* PRACTICAL AND AMATEUR WIRELESS, *George Newnes, Ltd., Tower House, Southampton Street Strand, W.C.2.*

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

A 10-Metre Log

SIR,—As I have not noticed a 10-metre log from this part of the country I am enclosing the following.

My set is the "full range short-wave receiver" described in PRACTICAL WIRELESS 12.1.35, by A. W. Mann.

Incidentally, as this is my first venture on 10 metres, and as all stations were received on February 27th between 3.30 and 4.45 p.m., I should like to hear from other readers as to whether conditions were exceptionally good.

All stations were received on 'phones, using only two valves: W7ACD, W3EGA, W4EGT, W8WHQ, W1DKQ, W5JR, W8KYY, W8TZ, W2ADJ, W9EOZ, W1IAO and VE1DR.

During the whole of this period I never heard a single G station, although the band seemed to be alive with W's, all of which were good signals.—R. ELLIOTT (Handcross, Sussex).

HOW LATE DO PEOPLE LISTEN IN THE EVENING?

IT is interesting to note that as a result of a special questionnaire which the B.B.C. sent to two thousand listeners at the end of November, 1937, it has been ascertained that a mass switching-off of radio sets takes place between 10.0 and 10.30 p.m. on week-days. Very nearly half those who were listening up to 9.30 have switched off by 10.30. Half an hour later, the figure has dropped to a quarter. Between 11.30 and 12.0 only some three per cent. are listening.

The question, answers to which have produced these results, was framed as follows:—

"About what time in the evening do you usually stop listening (a) on week-days (not Saturdays)? (b) on Saturdays?

It has been found that on Saturdays more people listen later. Nearly 80 per cent. for example, listen between 10.0 and 10.30 p.m., as against 54 per cent. at the same time on other week-days. One Saturday listener in six has still got his radio switched on between 11.30 and midnight.

A further analysis of the replies has revealed that late Saturday listening is relatively greater among working class than among middle class listeners. Between 11.0 and 11.30, for example, 25 per cent. of middle class listeners are still switched on as compared with 33 per cent. of working class listeners. It has been revealed, however, that earlier in the evening slightly fewer working class than middle class folk are listening to wireless programmes.

This is the third interim report issued on results of this questionnaire, which was sent to the two thousand listeners who were completing weekly listening log sheets in connection with variety programmes.

REPLIES IN BRIEF

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

G. C. (Rainham). We have not described an H.F. unit of the type you require, and you may find it difficult to add such a unit satisfactorily to your set in view of the voltage supply necessary.

N. R. (N.W.11). The Prefect S.W. Three is the nearest, but this does not employ a metal panel. An H.F. stage for the set has also been described.

J. G. G. (Southampton). Without more complete details we are unable to suggest the best plans for your arrangement. You may find that some scientific apparatus would be needed, apart from the radio side.

E. T. R. (Hull). The solenoid winding is the medium-wave section, and the reason for the pile winding is to reduce the size of the former and to avoid difficulties due to self-capacity, etc. There are many important features such as turns near each other of different potential, etc.

H. G. A. (Fleet). You must use the Hivac valve in this circuit, as it is the only one made of the type specified. An ordinary Class B valve cannot be used.

A. W. S. (S.E.4). We have no details and suggest you write to the makers. They may have been specially designed for a particular set and thus may not be of use in any but the original circuit design. We believe the I.F. was a non-standard value.

H. O. (Kirkcaldy). You must adhere to the specification which you supply. Changes must be notified, but no inspection is usually carried out. The crystal is more or less essential to keep the frequency constant.

W. A. W. (N. Wembley). The B.B.C. will supply you with full details, and we gave the wave-form and other essentials as set up by the Television Advisory Committee in PRACTICAL WIRELESS dated October 5th, 1935.

H. J. B. (Birmingham, 21). The trouble is probably that known as threshhold howl. As shown in your diagram the H.T. applied to the H.F. valve is also applied to the grid of the detector valve through the coil.

J. B. (Dundee). The circuit should be quite satisfactory, but you must not expect very great volume from such a scheme.

A. C. B. (Sidcup). We have not used the coil combination in question but probably the makers can still supply you with the connection data. Their address is Mawneys Road, Romford, Essex.

L. G. (S.W.20). We cannot supply a blueprint of the set, and cannot send prints or back numbers C.O.D.

T. G. H. (Liverpool). A lamp or some piece of mains equipment may be joined in series with your accumulator and the mains and will enable you to charge it yourself. A 100-watt lamp would enable a current of ½ amp. to be passed.

A. P. (Chesham). The coil is not now listed and we are unable to trace any details of it. We suggest you write direct to the Wearite company regarding connection details. We have not used it in any of our sets.

R. E. (Warrington).—Ordinary 6 or 8 BA threaded rod is used and should be obtainable from any good radio dealer. If you find difficulty in obtaining it from such a store you may obtain it at a scientific apparatus dealer's or some similar shop.

M. J. T. (Acocks Green).—As the power valve gives results you should increase the H.T. applied to the valve. You may also find that an L.F. or similar valve will give better results than the present one.

K. H. (Ballymena).—We cannot recommend the use of the unit as a one-valve set in view of the great difficulty in removing hum when headphones are used.

E. C. W. (Willesden).—Your unit is probably unsuitable for the particular set, and we suggest you write to the makers of the set and find out whether or not any special adjustments or alterations are required in order to use the unit.

Practical and Amateur Wireless
BLUEPRINT SERVICE

These Blueprints are drawn full size.

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

Issues of Practical Wireless .. .. 4d. Post Paid
Amateur Wireless .. .. 6d. ,, ,,
Practical Mechanics .. 7½d. ,, ,,
Wireless Magazine .. 1/3 ,, ,,

The index letters which precede the Blueprint Number indicate the periodical in which the description appears: thus P.W. refers to PRACTICAL WIRELESS, A.W. to *Amateur Wireless*, P.M. to *Practical Mechanics*, W.M. to *Wireless Magazine*.

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

PRACTICAL WIRELESS

	Date of Issue.	*No. of Blueprint.*
CRYSTAL SETS.		
Blueprint, 6d.		
1937 Crystal Receiver	9.1.37	PW71
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprints, 1s. each		
All-wave Unipen (Pentode) ..	—	PW31A
Beginner's One-valver	19.2.38	PW85
Two-valve : Blueprints, 1s. each.		
Four-range Super Mag Two (D,Pen)	—	PW36B
The Signet Two (D & LF) ..	29.8.36	PW76
Three-valve : Blueprints, 1s. each.		
The Long-range Express Three (SG, D, Pen)	24.4.37	PW2
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2 LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow) ..	22.5.37	PW35
Summit Three (HF Pen, D, Pen)..	—	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW39
Hall-Mark Three (SG, D, Pow) ..	12.6.37	PW41
Hall-Mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans))..	*June* '35	PM1
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	PW53
Battery All-Wave Three (D, 2 LF (RC))	—	PW55
The Monitor (HF Pen, D, Pen) ..	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P) ..	14.8.37	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen) ..	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen) ..	31.10.36	PW69
The "Colt" All-Wave Three (D, 2 LF (RC & Trans))	5.12.36	PW72
The "Rapide" Straight 3 (D, 2 LF (RC & Trans))	4.12.37	PW82
F. J. Camm's Oracle All-Wave Three (HF, Det, Pen)	28.8.37	PW78
1938 "Triband" All-Wave Three (HF Pen, D, Pen)	22.1.38	PW84
Four-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P) ..	1.5.37	PW46
Fury Four (2SG, D, Pen) ..	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B)	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P) ..	26.9.36	PW67
All-Wave "Corona" 4 (HF Pen, D, LF, Pow)	9.10.37	PW79
"Acme" All-Wave 4 (HF Pen, D (Pen), LF, Cl. B)	12.2.38	PW83
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen) ..	—	PW18
A.C.-D.C. Two (SG, Pow) ..	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow) ..	—	PW35C
D.C. Premier (HF Pen, D, Pen)..	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen)..	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	—	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2 LF (RC))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
All-World Ace (HF Pen, D, Pen)	28.8.37	PW80
Four-valve : Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	24.7.37	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	9.2.35	PW47
A.C. All-Wave Corona Four ..	6.11.37	PW81
SUPERHETS		
Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three-valve) ..	5.6.37	PW40
F. J. Camm's 2-valve Superhet ..	13.7.35	PW52
F. J. Camm's £4 Superhet ..	—	PW58
F. J. Camm's "Vitesse" All-Waver (5-valver)	27.2.37	PW75
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valve) ..	—	PW43
D.C. £5 Superhet (Three-valve) ..	1.12.34	PW42
Universal £5 Superhet (Three-valve)	—	PW44
F. J. Camm's A.C. £4 Superhet 4 ..	31.7.37	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitone" Universal Four ..	16.1.37	PW73
SHORT-WAVE SETS.		
Two-valve : Blueprint, 1s.		
Midget Short-Wave Two (D, Pen)	—	PW38A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2LF (RC and Trans))	7.8.37	PW63
The Band-Spread S.W. Three (HF Pen, D (Pen), Pen) ..	29.8.36	PW68
PORTABLES.		
Three-valve : Blueprints, 1s. each.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen) ..	—	PW65
Parvo Flyweight Midget Portable (SG, D, Pen)	19.6.37	PW77
Four-valve : Blueprint, 1s.		
Featherweight Portable Four (SG, D, LF, Cl.B)	15.5.37	PW12
MISCELLANEOUS.		
S.W. Converter-Adapter (1 valve)	—	PW48A

AMATEUR WIRELESS AND WIRELESS MAGAZINE

	Date of Issue.	*No. of Blueprint.*
CRYSTAL SETS.		
Blueprints, 6d. each.		
Four-station Crystal Set	12.12.36	AW427
1934 Crystal Set	—	AW444
150-mile Crystal Set	—	AW450
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprints, 1s. each.		
B.B.C. Special One-valver ..	—	AW387
Twenty-station Loudspeaker One-valver (Class B)	—	AW449
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans) ..	—	AW388
Full-volume Two (SG det., Pen)..	—	AW392
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans) ..	—	AW338A
Lucerne Minor (D, Pen)	—	AW426
A Modern Two-valver	—	WM409
Three-valve : Blueprints, 1s. each.		
Class B Three (D, Trans, Class B)	—	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	—	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans) ..	2.12.33	AW412
1934 Ether Searcher; Baseboard Model (SG, D, Pen)	—	AW417
1934 Ether Searcher: Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans) ..	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
Mullard Master Three with Lucerne Coils	—	AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All-Britain Three (HF Pen,D,Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM318
Simple-tune Three (SG, D, Pen)..	*June* '33	WM327
Economy-Pentode Three (SG, D, Pen)	*Oct.* '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans) ..	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	—	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen) ..	*June* '35	WM389
Certainty Three (SG, D, Pen) ..	—	WM393
Minitube Three (SG, D, Trans) ..	*Oct.* '35	WM396
All-Wave Winning Three (SG, D, Pen)	*Dec.* '35	WM400
Four-valve : Blueprints, 1s. 6d. each.		
65s. Four (SG, D, RC, Trans) ..	—	AW370
"A.W." Ideal Four (2 SG, D,Pen)	16.9.33	AW402
2HF Four (2 SG, D, Pen) ..	—	AW421
Crusader's A.V.C.4 (2HF,D,QP21)	18.8.34	AW445
(Pentode and Class B Outputs for above : Blueprints, 6d. each) ..	25.8.35	AW445A
Self-contained Four (SG, D, LF, Class B)	*Aug.* '33	WM331
Lucerne Straight Four (SG, D, LF, trans)	—	WM350
£5 5s. Battery Four (HF, D, 2LF)	*Feb.* '35	WM381
The H.K. Four (SG, SG, D, Pen)	*Mar.* '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	*Apr.* '36	WM404
Five-valve : Blueprints, 1s. 6d. each.		
Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
Class B Quadraplyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344
New Class B Five (2 SG, D, LF, Class B)	*Nov.* '33	WM340
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.	—	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C.-D.C. Two (D, Pen)	—	WM394
Three-valve : Blueprints, 1s. each.		
Home-Lover's New All-electric Three (SG, D, Trans) A.C. ..	—	AW383
S.G. Three (SG, D, Pen) A.C. ..	—	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF Pen, D, Pen)	23.6.34	AW439
Mantovani A.C. Three (HF Pen, D, Pen)	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	*Jan.* '36	WM401
Four-valve : Blueprints, 1s. 6d. each		
All-Metal Four (2 SG, D, Pen) ..	*July* '33	WM326
Harris' Jubilee Radiogram (HF Pen, D, LF, P)	*May* '35	WM386
SUPERHETS.		
Battery Sets : Blueprints, 1s. 6d. each.		
Modern Super Senior	—	WM375
Varsity Four	*Oct.* '35	WM395
The Request All-Waver	*June* '36	WM407
1935 Super Five Battery (Superhet)	—	WM379
Mains Sets : Blueprints, 1s. 6d. each.		
1934 A.C. Century Super A.C. ..	—	AW425
Heptode Super Three A.C. ..	*May* '34	WM359
"W.M." Radiogram Super A.C.	—	WM366
1935 A.C. Stenode	*Apl.* '35	WM385
PORTABLES.		
Four-valve : Blueprints, 1s. 6d. each.		
Midget Class B Portable (SG, D, LF, Class B)	20.5.33	AW389
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Two H.F. Portable (2 SG, D, QP21)	*June* '34	WM363
Tyers Portable (SG, D, 2 Trans)	—	WM367
SHORT-WAVE SETS—Battery Operated		
One-valve : Blueprints, 1s. each.		
S.W. One-valve converter (Price 6d.)	—	AW320
S.W. One-valve for America ..	23.1.37	AW429
Rome Short-Waver	—	AW452
Two-valve : Blueprints, 1s. each.		
Ultra-short Battery Two (SG det., Pen)	*Feb.* '36	WM402
Home-made Coil Two (D, Pen) ..	—	AW440
Three-valve : Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's Short-waver (SG, D, Pen)	*Jan.* 19,'35	AW463
The Carrier Short-waver (SG,D,P)	*July* '35	WM390
Four-valve : Blueprints, 1s. 6d. each.		
A.W. Short-wave World-Beater (HF Pen, D, RC, Trans) ..	—	AW436
Empire Short-Waver (SG, D, RC, Trans)	—	WM313
Standard Four-valver Short-waver (SG, D, LF, P)	*Mar.* '35	WM383
Superhet : Blueprint, 1s. 6d.		
Simplified Short-waver Super ..	*Nov.* '35	WM397
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Two-valve Mains Short-waver (D Pen) A.C.	—	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C.-D.C.	—	WM368
"W.M." Long-wave Converter ..	—	WM380
Three-valve : Blueprint, 1s.		
Emigrator (SG, D, Pen) A.C. ..	—	WM352
Four-valve : Blueprint, 1s. 6d.		
Standard Four-valve A.C. Short-waver (SG, D, RC, Trans) ..	*Aug.* '35	WM391
MISCELLANEOUS.		
Enthusiast's Power Amplifier (1/6)	*June* '35	WM387
Listeners' 5-watt A.C. Amplifier (1/6)	—	WM392
Radio Unit (2v) for WM392 ..	*Nov.* '35	WM398
Harris Electrogram (battery amplifier) (1/-)	*Dec.* '35	WM399
De-Luxe Concert A.C. Electrogram	*Mar.* '36	WM403
New Style Short-Wave Adapter (1/-)	*June* '35	WM388
Trickle Charger (6d.)	*Jan.* 5, 35	AW462
Short-wave Adapter (1/-)	—	AW456
Superhet Converter (1/-).. ..	—	AW457
D.L.D.L.C. Short-wave Converter (1/-)	*May* '36	WM405
Wilson Tone Master (1/-) ..	*June* '36	WM406
The W.M. A.C. Short-Wave Converter (1/-)	—	WM408

QUERIES and ENQUIRIES

Reducing Condenser Capacity

"Would you please tell me if it is possible to cut down the capacity of a medium-wave tuning condenser of .0005 mfd. down to .00015 for short-wave tuning, by putting a fixed condenser in series with it? If it is possible will you give me the value necessary?"—A. A. B. (Harmondsworth).

WHEN condensers are joined in series, the resultant capacity is the reciprocal of the sum of the reciprocals, or to put it in mathematical form:—

$$C = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2}}$$

This may be put another way, by saying that the resultant capacity is given by multiplying the two capacities together and dividing the answer by the sum of the two capacities. If you connect another .0005 mfd. condenser (fixed) in series with the .0005 mfd. variable the resultant *maximum* capacity will be .00025 mfd. and this may be used for short-wave tuning. You must bear in mind, however, that the minimum capacity will not be so low as would be provided by a .0002 mfd. variable condenser and thus the arrangement is not ideal for short-wave tuning. If you do not wish to obtain a new condenser a better plan would be to dismantle the component and reassemble it with only half the plates and thus obtain half the capacity.

Bandspread S.W. Three

"I am interested in the Bandspread receiver and should be glad if you would let me know the short wavebands which this receiver covers."—D. McE. (Laoighis).

THE coil which was specified for this receiver was the Wearite type B. This covers a range from 24.6 to 51.0 metres when tuned with the condenser specified. The makers also supply two further coils in this range, types A and C, and these cover respectively from 13.4 to 27.7 and 48.3 to 100 metres. Thus, by obtaining a set of the coils you will be able to use the receiver to tune from 13.4 to 100 metres.

External Speaker

"I have been presented with a small speaker in a cabinet, and decided to make use of it as an extension speaker with my commercial set. There are two sockets on the back of this marked Ex. L.S., and there is a switch to cut off the speaker in the set. There are two leads sticking out of the back of the cabinet speaker and I joined these to the two sockets, but could only obtain very weak signals. Is there any special feature which I must watch in regard to this point or does it indicate that the new speaker is defective?"—W. B. (Brighton).

THERE is a possibility that your new speaker is not working, but it is also essential that you make certain that the speaker matches the output arrangement of your set. Modern receivers as produced by manufacturers are now in two forms—those requiring a low-resistance extension speaker and those requiring a high-resistance speaker. You may thus have a speaker which will need the inclusion of a transformer to match the set, or which may require an internal transformer to be removed. Make quite certain regarding this point before making any further tests.

RULES

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

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

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

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

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

Output Transformer

"I am going to make an output transformer for my push-pull quality amplifier, and there are one or two details which I should like to have explained before going ahead. I have worked out the size of core, bobbin, wire, etc., but desire to make arrangements for matching different speakers. Should I tap the primary or secondary, and what is the most efficient way of wiring or arranging the separate sections?"—F. T. (Blackpool).

IF the amplifier is a quality unit, then you should make quite certain that your output transformer is of the highest class, and you may easily spoil the results given by your amplifier by an unsuitable matching unit. There are many factors which must be borne in mind in the design of this component, and we recommend that you split the primary winding, placing the secondary winding between the two sections of the primary. Make quite certain that each half is exactly matched, not only with regard to quantity of wire, but from a capacity point of view, and this will entail the use of a good winding machine, to get each layer identical. Tap the secondary, but do not endeavour to make the transformer cover too wide a range from the matching point of view.

Trimmer Difficulty

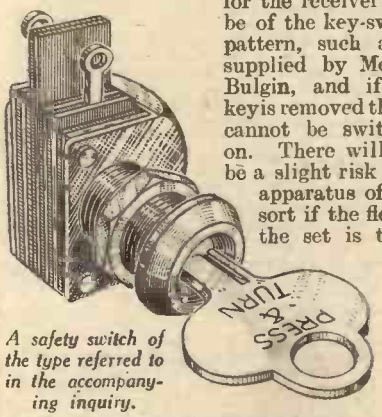
"I have made a set, using some parts of rather old design obtained from a well-known surplus supplies stores. I am assured that the condenser is matched in each section and that it has not been used, and that the coils also are matched and undamaged. I have tried for hours to trim the set, using a standard circuit as given on a leaflet with the coils, but am unsuccessful. I wonder if you could suggest a way of doing this. I can get one or two stations right, but at any other part of the dial they go out."—G. C. (E.1).

THE trouble may be that as you have "trimmed for hours," you have worn out the trimmers. This may sound rather peculiar, but certain types of trimmer used in the past relied upon the pressure of a strip of metal, adjusted by a screw. The capacity was formed by a piece of mica between the pressure plate and the body of the gang condenser or a piece of metal attached to it. When the screw is tightened the plate is depressed, and on unscrewing the screw the plate should return to its original position. Continued adjustment of the screw, however, may have destroyed the "springiness" of the plate, and thus one or more of the trimmers may actually be inoperative, although the screws may still be adjusted. Cut out the trimmers and mount the modern small ceramic trimmers on the chassis or near the condenser and use these for trimming.

Safety Switch

"I have a powerful mains set, and am now rather anxious as I have a young son who is inclined to tamper with the set. I do not want him to get a shock and wonder whether you have published any wrinkle or other idea which would enable me to make the set quite safe when I am away from home."—O. S. (Shrewsbury).

THE best plan is to make the mains connection inside the cabinet, with the lead passing through a hole in the back. The back should be provided with an ordinary small cabinet lock and key so that it cannot be opened. The switch for the receiver may be of the key-switch pattern, such as is supplied by Messrs. Bulgin, and if the key is removed the set cannot be switched on. There will still be a slight risk with apparatus of this sort if the flex to the set is taken from a floor socket, and therefore, it may be desirable to box in this socket and rely upon the switch on the set to switch on and off.



A safety switch of the type referred to in the accompanying inquiry.

Auto. Valves

"I have noted that certain American firms advertise 'auto.' type valves, with a heater rated at 6.3 volts. Does this word indicate, as I have been told, that the valves are for car use or that they are automatic? I cannot quite reconcile the 6.3 volts with a 12-volt car battery."—G. E. R. (Cambridge).

THE valves in question are for car radio apparatus, and the heaters may thus be used with a 6-volt or a 12-volt car battery simply by using series or parallel heater connections. This type of valve is now made by certain English valve manufacturers and it may, if desired, be used with standard A.C. or D.C. mains supplies of the high-voltage type.

The coupon on page iii of cover must be attached to every query.

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CONVERSION UNITS for operating D.C. Receivers from A.C. Mains, improved type, 120 watt output at £2/10/0. Send for our comprehensive list of speakers, resistances and other components. **WARD**, 46, Farringdon Street, London, E.C.4. Telephone Holborn 9703.

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63, HIGH HOLBORN, W.C.1. Holborn 4631.

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Huge Purchase of Universal 7-valve All-Wave Superhet Chassis. 4 Wave Bands covered, Ultra Short, Short, Medium and Long. Fitted 7 **Mullard Valves** as follows: Pre H.F. Stage VP13C, Frequency Changer FC13C, I.F. Stage VP13C, TDD13C for Detection, A.V.C. and L.F., SP13C Muting Valve, Output Pen 36C, URIC Rectifier, plus potential divider on D.C. Spot Light Tuning, Station-named Dial, etc. Brand new, a really magnificent job, **£3 17s. 6d. each.**
Special Speaker for above, fitted Pentode Transformer, 600 ohm Field, 7½" cone, etc., **12/6 each.**

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Huge purchase Philco 3-valve Battery Short-wave Receivers. A really splendid model, fitted in handsome contrasted, walnut cabinet, 2 speed dial, large P.M. Speaker, with the added attraction of a Short-Wave Band. Listed 8½ gns., our price to clear **£4 12s. 6d. each.**
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(Continued in column 3)

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EUROPA MAINS VALVES. 4v. A.C. Types, A.C./HL, A.C./L A.C./S.G., A.C./V.M.S.G., A.C./H.P., A.C./V.H.P., A.C./P, and 1 watt D.H. Pentodes, all 4/6 each. A.C./Pens. 1.H., 5/6; A.C./P.X.4, 6/6; Oct. Freq. changers, 8/6; Double Diode Triodes, 7/6; Triode H. ex. Freq. Ch., 8/6; Tri. Grid. Pen., 10/6; 3½ watt I.H. Triode, 7/6.

UNIVERSAL TYPES. 20v. .18a. S.G., Var.-Mu. S.G., Power, H.F. Pen., Var.-Mu. H.F. Pen., 4/6 each.

13v. .2a. gen. Purpose Triodes, 5/6; H.F. Pens. and Var.-Mu. H.F. Pens, Double Diode Triodes, Oct. Freq. Changers, 7/6 each. Full-Wave and Half-Wave Rectifiers, 5/9 each.

AMERICAN VALVES. We are sole British Distributors for TRIAD High-grade American Valves. All Types in stock. Standard types, 5/6 each. All the new Octal base Tubes at 6/6 each. 210 and 250, 8/6 each; 81 and 2A3, 8/- each.

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,,	6 ,,	½	,,	**16/6.**
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(Continued from column 1)

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14s. 6d. Goodman's 1938 Permanent Magnet Moving Coil Speaker, 8" with universal transformer.
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See page 9

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Edited by F. J. CAMM

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Vol. 12. No. 287. March 19th, 1938.

THE "IMP" 4 VALVE PORTABLE

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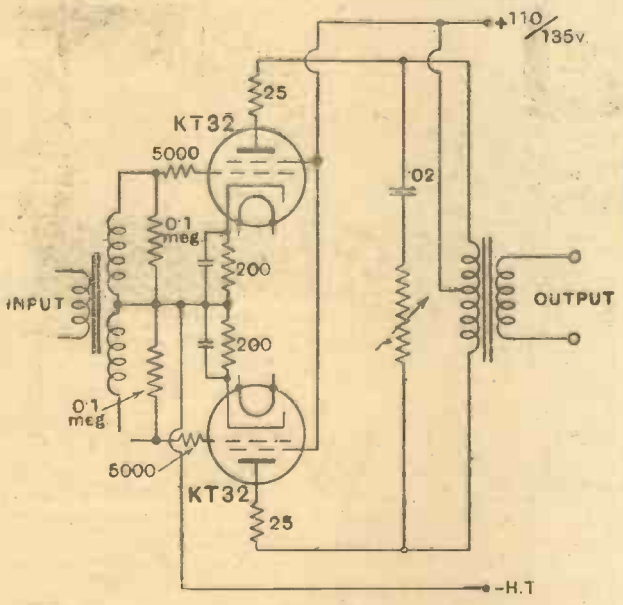

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OSRAM VALVES—DESIGNED TO ASSIST THE DESIGNER

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MAINS STAND-BY TWO

See Page 18

Practical and Amateur Wireless

Edited by F. J. CAMM

Technical Staff:
W. J. Delaney, H. J. Barton Chapple, Wh.Sch., B.Sc., A.M.I.E.E., Frank Preston.

VOL. XII. No. 287. March 19th, 1938.

ROUND *the* WORLD *of* WIRELESS

Portable Design

DURING the summer months many listeners find a need for a set which may easily be carried about, either as part of a hiker's equipment or as part of a cyclist's equipment. We have already designed several receivers of this type, and in this issue give yet another design, which possesses certain novelties not found in previous receivers. It utilises four of the special Midget valves, and is designed to be carried in a small waterproof case, with the necessary H.T. supply in a separate case. This enables the load to be shared by two people, although if desired it could all be accommodated in one case. There are several novelties in the design of this receiver which the keen constructor will find of great interest—the method of combining the on/off switch with the tuning control, and the medium/long-wave switching, by means of a Clix loudspeaker control panel, being only two of these interesting points. The receiver is economical in operation, and ordinary dry cells are specified for the L.T. supply. With five or six feet of wire good loudspeaker signals are obtainable in the centre of London, and thus in country districts unscreened by the tall metal buildings which are found in the cities really good signals should be obtained from several stations. The receiver is easy to handle, there being only two controls, and the main constructional details will be found on pages 14 and 15 of this issue.

Ray Ventura Broadcast

THE well-known French band leader Ray Ventura is paying a flying visit to this country during March and will be giving a broadcast on March 28th on the National wavelength. He is also appearing with his band, the Collegians, at the Odeon, Guildford, on March 26th.

A Television Bar

A NEW idea has been introduced at the Woolwich Empire, where Teddy Glanvil has established what he calls a Television Bar. At the back of the circle the patrons can see and hear the acts which are performing whilst enjoying their refreshments.

Esperanto Broadcasts

THE National Broadcasting Service in Eire, after several experimental broadcasts, has now decided to introduce the international language as a regular programme item.

Novel Microphone Arrangement

AT the Severance Hall, in Cleveland, Ohio, a large gong has been erected with a crystal microphone of Brush manufacture near it. This is fed to an amplifier giving an unusual sound circuit. It is employed for calling members of the orchestra to their places, signals the audience into the auditorium and serves as the tone used by the orchestra for tuning their instruments.

ON OTHER PAGES

Ferranti Test Meters

THE recent increases in the prices of raw materials has resulted in corresponding increase in the prices of a number of components, and now Messrs. Ferranti announce that the prices of their small ammeters and voltmeters have also been increased. The rate of increase varies and new price lists are being prepared.

Ruckzuck Broadcasts

AN idea which is popular in Germany is to relay two bands playing alternate numbers from different places. This is known as a Ruckzuck broadcast, and the B.B.C. is reported to be making arrangements to provide a similar idea in the spring quarter. One of the two bands taking part will be playing in London, whilst the second, playing every other number, may be located in some other European country or in the United States. Full details will be announced when released.

Animal Defences

IN the National on March 16th Professor Munro Fox will explain some of the interesting methods of defence and protection adopted by animals. He will explain, for instance, how a lizard which is caught by its tail will shed the tail to escape, and how for a similar reason the popular crab will shed a leg.

Youth's View on Programmes

OWING to recent criticisms by young people the Northern Talks Department has arranged for a series of three ten-minute talks by young people on their views of things in general. The first of these talks will be given in the Northern programme on March 22nd, and will be repeated in the National programme on March 24th.

Spring in the Air

AT this time of the year spring is the general topic, and a special programme entitled "Spring on the Air" is to be given in the Scottish programme on March 26th. Spring flowers, spring onions, spring fever and spring mattresses will all find a place in the programme, which is described by Howard Lockhard, who is responsible for the pun and the programme, as a seasonable miscellany in song and sketch.

Special Broadcast from Vienna

ON April 24th, Vienna (Austria), between G.M.T. 19.00-20.30, will offer a special radio programme entitled *The Call of the Fatherland* to its nationals resident overseas. In addition to the transmission on medium wavelengths from the home broadcasting stations, the entertainment will be heard at G.M.T. 11.00 through PHI, Huizen (Holland) on 16.88 m. (17.775 mc/s), directed towards Asia and the Far East.

ROUND the WORLD of WIRELESS (Continued)

Short-wave Radio in Swiss Mountains

SHORT-WAVE radio was recently tested in the Swiss mountains for use by Ski-ing Rescue Brigades and the Swiss Army. Portable receiving and transmitting "stations" were "worn" by the skiers during the tests and radio direction-finding apparatus was brought into use to locate the "casualties." An aeroplane, which received instructions while in the air by radio, went to the rescue.

Sunday Programmes

WE are informed that on and after April 24th a programme will be broadcast every Sunday morning between 10.45 a.m. and 12.30 p.m. The new programmes will follow the morning service and the weather forecast, at present broadcast on Sundays from Droitwich only between 9.30 and 10.45 a.m. They will be of a light character, on the lines of those now broadcast on Sunday afternoons. Upon their introduction the whole Sunday morning programme from 9.30 onwards will be radiated by Droitwich and Regional transmitters.

INTERESTING and TOPICAL NEWS and NOTES

A temporary transmitting station in the Swiss Mountains sending out a call for assistance during recent tests.

Britain's Battle Fleet

WITH the Navy Estimates very much in the air at the moment, the broadcast by Lord Strabolgi, who is one of the official speakers on naval questions in the House of Commons, will be of particular interest.

Among subjects with which Lord Strabolgi will deal are the controversy regarding the effectiveness of the giant capital ship, the British Admiralty's preference for smaller battleships, the Washington Naval Agreement of 1921, and the Naval Conferences of 1930 and 1936. The dock and canal question, the influence of the torpedo on battleship construction, and the relative virtues of various gun calibres will also be dealt with in a talk of both topical and general interest.

"Going Greek"

FOR three quarters of an hour on the night of March 16th the B.B.C. is to broadcast on the Regional wavelength an excerpt from "Going Greek," the musical show in which Firth Shepherd presents Leslie Henson at the Gaiety Theatre. The programme, one of the series of "Tunes of the Town," will be compèred by Anthony Hall.

City of Birmingham Orchestra

THE City of Birmingham Orchestra's concert on March 20th will be their last of the Season of Sunday concerts at Birmingham Town Hall. Leslie Heward will conduct. The programme will include Dvorak's Fourth Symphony.

Dance Cabaret

DANCE Cabaret will come from the Royal Bath Hotel Ballroom, Bournemouth, on March 16th, when the artists will include: Cecil Johnson, "The Comedy Commentator"; the Music Hall Boys; and dancing to Billy Bissett and his Canadians, with the Canadian Capers and Alice Mann.

Hallé Concert

SIR THOMAS BEECHAM is to conduct the Hallé Orchestra on March 17th in a programme which will include Delius's "Sea Drift" and Mozart's Symphony No. 38 in D (K.504). The concert opens with Brahms's Tragic Overture. Dennis Noble will be the baritone soloist in "Sea Drift." The Orchestra will be led by Alfred Barker, with Herman Brearley as Chorus Master.

Cabaret from Torquay

THE artists in a programme of Dance Cabaret which will be broadcast from the Imperial Hotel, Torquay, on March 24th, will include: Howard and Vivian, "Entertainers at the Piano"; Kenneth Blane, comedian; Three in Harmony, "Elva, Yolande and Dorothy"; and Cliff Gwilliam and his Dance Band. Cliff Gwilliam has broadcast several times from Rhyl, where he conducts the orchestra during the summer season. It will be the first broadcast to be included in West of England programmes from the Imperial Hotel.

Music from the North

NORTHERN music programmes on March 22nd will include the Manchester Tuesday Mid-day Concert, when Lucy Pierce (pianoforte) will play a Schubert sonata. Jack Hardy's Little Orchestra will give a programme of light music for Regional listeners and, in the Liverpool Philharmonic Concert, which Sir Henry Wood will conduct, Cyril Smith will play, with the Orchestra, Rachmaninoff's third piano concerto, while Rachmaninoff's third symphony will be heard in the second half of this programme.

A Revue in Miniature

MARTYN C. WEBSTER will compère one of his "Follow On" programmes on March 22nd. These are revues in miniature, and the numbers are so linked that one subject suggests the next. The author—Edward J. Mason—and the composer—Basil Hempseed—have both done a good deal of writing for radio. The artists engaged are Dorothy Summers, Marjorie Westbury and Doris Nichols, Hugh Morton, Lester Mudditt and David Fenton, with Jack Hill and his Orchestra. The show will be repeated the following afternoon (March 23rd).

SOLVE THIS!

PROBLEM No. 287.

Atkins built a superhet, using all standard components. He was very careful to obtain ganged matched coils, I.F. transformers, and a superhet gang condenser designed for the same frequency, but in spite of this he could not gang the receiver. He borrowed a calibrated oscillator and found that it was impossible to trim the set. He accordingly returned the coils to the makers—assuming that they were faulty. They were returned and reported O.K. What was the trouble with the set, which was built exactly to the coils and valve makers' specification? 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. 287 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, March 21st, 1938.

Solution to Problem No. 286.

The smoothing condenser connected on the mains side of the smoothing choke had broken down in Smithson's receiver and had short-circuited. This, of course, shorted the rectifying valve.

No reader successfully solved Problem No. 285, and accordingly no books are being awarded this week.

Technical Fundamentals—4

The Various Problems Connected with Selectivity are Discussed in This Fourth Article of the Series

WE will commence our consideration of the important subject of selectivity by dealing with the case of a single H.F. tuned circuit. Towards an internally injected high frequency, e.m.f., the circuit presents an impedance which is minimum at the resonant frequency, and which rises in value as the applied frequency is taken farther from resonance, either up or down. Assuming that the circuit is tuned to the carrier frequency of a wanted signal, and knowing that unwanted signals will have different carrier frequencies, it is clear from the foregoing that the circuit exercises some discrimination between the wanted and an unwanted signal. The characteristics of the circuit as regards this signal "sélection" property is termed its "selectivity."

For the present we will look at the matter of selectivity only from the point of view of the prevention of interference by unwanted signals; other considerations will follow later. The first obvious practical complication that comes to mind is the possibility of an unwanted signal e.m.f. having very much greater amplitude than that of the wanted signal. In such a case there is the risk that although the unwanted signal meets the greater circuit opposition it may produce stronger oscillations in the circuit than those of the wanted signal. This is enough to suggest that the characteristics of the circuit should be such that the impedance rises very rapidly with departure of frequency from resonance. As will be appreciated later, complications come in here.

The selectivity characteristics of a circuit can be detailed in various ways but undoubtedly a graphical diagram gives the information in a form that can be most readily appreciated. Fig. 6 is an example of one kind of graph (Ignore the dotted curve at present.) It is to be assumed that the H.F. circuit is kept tuned to a constant frequency and that an e.m.f. of constant amplitude, but of variable frequency, is injected into it. The voltage built up across the circuit by the oscillations at various frequency values is measured, and these voltage values are plotted against frequency. As we are interested only in a fairly limited range of frequencies centred on the resonant value, it is convenient to make the frequency scale show kilocycles off resonance (with a centre zero point for the resonant frequency itself).

In Fig. 6 let F_0 and F_1 correspond to the frequencies of the wanted signal and an unwanted signal, respectively. For equal e.m.f's, A will represent the output from the wanted signal, and B the output from the unwanted signal. The radio A/B is of great importance. Incidentally, this ratio gives the number by which the output voltage at resonance must be divided to give the output voltage of the unwanted signal, and "so many times down at so many kc/s off tune" is a useful method of indicating the selective properties of a circuit. It will be understood, however, that a number of different frequency points must be specified if a clear idea of the circuit's selectivity is to be obtained. That is why a graph is so convenient.

The narrower the graphical curve (i.e., the more "peaky" it is) the greater is the selectivity indicated.

Factors Controlling Selectivity

Of close interest to the amateur experimenter is the question as to what governs the selectivity. The whole matter hinges upon the variation of the impedance

$$\sqrt{R^2 + (\omega L \sim 1/\omega C)^2}$$

with changes of frequency.

The reactive component $(\omega L \sim 1/\omega C)$, of the impedance is obviously a function of frequency, and as a few simple calculations would show, the greater the ratio L/C the greater will be the variation of $(\omega L \sim 1/\omega C)$

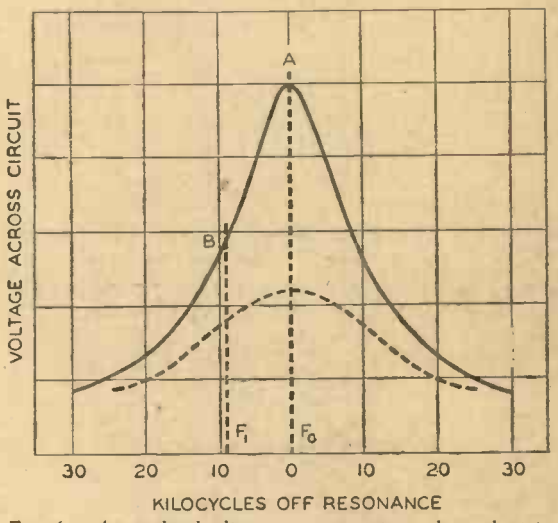


Fig. 6.—A graphical diagram representing the selectivity characteristics of a circuit.

with frequency changes. So one factor governing selectivity will be the ratio of the inductance to the capacity. This leaves the resistance to be allowed for.

H. F. resistance normally increases with increase of frequency, as already stated, but over the range of frequency variation that is associated with such a curve as that of Fig. 6 we can regard any change of resistance as being small. It is to be understood, however, that it will not be permissible to neglect resistance changes unless the tuning of the circuit remains constant.

If we regard R as being approximately constant, then we can see that it must have a steadying influence upon impedance variations (with frequency). Therefore, the greater the value of R the less will be the selectivity. Furthermore, the greater the value of R the smaller will be the output voltages at all frequencies, including that of resonance. Again, an increase of R (say by deliberately adding resistance to the circuit) would reduce the output at resonance to a greater extent than that at some frequency off resonance.

In Fig. 6, the dotted curve corresponds to a case where the L/C ratio is the same as for the full-line curve, but R is greater.

Selectivity is greater the greater the ratio L/C and the smaller the value of E, i.e., the greater the value of I/R. This indicates a very close connection between the selectivity of a circuit and its magnification at resonance.

$$\text{Magnification} = \frac{\omega L}{R}$$

$$\text{At resonance } \omega = \frac{1}{\sqrt{LC}}$$

Substituting $1/\sqrt{LC}$ for ω in the magnification formula gives us

$$\frac{\omega L}{R} = \frac{1}{R}\sqrt{\frac{L}{C}}$$

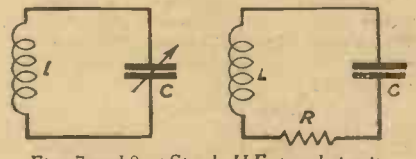
Still confining our attention to the single H.F. tuned circuit let us consider what is involved when it comes to a question of how to get the maximum selectivity. It may appear that it is merely a matter of making L high, C low and R low, and in many respects this is so, but there are practical complications. First of all, assuming variable condenser tuning, the importance of tuning range must not be ignored, and this will impose practical limitations upon the range of values from which both L and C can be chosen. Again, R tends to increase with increase of L, and may do so disproportionately, so the choice of suitable value for L is normally quite a narrow one.

R is, of course, the effective H.F. resistance of the circuit and, without taking shunt damping into account at the moment, it can be said that the tuning coil generally contains the major part of the total H.F. resistance. As a consequence, coil design is very much wrapped up in the matter of selectivity. As far as the coil alone is concerned high selectivity demands a high Q value ($Q = \omega L/r$, where r is the coil's H.F. resistance).

Shunt Damping

We have been considering a single H.F. tuned circuit such as that of Fig. 7. This circuit inevitably has resistance, and Fig. 8 is a theoretical equivalent diagram drawn to emphasise the existence of the resistance. R in Fig. 8 represents, theoretically, the total H.F. resistance of the circuit.

In the usual practical case the H.F. circuit will not be an isolated one, but will



Figs. 7 and 8.—Simple H.F. tuned circuits.

be connected to other apparatus, and we generally have to allow for some value of resistance, or impedance, which is in shunt with the H.F. circuit. The plain resistance case is illustrated in Fig. 9, R1, the external shunt resistance across the LC circuit will definitely cut down both the magnification and the selectivity of the latter. In fact, the effect of R1 will be exactly as though the internal resistance of the LC circuit had been increased. Fig. 10 is theoretically equivalent to Fig. 9, r representing the additional resistance which is effectively "thrown" into the LC circuit by the external shunt resistance R1, while R represents the resistance of the LC circuit itself.

(Continued overleaf)

TECHNICAL FUNDAMENTALS

(Continued from previous page)

It should be noted that, at the resonant frequency,

$$r = \frac{L}{CR1}$$

In a more complex shunt impedance case we would find that the reactive component of the impedance affects the tuning of the H.F. circuit, while the resistive component effectively increases the resistance of the latter.

Generally, the effect of resistance shunted across an H.F. tuned circuit is to be regarded as undesirable, even though it may be unavoidable, but should it so happen that it is necessary to cut down the magnification and selectivity of a tuned circuit, then a resistance shunt can prove to be very helpful.

Using Several Tuned Circuits

Still keeping to the sole idea of preventing interference between stations, we must now face up to the fact that the best selectivity obtainable from a receiver with only one H.F. tuned circuit is actually not very good.

Shunt damping and other effects due to causes external to this one tuned circuit will inevitably keep the selectivity to a low order. In any case, the maximum coil L/r ratio has its practical limitations.

It is necessary to keep in mind that when it comes to a matter of distant reception the requirements for the prevention of interference are rendered all the more stringent by the fact that it is necessary to allow for the possibility of the wanted signal (at the aerial) being of much less amplitude than some unwanted signal of "adjacent channel" frequency.

A great improvement in selectivity will be obtained if the signals are made to pass through several tuned circuits before reaching the detector. If one tuned circuit cuts down an unwanted signal relative to the wanted signal, then it is obvious that if the output of this circuit is caused to energise a second tuned circuit the latter will still further increase the ratio of wanted to unwanted signal. We are not necessarily referring to the case of coupled circuits. Strictly speaking, "coupling" involves some form of impedance common to two circuits, but such cases have a special story of their own, which will be discussed later.

If two tuned circuits are so arranged that the output of one can excite the other, without common impedance being involved, the two circuits are said to be "in cascade," and this is the case in which we are interested at the moment. The outstanding practical example is that of a tuned grid circuit and a tuned anode circuit associated with an H.F. amplifying valve. There is the complication that the inter-electrode capacity of the valve will actually couple the two circuits, but such coupling is incidental and, in any case, can be reduced to very small proportions with suitable arrangements.

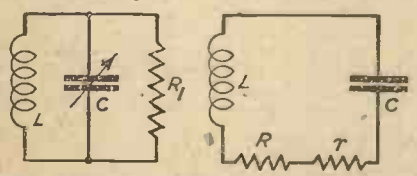
To add tuned circuits in cascade is one method of gaining selectivity that is open to the experimenter. If they are all variably tuned circuits, however, the handling of them may prove to be difficult, except where the number is restricted to two, or perhaps three.

If two tuned circuits have exactly similar characteristics, and if they are truly in cascade, then an unwanted signal output at the first circuit of, say, "two times down at 5 kc/s off tune" will become "four times down" as regards the output of the second circuit. A third circuit would make it "eight times down."

Selectivity Over a Wave-range

With variable condenser tuning, every change of tuning adjustment alters the L/C ratio. This suggests that in tuning over a wave-range the selectivity will change, becoming greater at the higher frequency end of the range. The changing of the effective H.F. resistance complicates the issue, however.

In considering selectivity at one tuning setting we permitted ourselves to ignore such changes of H.F. resistance as would occur over the limited range of frequencies involved, but we cannot ignore resistance changes when it comes to a matter of shifting from one part of a wave-range to another. The H.F. resistance of a tuned circuit will be very appreciably different at the two extremes of, say, the medium wave-range. Since H.F. resistance increases with frequency there is the implication here that the selectivity will become less as the tuning is adjusted towards the higher frequency end of the range. In view of the L/C ratio change having the opposite tendency, what can we anticipate as being the effect likely to be found in practice? In normal circumstances the H.F. resistance changes have the predominating influence, so we can expect that the selectivity will actually decrease as the variable condenser is reduced in setting.



Figs. 9 and 10.—Tuned circuits incorporating shunt and additional resistances.

Out of all this emerges the obvious fact that a selectivity curve gives correct information only for a particular tuning setting, and it is customary for the resonant frequency to be specified against such a curve.

Selectivity and Quality

The question of selectivity involves another consideration apart from that of the prevention of interference.

The analysis of a modulated signal into carrier and sideband components shows that if the selectivity is so great that the H.F. response drops rapidly from the resonant frequency, then the sideband components of the wanted signal are going to suffer from attenuation. Now, if the amplitudes of the sidebands are cut down (and to different degrees), then the modulation envelope of the oscillations applied to the detector will not be a replica of the original modulation; in other words, there will be distortion. This sideband "cutting" will have the tendency to decrease the intensity of the high notes reproduced in relation to the low notes.

To make the response curve (assuming that it is single peaked), so flat over the range of frequencies centred on resonance that the sidebands are not appreciably attenuated would be all very well from the point of view of quality of reproduction, but for any degree of distant reception the results would be hopeless. The spread of the H.F. response would be sufficient to lead to bad interference between stations.

We have a problem here. Still keeping to the idea of a selectivity characteristic of the kind shown in Fig. 6, it looks as though freedom from interference demands a sharp, "peaky" curve, while very good quality reproduction demands a wide curve with no suggestion of a pronounced peak.

"High-note" Cutting

The ways in which this problem can be tackled depend upon the particular standard of reception that it is required to work to. If it is the case that considerable high-note "cutting" can be tolerated, the problem becomes simpler because the way is open for a compromise. The selectivity can be made just sufficient to prevent bad interference between stations, the response curve not being so sharp at the peak that the sideband attenuation makes the reproduction intolerable. If there is to be no attempt at distant reception the selectivity problem becomes very simple because for local station (and local station only) reception there is little need to worry about the adjacent channel stations. The low sensitivity which is permissible in such a case will, in itself, act as a safeguard against interference from distance stations But are we bound to link up this problem entirely with selectivity curves of the single peaked type? The fact that the answer is in the negative opens up a most interesting story—the story of coupled circuits.

For the H.F. response to keep sensibly level on either side of resonance, so as to prevent bad sideband cutting, and yet for the response to be well down at the frequency of the carrier of an adjacent channel station, is a condition that would be realised if the response curve was flat-topped (perhaps slight double peaking) with a very rapid fall-away on either side of the flat top. So a flat topped, steep sided response curve represents an ideal where the selectivity versus quality problem is concerned, and such can be obtained under certain conditions with coupled tuned circuits. Even so, the present frequency allocations of broadcast transmissions makes matters very difficult when both high-fidelity reproduction and freedom from interference is desired.

After we have looked into the matter of coupled circuits we will briefly, but more definitely, deal with standards of reproduction in relation to H.F. response.

COASTAL RECEPTION

IN the Queen's Arcade, Hastings, is a plaque bearing the inscription "Television, first demonstrated by John Logie Baird, from experiments started here in 1924." It is therefore quite appropriate that this town on the south coast should be one of those in which it has been proved quite definitely that reception of the Alexandra Palace transmissions can be undertaken, provided the domestic installation is correctly undertaken, and a sensitive standard commercial receiver used. As indicative of what can be done, a Baird T.5.C receiver gave perfect sound and vision the other evening during the course of a lecture given to a special Rotary function. No difficulty was experienced in maintaining synchronism throughout the duration of the transmission, while the picture quality was good, and suffered but little from electrical interference. No pre-amplifier was found necessary, although the distance between transmitter and receiver was over seventy miles.

USE A FUSE!

Some Usual and Unusual Suggestions for Protecting Valves, Components and the User of Modern Radio Receivers - - By W. J. DELANEY

THERE is an increasing realisation that thought spent on the design of wireless apparatus from the point of view of protection will avoid damage to the set, and also protect the user. It is a common thing for a modern set to be built without any protective device and for bare wires to be used for wiring throughout, and such a set may be in use daily for a considerable period without incident. But, in the event of a small component breaking down the results may be serious and an expensive valve or valves may be destroyed. Apart from this even a modern mains set may easily be the source of a serious shock, in spite of the care which may be taken when examining it. Safety devices may be divided into two groups—the inclusion of fuses or circuit breakers preventing damage which may arise from overloads introduced by damaged components or short-circuits, and the insulation of certain leads to prevent short-circuits. The removal of mains voltages when a set is opened may also be regarded as a very valuable safety device and there are various ways in which this may be carried out. In mains apparatus also, it is important to remember that plugs with unprotected metallic parts should not be joined to the live side of the supply.

Fuses

Dealing first with the problem of fuses, the most valuable components in a receiver may be regarded as the valves. Therefore, fuses should be included to protect these, and the method of arranging for this will depend upon the type of set. In an ordinary battery receiver the valves would be destroyed if a voltage in excess of the L.T. supply were applied and, therefore, the fuse should be included in the leads in such a manner that an excess voltage cannot be applied. The usual battery connections are shown in Fig. 1, and it will be seen that H.T.— is joined to one side of the filament supply, and thus should the positive side of the H.T. supply come into contact with anything on the positive side of the L.T. supply the total H.T. voltage would be applied across the filaments, and they would be destroyed. As the H.T. battery may be tapped, and two or more leads used in conjunction with the receiver, it is obviously preferable to put a fuse in the H.T.— lead, and this is the usual arrangement, shown in Fig. 2. For the benefit of those who are not quite clear how a fuse in the H.T. lead will protect the filaments it may be pointed out that in the usual circuit the H.T. supply is applied to valve anodes, and the current flowing is extremely small. In some cases, of course, a potentiometer may be joined across the supply, but the flow of current is only through the H.T. circuit. If any lead on the positive side of the H.T. battery comes into contact with the L.T. positive leads the filaments would be joined across the H.T. battery, and the low-resistance of the filament circuit would thus enable a very high current to flow from the high voltage supply, and this would destroy the filaments.

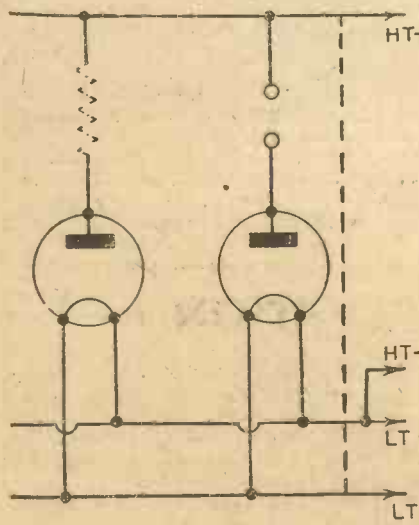


Fig. 1.—This diagram shows the standard battery connections, and how the H.T. can damage the valves by shorting to L.T.+.

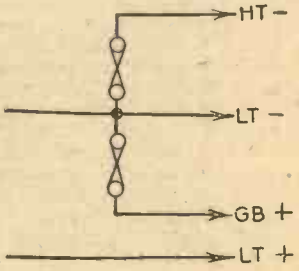
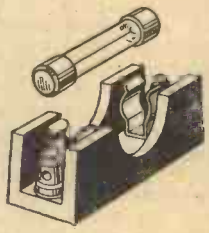
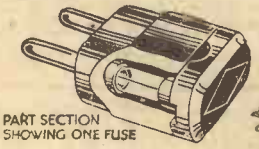


Fig. 3.—Additional protection may be provided by a fuse in the G.B. circuit as shown here.





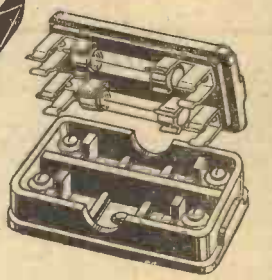


Fig. 4.—Here are some standard Bulgin fuses for use in mains apparatus.

Fuse Rating

The rating of a fuse for this type of protection should be slightly below that current which is needed for the valves in the set. It may be calculated by adding together the current of each of the valves, and then selecting a fuse rated at about ½ or 2-3rds of that current. In the majority of receivers a 100 mA fuse will be found suitable. If a high value of grid bias is employed it may also be worth while to include a fuse in the G.B. positive lead, as this is also joined to the L.T. negative lead, and thus may be regarded exactly in the same light as the H.T. negative lead—an accidental connection of the G.B. negative plug to the positive side of the L.T. supply applying an excess voltage to the filaments. It will be realised, of course, that the accidental short circuits just mentioned may arise through an H.T. positive or G.B. negative plug being dropped when making voltage changes or when testing a set, and therefore an alternative idea, which, although cheaper, is just as effective, is to protect the positive side of the filament supply. Insulated sleeving or the use of flex or other insulated wire for this purpose may be recommended, but the positive valve legs, and the accumulator positive terminal, are still bare, and may thus give rise to the trouble.

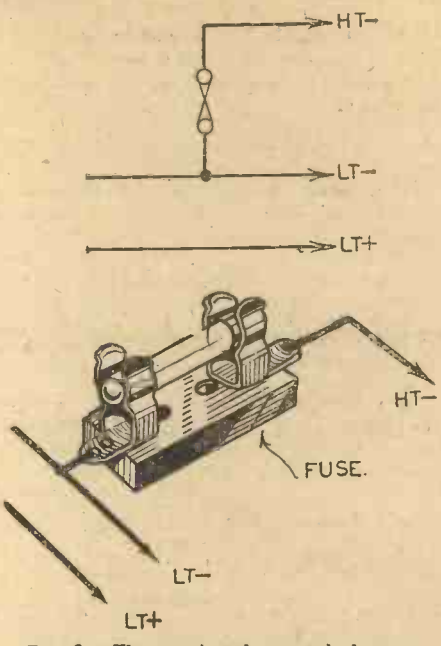


Fig. 2.—Theoretical and pictorial diagrams of battery connections with fuse in position.

Mains Fuses

In a mains receiver it is usual to employ insulated leads for the heaters, and as these are fed from a transformer secondary which is itself soundly constructed there is not the same necessity for heater protection. In a universal or A.C./D.C. receiver, however, the inclusion of a fuse in series with the heaters is recommended, and this may take the form of a dial-light of the type specially designed for the purpose. In an A.C. receiver one of the commonest troubles is failure of a smoothing condenser, and this may develop an internal short-circuit, and thus place an overload on the rectifying valve. One of the best protections for this type of trouble, and one which will also

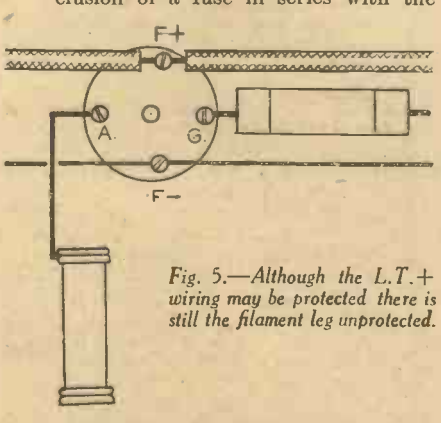


Fig. 5.—Although the L.T.+ wiring may be protected there is still the filament leg unprotected.

(Continued on next page)

USE A FUSE!

(Continued from previous page)

protect the rectifying valve against short-circuits in the receiver, is the inclusion of a fuse in the H.T. negative lead, and to afford maximum protection it should be placed as close to the centre-tap terminal on the transformer secondary as possible. If a flexible lead is fitted to the transformer,

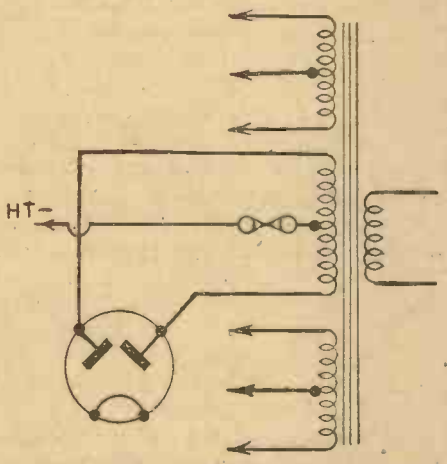


Fig. 6.—A fuse to protect a rectifying valve should be placed as shown here.

cut it off close to the transformer, and mount the fuse near it, using the lead from the other side of the fuse holder in place of the original flexible lead. The value of the fuse should be about .5 amps, and similar components should also be included in *both* leads from the mains to the receiver. Although, theoretically, a single fuse on the mains side is all that is necessary, it is possible under certain conditions for a short-circuit to arise in such a manner that the single fuse will be out of circuit.

Mains Connectors

The devices so far mentioned are for the protection of the receiver, but it is also desirable to protect the user, and in a battery set the voltages available are not high enough to do serious harm, although a shock may be unpleasant when not expected. Removal of the H.T. negative plug when touching the inside of a set will, however, prevent a shock from being obtained. In a mains receiver, the mains should first be *disconnected* from the set, and it should be borne in mind that it is often insufficient merely to switch off. One side of the mains may be in actual contact with certain parts of the circuit and by standing on a stone floor, or even the capacity existing between the body and earth, may enable a nasty shock to be felt. There are various types of mains connector on the market, and it is a simple matter to fit these. If, however, a back is fitted to the receiver, it is a good plan to mount one part of the mains connector on the back so that when this is removed in order to get into the interior of the set the mains will automatically be disconnected.

Some amateurs are in the habit of using the ordinary 5-amp. mains plugs and sockets for connection between the set and the mains, and although it is quite in order to do this, make quite certain that the *plug* is fitted to the receiver, and the *socket* to the cabinet back. If the order of things is reversed the two pins on the plug will be live to the mains when the mains switch is on, and thus when the lead is pulled away from the set there are two live points exposed.

Special mains connectors are, of course, available from several sources, and these are in various patterns suitable for mounting on wooden or metal chassis, or on cabinets. In the Bulgin range, for instance, there are completely shrouded models in which pins and sockets are protected under all normal conditions, and these may also be obtained with fuses incorporated. Two patterns, List P.73 and P.76 have plugs with a larger end fitted, and this may be used in conjunction with a hole in a cabinet back to provide the automatic disconnection already mentioned and illustrated in Fig. 7. Finally, when fitting this type of connector to a D.C. or A.C./D.C. set it must be remembered that correct mains polarity must be maintained.

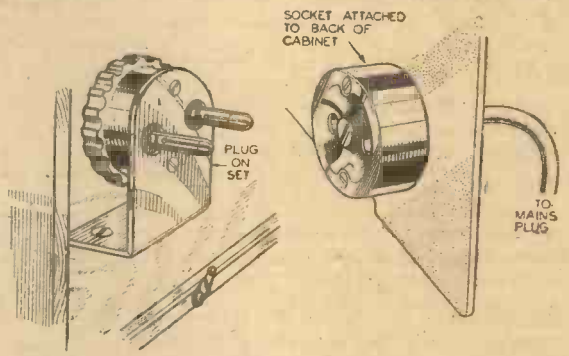


Fig. 7.—To avoid shocks when testing a mains set, a plug and socket may be included in this manner.

Important Broadcasts of the Week

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

Wednesday, March 16th.—Symphony concert: Last concert of the series, from the Queen's Hall, London.
Thursday, March 17th.—Variety from the Holborn Empire.
Friday, March 18th.—La Rondine (The Swallow), a lyric comedy.
Saturday, March 19th.—A commentary on the Rugger match, England v. Scotland, from Twickenham.

REGIONAL (342.1 m.)

Wednesday, March 16th.—An excerpt from Going Greek, from the Gaiety Theatre.
Thursday, March 17th.—Ice Hockey, National Tournament: a commentary on the last period of the game, Brighton Tigers v. Wembley Lions, from the Sports Stadium, Brighton.
Friday, March 18th.—Northern Music Hall Parade: Variety from the Argyle Theatre, Birkenhead, the Palace Theatre, Blackpool, and the Empire Theatre, Gateshead; Concert Party programmes from the Palace Theatre, Burnley, and the Grand Theatre, Doncaster.
Saturday, March 19th.—Katinka, a musical comedy.

MIDLAND (296.2 m.)

Wednesday, March 16th.—Orchestral programme.
Thursday, March 17th.—Variety from the Opera House, Leicester.
Friday, March 18th.—What Industry Offers your Child: The Building and Constructional Trades, a discussion.
Saturday, March 19th.—Katinka, a musical comedy.

NORTHERN (449.1 m.)

Wednesday, March 16th.—Saga at Storr, a play by C. B. Pulman.
Thursday, March 17th.—The Hallé Society's Concert, from the Free Trade Hall, Manchester.
Friday, March 18th.—Northern Music Hall Parade: Variety from the Argyle Theatre, Birkenhead, the Palace Theatre, Blackpool, and the Empire Theatre, Gateshead; Concert Party programmes from the Palace Theatre, Burnley, and the Grand Theatre, Doncaster.
Saturday, March 19th.—Liverpool Welsh Choral concert from the Central Hall, Liverpool.

WELSH (373.1 m.)

Wednesday, March 16th.—Melodies of Wales: vocal programme.
Thursday, March 17th.—Choral programme from Penuel Chapel, Pontypridd.
Friday, March 18th.—Programme of Music by Schubert.
Saturday, March 19th.—Cyn y 'Steddfod (Before the Eisteddfod), a light programme about a local Eisteddfod.

WEST OF ENGLAND (285.7 m.)

Wednesday, March 16th.—Dance Cabaret, from the Royal Bath Hotel Ballroom, Bournemouth.
Thursday, March 17th.—Westward Ho! Number Six of a radio magazine.
Friday, March 18th.—Ballroom Dancing: West of England Championship, a commentary on the finals for the Imperial Trophy, from the Victoria Rooms, Bristol.
Saturday, March 19th.—Orchestral concert, from the Colston Hall, Bristol.

SCOTTISH (391.1 m.)

Wednesday, March 16th.—A Ceilidh Evening in Ardgour, from the MacLean of Ardgour Memorial Hall.
Thursday, March 17th.—Yon Antrim Days, reminiscences of people and things in Scotland in 1890.
Friday, March 18th.—The Scottish Country, an impression of Life in Ardgour, from Ardgour.
Saturday, March 19th.—Pride o' the Green, a comic opera in two acts.

NORTHERN IRELAND (307.1 m.)

Wednesday, March 16th.—Ireland Dances: a programme of contrasts and comparisons.
Thursday, March 17th.—Speed: a programme in fast dance tempo, from the Plaza Palais de Danse and the Ritz Cinema.
Friday, March 18th.—Organ recital from the Cathedral Church of St. Columb, Londonderry.
Saturday, March 19th.—Ireland Dances: a programme of contrasts and comparisons.

ON YOUR WAVELENGTH

By Thermion

Push-button Tuning

I UNDERSTAND that those who require to make an automatic tuning system for their receiver will be able to do so in the very near future. As soon as components are ready the designs will be published in this journal. Thus, the benefits of this system will not be conferred only on those who merely buy commercial receivers. It is understood, of course, that the number of stations which can be linked with such a system is comparatively small considering the number of stations which the set under normal tuning arrangements could actually receive. Personally, I do not think so much attention should be devoted to tuning systems when so many other parts of the circuit are in need of attention.

The Southampton Relay Scheme Fails

I AM glad to notice that the Post Office scheme for Post Office operated wireless relay systems at Southampton has failed. A Post Office engineer thinks that successful relay experiments will be carried out in other towns, and that the quadruple cable system will be installed very soon. They think that owing to the increase in the number of local relay systems which cause interference with Post Office telephones and telegraphs, wireless traders would do better to negotiate with the Post Office than to lose their business anyway, owing to the competition of the relay system. The defects of the P.O. relay system are, briefly, that listeners are forced to tune-in to one of four stations only. In Southampton alone it was estimated that the loss to the town would be £4,000 a year from rates, £125,000 from electricity charges, and £30,000 loss to wage earners. Whatever the answer of the Post Office may be, it is a matter for congratulation of the wireless trade in Southampton that they have refused to allow the Government to insert the thin end of the wedge of unfair commercial competition in Southampton.

Confusion Worse Confounded

WE have standardisation committees on the mechanical and electrical sides, and I think it is time that someone now set about standardising the nomenclature adopted by wireless manufacturers. The car trade is in a somewhat similar state, where you have the confusion of cars being termed "Eights," which may refer to horse-power or the number of cylinders, and there are similar anomalies. A trade contemporary publishes the appended abstract of a conversation which shows how difficult things are getting. It happened in a wireless dealer's shop :

"*I want a valve, please.*"

"*Yes, sir, what type and make?*"

"*I don't know, it's for a wireless.*"

"*What make of set is it?*"

"*I'm not sure. I think it is a —— or a ——*"

"*Is it a mains or a battery set?*"

"*Oh, one of them you plug in—an electric.*"

"*Is the valve an S.G., detector, power, or pentode?*"

"*I don't know.*"

"*Well, how many legs has it? Has it 5, 7 or 9 legs, or has it the new octal base? Is it an English or American type valve?*"

"*There are a lot of legs, but I didn't count them.*"

"*Well, we do not appear to be getting much further, sir; hadn't you better bring in the dud valve?*"

The question arises as to whether we need all these fancy valves with fancy bases. My neighbour's set seems just as horrible as it did a few years ago when he was using triodes.

My Quality Receiver

TO satisfy the many readers who have written asking for details of my quality receiver, may I point out that I am hard at work upon it. It will not not be cheap, so those people who desire the quality of a 60 guinea hand-made job for next-to-nothing will, I am afraid, be disappointed. I have put quality first, and expense second. Even when the design is published I have no doubt lots of readers will think that I ought to have included something which I have decided is unnecessary. As E. W. B., of Herne Hill, says :

"There seem to be numerous versions of this interesting subject, and when one is deciding which design will be *the* one, someone always bobs up with something that the others haven't got, and so off we go again on another tack. One reason for failure in good reproduction in battery type sets is that the vital parts are *not* chosen with due regard for their function, with the result that a terse letter appears in the following issue of PRACTICAL AND AMATEUR WIRELESS from X to Y, giving everyone a portion of his (alleged) mind about it.

"Your correspondent, H. A. R., of Cardiff, doesn't seem to care for this so-called latest rhythm; am I right in guessing that he also prefers real music as offered by the 'Proms,' etc.? I am very amused by K. T. H.'s poem, and I hope he sends a copy of it to the 'Chief,' suitably framed of course.

"I was glad to note that you referred to a Wasp from Accrington. Anyone who refrains from putting an address on a letter is usually to be ignored, as any such criticisms they may offer are not worth the paper they are written on, and surely only cowards without courage adopt this skunk-like practice, which I greatly deplore."

In spite of the assertions of my correspondent I am quite convinced that the demand for a quality receiver is *comparatively* small. However, it is up to those who want my design for a quality receiver to prove me wrong. The Editor is under the impression that the demand chiefly comes from an articulate and noisy minority. It is significant that in the voting competition we held some time ago not one reader asked for a first-class quality receiver. Many thousands, however, have testified to the high quality of the Editor's sets, and having heard most of them, I have my doubts as to whether his sets could be improved upon. Having seen him at work and witnessed the enormous amount of thought and attention he puts into them, they deserve their success, and it is with some trepidation that I gate-crash into the realms of design.

The Spelling Bee

I DO not know what this Bee business is about—and don't misunderstand my meaning. Why we should have to have these absurd spelling competitions on a Sunday linking up two or three continents to find who can spell best I do not know. Dictionaries are cheap, anyway, and you can always find one which agrees with your particular way of spelling. If a word is misspelt in a dictionary (they cannot always be right), the word is on record for all time. The work of deciding pronunciation, and spelling, should be undertaken by the British Government and none other. As a hard-boiled Englishman I object to the Scots, the Welsh and the Irish having a say in the game; and it doesn't matter, anyway. Lord Snowden attained highest rank, and he could not correctly pronounce the word *situation*. Ramsay MacDonald became Prime Minister although he could not pronounce *world*, and J. H. Thomas has a delightful use for the aspirate in the wrong places. Most of our politicians and public speakers are ungrammatical, and a word or a phrase, however wrong, has merely to be uttered a sufficient number of times for common usage to give it cachet. Let us have the programmes occupied with something amusing and entertaining, especially on Sunday. I am glad to learn that we are going to have a Sunday morning programme. We are promised that it will be "light." I hope it will be.

Good Samaritans

AFTER my recent attack on fraudulent claims, I am happy to be able to publish the following letter from a genuine case. This letter is from T. G. H., and if any readers can supply what he wants I shall be glad to send them on.

"As my address denotes, I am a patient in a hospital and have been since 1926—quite a long time isn't it?—and believe me, I'm a fixture. Also I have no living relatives, nor have I even the smallest income, or insurance. Up to now I believe I am quite a genuine case for your Good Samaritans. But to get to the point, for some years now I've had a radio, and my present one, bought second-hand for 10s., is in a deplorable condition, particularly the speaker and valves. It is a 3-valve ——— S.G., Det., Pentode. I am using a D.C. eliminator for H.T.; cost of upkeep 4d. per week for accumulator, which I think is marvellous.

"Have any of your Good Samaritans one or all of the following items they wish to dispose of?

1. A decent speaker (who said moving coil?).
2. A 2-gang .0005 condenser.
3. A not too old pentode valve.

"Well, how about it? Perhaps you'll regain a little of your belief in the power to do good.

"Methinks *my case* will stand up to your investigations, for I am not a regular reader of this paper, nor have I a starving wife and children—but I have a very urgent need of the items mentioned above. Believe me, this wireless, bad as it is, has been jolly good company. Perhaps I shall be hearing from you, but I must ask you not to publish my name, etc."

Notes from the Test Bench

Variable-Mu Valves

WHEN modernising an old battery-operated receiver it is often thought desirable to fit a variable-mu H.F. valve. In many cases it will be found, however, that the tuning coil is provided with self-contained switching or is otherwise so arranged that the connection to the volume control potentiometer is not easily provided for. It should be remembered that it is not essential to feed the control to the coil. It is quite permissible, and is, in fact, very often desirable, to connect the grid direct to the potentiometer, interposing a high-resistance leak in the lead, and a fixed condenser between the grid and the tuning circuit. This scheme sometimes offers advantages from a stability point of view, although connected to the grid, as the H.F. stopper may be joined direct to the grid terminal and the control placed much closer than in the ordinary case. A smoothly-operating control is, of course, essential in this position, and the older type of tapped or wire-wound control which varies in "jumps" should not be used.

Transformer Regulation

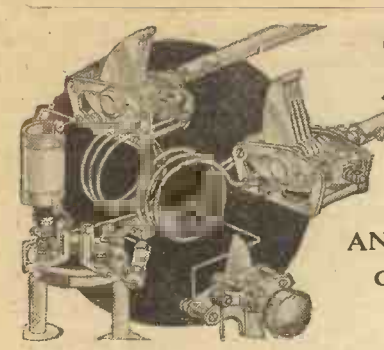
QUERIES often arise as to the variation of the output voltage in mains transformers when used below or above the rated markings. Modern transformers are usually well-designed and when a suitable gauge of wire and size of core is employed, the rise of voltage on no load may be regarded as approximately 5 per cent. Of course, in some cases it may be more and in other cases less, but this figure may be taken as a satisfactory mean. The rise will, of course, be proportionately lower when current is taken and from this figure it should be possible with a good component to calculate approximately the difference in voltage at the load required. Excess voltage may be removed by means of a bleeder resistance connected across the winding, the value being calculated in the usual way by Ohms law—excess voltage divided by the current giving the value of the resistance.

Oxford and Cambridge Boat Race Commentary

I AM informed that the Oxford and Cambridge Boat Race will this year have added interest because the television camera will broadcast pictures of the finish of the race at Mortlake, thus creating radio history.

The B.B.C. is again arranging for John Snagge, of the Outside Broadcast Department, who was prominently identified with rowing during his Oxford career and is now annually responsible for B.B.C. Boat Race broadcasts, to take a launch on the Thames on March 24th, and, accompanied by George Drinkwater, famous rowing Blue, to pick up both the Oxford and Cambridge Eights in practice. They propose to broadcast to listeners what appears to them to be the state and form of the crews as seen on that afternoon. This commentary will be some ten days before the actual race and may possibly prove to be a correct forecast of the result.

The transmission will be by a portable transmitter in the launch. This works to a temporary short-wave station erected on shore, which in turn is connected to Broadcasting House by landline. Actually, this preliminary trial has occurred every year as a full dress rehearsal, but this is the first occasion on which it will be broadcast.



Short Wave Section

AN ULTRA-SHORT-WAVE CONVERTER

Constructional Details of a Simple but Efficient Unit are Given in this Article.

THE writer has been seeking a simple and foolproof circuit for ultra-short-wave reception. Experimental work was carried out during which valves of the simplest kind were used in various oscillator circuits, but all of these seemed to possess disadvantages. It was not until a triode hexode was tried with certain circuit simplifications that the final circuit, shown in Fig. 1, was arrived at.

One of the difficulties on the ultra-short-waves is grid loading of the detector valve. The grid input impedance of the valve drops considerably at these high frequencies. Tuning becomes broad, and little amplification is obtained; it is therefore usual to deload the grid circuit as much as possible. At the same time, of course, sufficient signal energy has to be transferred to the valve.

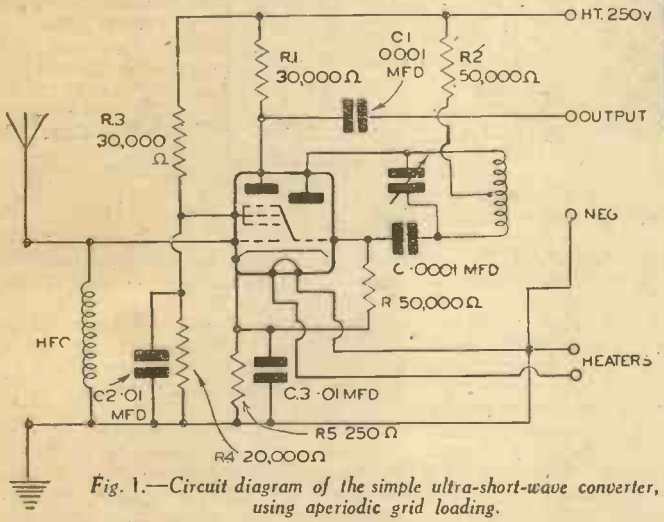


Fig. 1.—Circuit diagram of the simple ultra-short-wave converter, using aperiodic grid loading.

Obviously then, the grid input circuit is one of the more critical features referred to on the ultra-short waves.

Grid Loading

In the circuit shown in Fig. 1 the grid of the valve is highly loaded by having the aerial connected direct on, and the tuned grid circuit is replaced by an ultra-short-wave H.F. choke. This provides an aperiodic input over the whole of the ultra-short-waveband, and also does away with the necessity of having a tuned aerial of the dipole kind. The oscillator circuit connected to the triode portion of the valve is of the Hartley type, and it is with this circuit that all the tuning is carried out.

It was decided to use the simple resistance-capacity method in the output. This is satisfactory, and enables the converter to be used with any kind of receiver input, and is again aperiodic over all wavelengths to which the receiver might be tuned to act as an intermediate frequency amplifier. Due to the screening of the modulator grid of the triode hexode and the use of a separate oscillator, the input, output, and oscillator circuits may be considered separately as there is not any interaction between them.

Circuit Values

The circuit values should be strictly adhered to, although it may be thought that the anode output resistance is of rather a low value, considering that the anode impedance of the valve is in the region of half a megohm. Under practical working conditions 30,000 ohms was found to be as high as it was advisable to go, as the hexode part of the valve is designed to be used with a fairly high working voltage. The voltage for the screens is obtained by means of the potentiometer method, using fixed resistances, the stated values will automatically apply the correct working voltage to the screening grids, irrespective of the initial voltage applied to the converter. The tuning condenser has a maximum capacity of 40 micro-microfarads, which is slightly higher than the capacities generally used for ultra-short-wave tuning. However, there were several reasons for this. The capacity used gives a good frequency coverage; it was thought that if coil changing was necessary, much of the effectiveness of this little unit would be lost. Good oscillator stability is also obtained with a high ratio of external to internal valve capacity. Small changes in the wiring to the tuned circuit will not affect the calibration.

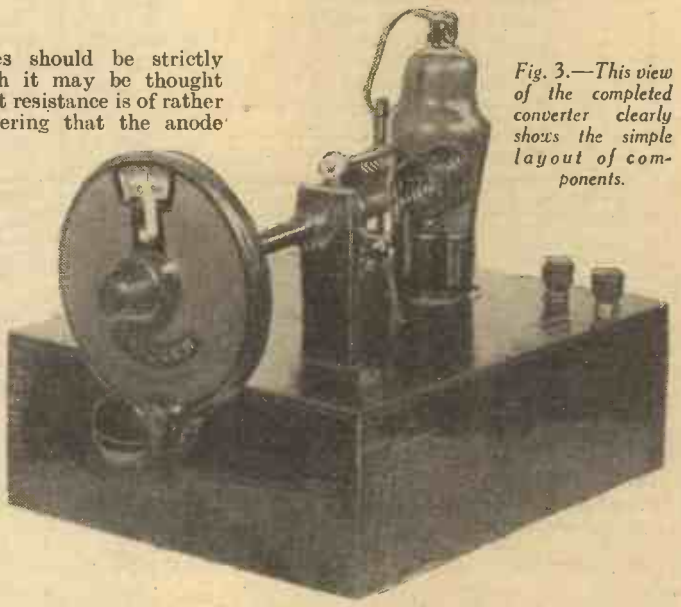


Fig. 3.—This view of the completed converter clearly shows the simple layout of components.

Constructional Details

Turning to the practical construction of the converter, a small wood chassis is used measuring 9 by 7 inches, and having a depth of 3 inches. The construction should be started by first mounting the five terminals along the chassis, and also the 7-pin valveholder. Viewing the chassis from the back, the two terminals at the left are for the heater of the valve. The three terminals at the right of the chassis are: H.T. positive, at the outside; output, the centre terminal; and negative terminal, nearest the valveholder.

The valveholder is mounted in the centre of the chassis, and as near to the back as possible, and it should be carefully noted that in mounting, the oscillator anode pin (No. 1) comes directly opposite, and nearest to, the tuning condenser.

The wiring underneath the chassis should next be carried out. Turning the chassis over so that the H.T. positive terminal appears in the top right-hand corner, the general arrangement will be clearly followed in Fig. 4. Starting from No. 1 pin of the valveholder, and moving in a clockwise direction, the lettering refers to respectively, oscillator anode, oscillator grid, screening grids, heaters, cathode and anode.

The resistances and condensers are supported by their own wiring, and

(Continued overleaf)

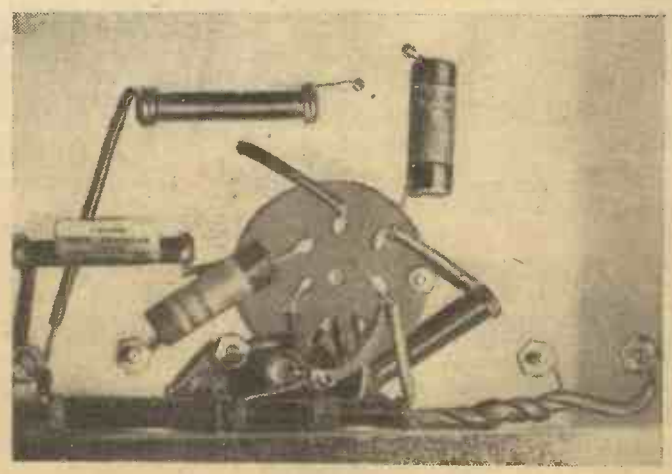


Fig. 2.—Underside view of the chassis.

SHORT-WAVE SECTION

(Continued from previous page)

apart from the heater connections, the only other wire required is from the oscillator anode pin to the fixed vanes of the tuning condenser. The moving vanes are taken to the oscillator grid condenser C. The wiring through the chassis to the tuning condenser, and to the tap on the coil from R2, should be as short and as direct as possible. Apart from the components just mentioned, and the output condenser and resistance, the rest of the components may be packed in as tight as possible round the negative terminal and the valveholder.

Returning to the top of the chassis, the tuning condenser is mounted on a small ebonite support screwed to a small block of wood, which is in turn screwed to the chassis. The condenser should be mounted as close as possible to the valve without actually touching it. The position of the tuning condenser should also be such that one terminal of the fixed vanes and the terminal to the moving vanes are as near to the chassis as possible.

LIST OF COMPONENTS.

One 40 micro-microfarad variable condenser (Eddystone).
One Ultra-short-wave H.F. choke (Eddystone)
Two 30,000 ohm resistances (Erie).
Two 50,000 ohm resistances (Erie).
One 20,000 ohm resistance (Erie).
One 250 ohm resistance (Erie).
Two .0001 non-inductive condensers (T.C.C.).
Two .01 non-inductive condensers (T.C.C.).
One 7-pin valveholder (Clix) (Chassis mounting).
One Extension outfit (Eddystone).
One Slow-motion tuning dial.
Five terminals, 16 S.W.G. enamel wire for coil, wood for chassis, etc., etc.
One valve, triode-hexode type (Osram X41).

Winding the Coil

The tuning coil is wound with No. 16 enamel wire, and has an overall diameter of five-eighths of an inch. The spacing between turns should be approximately one eighth of an inch. The coil is mounted directly across the condenser, one end being taken to the top terminal of the fixed vanes, and the other end to the terminal of the moving vanes. The coil is centre-tapped, a little of the enamel being scraped off the third turn, and the wire from the resistance R2 is soldered on.

The other component mounted on top of the chassis is the H.F. choke; one end of this is soldered to the negative terminal, and the other end is taken to the top cap of the valve, which is, of course, the control grid.

H.T. Voltage

The wiring of the converter, after completion, should be very carefully checked, particularly the resistance-capacity ensemble underneath the chassis. The converter can be used with any receiver, provided the receiver has one stage of H.F. amplification. The output terminal is connected to the aerial input of the receiver, H.T. and heater voltages are applied to the converter. It will be seen that one side of the heater is connected directly to the negative line, so that a centre-tapped transformer is not required. This also does away with questionable values of bypass condensers, and it will be seen that the heater of the triode hexode has a separate filament winding, either from the main set or from a separate transformer. Regarding the H.T. voltage, 250 volts is the maximum that should be applied, and during tests the H.T. voltage was varied from 300 down to 90 volts and it was found that the unit operated equally as well at the lower voltage, except for a slight drop in amplification.

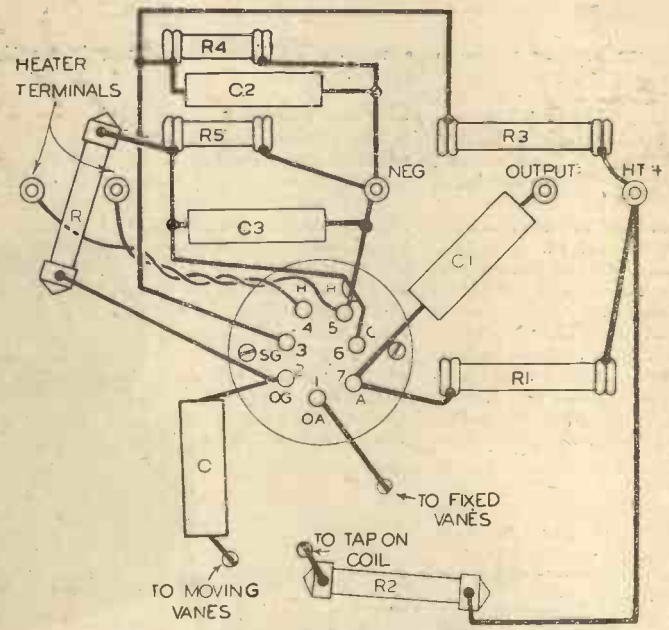


Fig. 4.—Diagram showing the arrangement of sub-chassis resistances and condensers, and wiring connections.

Operation

Any length of aerial can be used, and is clipped direct on to the top cap of the valve. During tests a local signal was tuned in on 10 metres, and the aerial was varied from a 95-ft. outdoor to a few feet of wire indoors. Apart from a considerable drop in the signal strength the calibration remained constant, the tuning dial not being touched. It must be pointed out that tuning is very sharp, but stable. If a broadcast receiver is used it should be tuned down to the bottom end of the medium waveband, and if a short-wave receiver is used the 170-metre band will provide the I.F. frequency. The ideal I.F. frequency is between 150 and 250 metres.

When the converter was being tested it was coupled to a straight three-valve receiver (H.F. det. and L.F.), and at a distance of over 100 miles from the Alexandra Palace it was just possible to detect the television signals under good conditions, so that it may be taken that below 7 metres this converter is something in the nature of the equivalent to a local-station receiver on the broadcast bands. On 10 metres it brought in amateur telephony signals from America and Canada with ease. The 10-metre band comes in right at the top of the tuning dial, or with the condenser just over three-quarters in mesh; the minimum wavelength will depend to a certain extent on the valve used, and capacity of the tuned circuit.

LEAVES FROM A SHORT-WAVE LOG

A New Colombian?

HJ6ABU is the call-sign given by a transmitter announced as located at Pereira (Republic of Colombia); the wavelength has been reported by some listeners as 48.82 m. (6.145 mc/s), and by others as 49.55 m. (6.055 mc/s). The call heard was: *Aqui La Voz de Pereira en la Republica de Colombia, emisora HJ6ABU.* As some of the South American short-wave stations are vacating the congested bands for channels above 50 m. (6 mc/s) there is a possibility that HJ6ABU is also seeking a place in the sun.

Santiago Again in the Log

HI1A, Santiago de los Caballeros (Dominican Republic), has increased its power; its interval signal of six slow chimes spread over about thirty seconds are so distinctive that they assist considerably towards quick identification. The wavelength is 48.47 m. (6.19 mc/s) and the call (phon.) *Akee esta-see-own ah-tchay ee ouno ah* (HI1A), *La Voz del Yah-kay.* The studio is on the ether from G.M.T. 15.30-19.30, and again from 22.00-03.00, and signs off by playing a gramophone recording of "Anchor's aweigh." Address: Apartado Postal, 423, Santiago de los Caballeros (Dominican Republic), West Indies.

The Significance of Sponsored Programmes

Readers who listen to the publicity programmes broadcast by the N.B.C. and C.B.S. networks through their short-wave outlets may be interested to learn that the gross revenue derived from the sale of time on the air by stations in the United States of America during 1937 attained the large amount of 140 million dollars. That this feature is being considerably developed is proved by the fact that the above figure represents an increase of nineteen per cent. over the revenue derived from this source in the previous year.

Regular Broadcasts from Guatemala

Listeners report the reception of excellent signals from TGWA, Guatemala City (Republic of Guatemala), Central America, a 10 kW. transmitter officially opened by the Radio Corporation of America on October 12th, 1937. The station works on 19.78 m. (15.17 mc/s) and is well heard from G.M.T. 21:00. Announcements, when International broadcasts are carried out, are made in Spanish, German, English, French and Italian.

Bangkok Can be Regularly Logged

HS8PJ, Saladeng, Bangkok (Siam), a 5-kilowatter on 31.58 m. (9.5 mc/s), is on the air every Thursday from G.M.T. 13.15-15.15 with a special programme destined to European listeners. On Monday a similar broadcast is given during the same period of the day, but on 15.77 m. (19.02 mc/s). The interval signal consists of three chimes (ascending scale), and announcements are made in several Western languages.

Transmitting Topics

In this Fifth Article of the Series Crystal-controlled Oscillators and Details of the Power Pack for a 10-watt Transmitter are Discussed.

By L. ORMOND SPARKES.

YOU will remember it was pointed out that there are two classes of oscillators, namely, crystal-controlled and self-controlled. As we are solely concerned at this stage with those coming in the crystal class, let us see what is meant by the term, and what are the usual circuit arrangements. Most constructors are familiar with the "piezo-electric" group of crystals, the most common member being that known as "quartz."

Properties of Crystals

These crystals have certain *electro-mechanical* properties which allow them to oscillate at definite fixed frequencies, the rapidity of which is governed by the "cut" and physical dimensions of the crystal.

Due to their electro-mechanical characteristics they can be used in what might appear at first sight very diverse ways; for example, there are "piezo-electric" pick-ups, loudspeakers, headphones and microphones, while, in the other direction, they are used in electrical oscillatory circuits to limit or govern the frequency of the oscillations.

For transmitting work the crystals are supplied mounted or unmounted, the mounting usually consisting of a moulded or turned insulated case so designed that the small slab of crystal is held between two metal plates, connections from which are brought out to two pins or other suitable contacts.

When ordering, one has to state the frequency response required, and the makers grind the crystal accordingly, and supply a certificate giving full details of its frequency, thus allowing the purchaser to satisfy the Postmaster-General of the accuracy of his frequency-controlling arrangements—a very essential item.

When studying a modern transmitting circuit the symbol shown on the left of Fig. 1 will invariably be seen, and that is how a crystal control or "gate" is denoted. The other two diagrams indicate the theoretical circuit, in an electrical sense, as one can think of a crystal having the equivalent of inductance, resistance and capacity in series, while the two metal-holding plates—mentioned above—can be considered as a certain capacity across the complete circuit, hence the condenser C1 in the third diagram of Fig. 1.

Self-controlled Oscillators

With "self-controlled" oscillators one has many items to contend with so far as maintaining a *constant* output frequency is concerned, therefore, it becomes a very difficult matter to keep such circuits perfectly free from frequency variation or, in other words, from the wavelength wandering up and down the scale. This fault *must* be avoided at all costs. Not only is it a very bad sign as regards the efficiency or operation of a station, but the P.M.G. will *not tolerate* such transmissions. These frequency variations with an S.C. oscillator can be caused by such things as H.T. supply not being dead constant, valve heating, swinging aerial or variations in grid and output load, to mention but the most common.

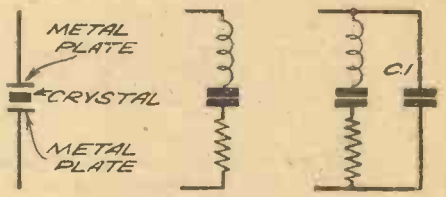


Fig. 1.—Symbol and theoretical equivalent of crystal control.

With a crystal-controlled equipment these snags are removed, likewise operation is simplified considerably, and the need for expensive calibrated check meters eliminated.

Crystal-controlled Oscillator

As regards the effect of a crystal in an oscillatory circuit, one might think of it as a *very* selective arrangement of an ordinary coil and condenser combination, but in actual use the crystal will be found to have a resonant point so sharply defined that it is impossible to secure similar conditions with inductance and capacity more usually associated with tuned circuits.

So far it would appear that the quartz crystal is a simple fool-proof arrangement that can look after itself, but, like all other good things, there are limits, and failure to know and observe these limits might ruin a crystal completely.

If a crystal is embodied in a circuit carrying radio or high-frequency oscillations, a certain amount of heat is generated, due to the structure of the crystal and the amplitude of the oscillations, and if the heat produced is not kept within certain limits it *can cause* frequency variation. Similarly, due to the characteristics of the crystal, certain oscillations are produced—apart from those the circuit is concerned with—which tend to produce additional heating and *mechanical stresses*, and if the H.F. voltages or the amplitude of oscillations are great enough it is possible for the crystal to crack up under the excessive strains applied. All this can be summed up and remembered in a very few words. A crystal-controlled oscillator must be limited so far as power output is concerned; it will only handle, with safety, low power, say, 4 to 5 watts.

This might not sound too good to the beginner, but, as it will be explained later, the output from the oscillator can be amplified by what are known as *power amplifiers*, thus allowing any output to be obtained.

The 10-watter

Having stated last week what the four shelves are for, I will now deal with the

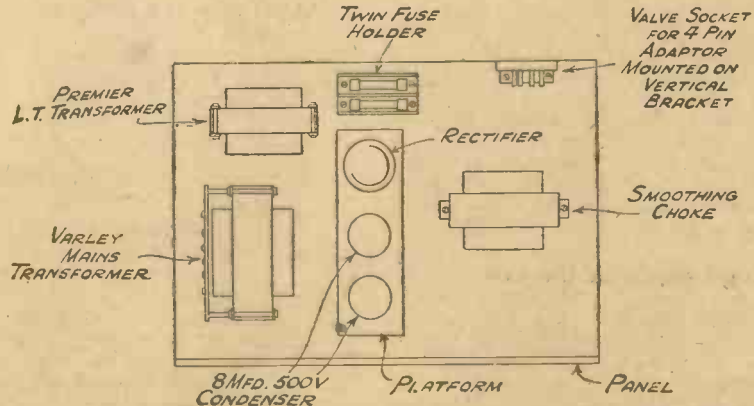


Fig. 2.—Showing layout of the power pack on the bottom shelf, and the relative positions of the mains and L.T. transformer and smoothing choke. The twin fuse is located to allow easy access from rear of rack, while the four pin adaptor and socket enable output to be broken for the quick removal of the shelf.

layout and constructional details of the fourth or bottom shelf which is to carry the power pack.

Bearing in mind the fact that most constructors interested in this series will, no doubt, have quite a lot of gear on hand, I do not propose to tie down the makes and types of all component parts, although, in your own interests, it will be advisable to follow all details as closely as possible.

The mains transformer No. 1 is a Varley type E.P.33, which is designed for use with a "B" type valve rectifier, namely, 350-0-350 volts at 120 milliamps. The L.T. windings being 4 volts at 2.5 amps., 4 volts at 6 amps., and 4 volts at 1 amp., thus allowing wide choice of circuit designs.

This, with a suitable rectifier, is intended to be the main supply of H.T. voltage, while for the heater of the American 6L6, which is to be used as the Tritet oscillator and doubler, I have included a small mains transformer capable of supplying 6.3 volts at 2 amps., again catering for any possible future needs. This transformer is obtainable from the Premier Supply Stores, and other recognised transformer manufacturers. For the smoothing, two Dubilier 500-volt dry electrolytics are used in conjunction with a good choke having an inductance of 25 henries at the above-mentioned H.T. current.

A twin fuse-holder—Bulgin—is connected in the H.T. secondary of the Varley transformer to prevent any possible damage through breakdowns of condensers, rectifier or other components in the H.T. circuit, and every wise constructor will include this in the layout.

For the output, a four-pin chassis type valveholder is mounted on a small vertical bracket to allow one of the four-pin Bulgin plugs to be used for the feeds to the other panels. You will note in Fig. 2, which shows the layout of this shelf, that I have included switches—Q.M.B. type—for switching on the mains supply to this section, for breaking the H.T. secondary circuit, and in the primary of the L.T. transformer to allow that circuit to be cut off if so desired. The Bulgin panel light is *essential* to serve as a safety pilot light indicating when the mains are on. The two Dubilier condensers and the rectifier valveholder are mounted on a small platform which is raised above the base sufficiently to clear the valveholder sockets and the positive terminals of the condensers.

Many readers will, no doubt, note that I am using a milliammeter on this panel, which I did not specify in the constructional details last week. Well, to be quite frank, I had the meter by me so I have included it to allow a check to be kept on the current consumption. Although not absolutely essential, it certainly is an asset, and is one of those items which can be added at a later date.

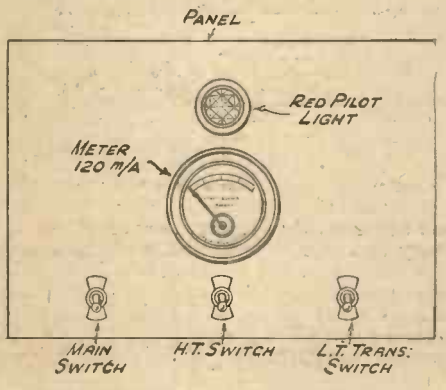


Fig. 3.—Panel dimensions and drilling sizes.

Those who haven't a mains transformer idle might wish to use one which will supply the whole outfit without the use of a separate L.T. transformer. Well, there is no reason why American valves should not be used throughout, if so desired, so I will give the additional details for that in my next article.

Co-operation Circle

As stressed before, it is up to everyone interested in transmitting to pass along their discoveries or snags, so all A.A.s and "fulls" are reminded to keep in touch with us. "Come in, somebody."

T. W. (Hants) raises the query whether a small transmitter can be operated off batteries. Most certainly it can. Provided a good constant supply of H.T. is available very satisfactory results can be obtained. The 2½-watt battery-operated transmitter, described during December and January of 1935-6, is a very good start.

R. S. (Somerset) brings to life that query which I thought I had disposed of satisfactorily, namely, "What use is an A.A. licence; what can one do with it?" Well, to be very brief, you can do everything a "full" licence will allow you to do *except* radiate over an unlimited area. You can carry out practically all tests, and learn all about operating and adjusting a transmitter and, what is more important, you can experiment to your heart's delight.

T. D. (Surrey) asks if it is advisable to construct a "self-controlled oscillator." If it is intended for transmitting, the answer is definitely *no*. See remarks regarding requirements of such oscillators.

F. S. S. (Birmingham) wants to know which is the best frequency to state when applying for a "full" licence. It is always advisable, when stating original frequency on which a station is going to be operated, to bear in mind the number of transmitters in your own district or area, and select a frequency which is the least likely to be jammed or swamped by any of those near you. In other words, keep off their frequency bands as much as possible.

Calls

To start the ball rolling in the Co-operation Circle, I give below two calls from A.A. readers, and I hope that these are the forerunners of a big membership to this movement. G. Chilvers (2DCP), of 20, North Everard Street, King's Lynn, Norfolk, states that the original series of Transmitting Topics were the means of him and his brother getting their A.A.s, and they are both anxious to get in touch with other A.A. operators seriously interested in the subject. The call-sign of his brother is 2CPO, and his address is A. Chilvers, 11, Albert Street, King's Lynn.

Another very interesting letter comes from A. N. Webster, of Huyton, Lancs, who suggests an item which, while I have not mentioned it in this series of articles, I did stress in the original series during the early part of 1936. However, it is well worth while mentioning again.

For serious work, and this applies to all who take up transmitting, it is really useless to carry out numerous tests and experiments unless some detailed record is kept of the tests and the results obtained, finishing up the report with the deductions formed by your observations.

A strong loose-leaf cover can be obtained for a few pence and, if the reports are filed under appropriate headings, future reference will be a speedy and simple matter.

By adopting some methodical system such as this, a very valuable reference file can be compiled which, apart from satisfying the licence regulations regarding the keeping of a log book, will save the experimenter from trusting too much to his memory.

WIRELESS FOR CARDIFF TERRITORIALS

The 82nd Field Brigade R.A. at Cardiff are to be equipped with the latest wireless apparatus for inter-brigade communication, and an instructor from Western Command headquarters is attending the Drill Hall, Cardiff, giving instruction in the use of the new apparatus. The illustration on the left shows Cardiff Territorials receiving instruction on the latest wireless sets at the Drill Hall.

A PAGE OF PRACTICAL HINTS

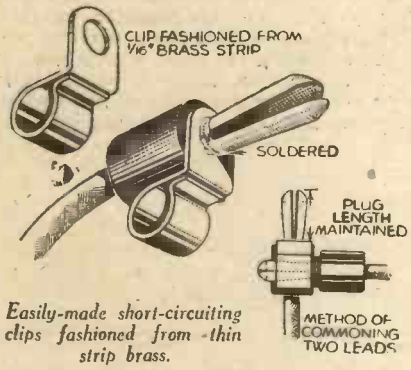
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

Simple Short-circuiting Clips

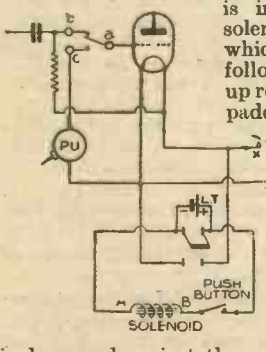
WHEN experimenting, it is often necessary to short-circuit two of the battery plugs for variation in the H.T. or G. Bias. Although it is a simple matter to utilise a short length of wire for doing so, I found in practice it is very unsatisfactory, and an element of danger. I therefore decided to design and construct a number of small clips, made up as shown in the accompanying sketches, which show the application of the clips quite clearly.—M. FLOYD (Wembley).



Easily-made short-circuiting clips fashioned from thin strip brass.

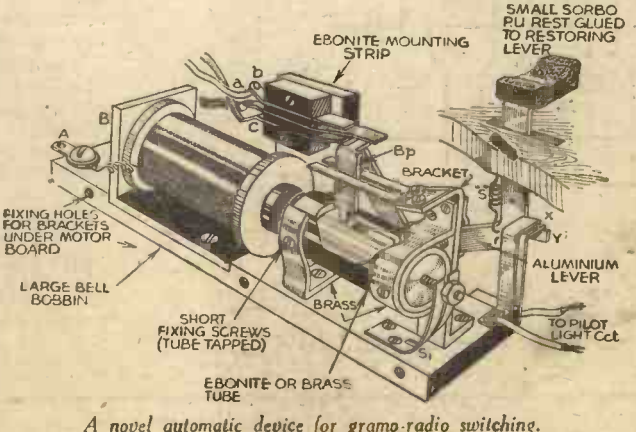
An Automatic Switching Device

THE accompanying illustration depicts an automatic arrangement whereby my radio set cannot be operated until the pick-up has been restored to its normal position. Indication of the pick-up having been left on the record is given by the pilot light incorporated on the front panel. At the same time, the gramo-radio switching is included in the solenoid movement which operates as follows: The pick-up rests on the Sorbo padded lever which is depressed against the tension of the spring "S," two contacts "X" and "Y" are disengaged, the pilot light is out of circuit, and the receiver is switched over to the radio.



When the gramophone is required, the motor is started, and the pick-up removed from the lever, the contacts "X" and "Y" engage completing the circuit for the pilot light. The push-button is then depressed, completing the circuit for the solenoid which immediately operates, drawing towards the pole piece of the electro-magnet, the soft iron plunger, into which has previously been drilled a ⅛in. hole. Into this hole drops the flat brass plunger "BP" under the tension of the split phosphor-bronze spring, thus releasing the pressure on the centre change-over switch contact, and switching over to gramophone. The circuit action here can clearly be seen on referring to the inset theoretical diagram. The normal "on/off" switch—which is of the DPDT type, and is included on the front panel—is wired to include the pilot light circuit, and this switch will, of course, be operated for radio and gramophone.

Restoration of the pick-up arm causes the plunger "B" to be disengaged from the hole in the solenoid plunger, this plunger being drawn back by the spring "S 1," the "a" contact of the change-over switch is restored to position for radio, and the pilot light contacts "X" and "Y" are disengaged.—A. T. WENDRIFT (Mansfield).



A novel automatic device for gramo-radio switching.

THAT DODGE OF YOURS!

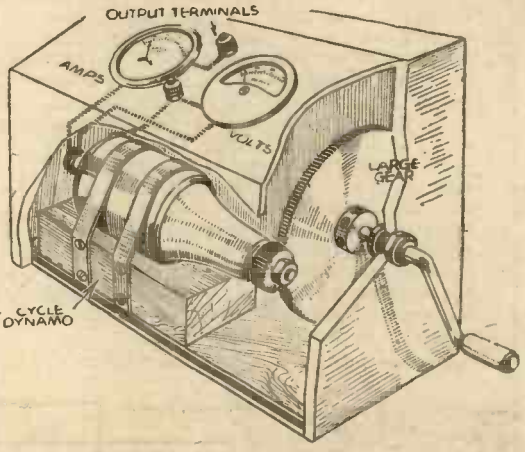
Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL AND AMATEUR WIRELESS," George Newnes, Ltd., Tower House, Southampton Street, Strand, 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.

SPECIAL NOTICE

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

A Small D.C. Generating Unit

HAVING for some time past been driven to the verge of distraction, when wanting to test circuits, etc., for continuity, I have devised the following little D.C. generating unit. No more do I have to find odd batteries and flashlamps. The generating portion is an old bicycle dynamo, driven at fairly high speed by a small crank, a small gear wheel having been fitted in place of the old knurled wheel on the dynamo spindle, and a large gear wheel driving it. The current, and the voltage, can be raised and lowered by simply turning faster, or slower. The outfit is securely fastened on my test bench, and I have found it invaluable. The accompanying illustration shows how the dynamo is mounted in a suitable cabinet, with two meters arranged in the sloping panel front. The drive is dismantled from a cheap grinding machine, which could be used without dismantling if suitably mounted.—A. N. AMERY (Willaston, Wirral).



A small D.C. generating unit made with a cycle dynamo.

THE "IMP" FOU

A Novel Portable which will be and Others who Require a Self-

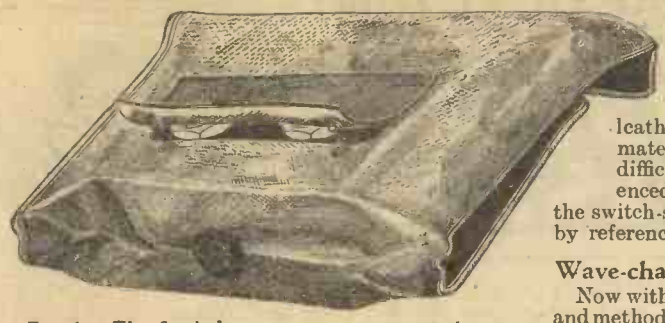


Fig. 1.—The finished receiver in its waterproof carrying case.

THE theoretical diagram of this receiver (Fig. 2) shows that a straightforward 4-valve circuit has been employed, embodying midget valves arranged as follows: A high-impedance leady-grid detector stage is tuned by a home-constructed coil, then comes a low-frequency stage in which is included a "threshold howl" filter condenser C5, for stabilising quality for the next amplifying stage, which is a low-impedance valve; finally, a pentode valve constitutes the output stage. Component and space economy, together with simplicity in wiring, are obtained by keeping out any circuit "trimmings," and all four valves are resistance-capacity coupled, whilst the dual-range coil meets the essential requirements for good local reception. There are only two controls—tuning and switching.

There are a number of reasons for sinking the knobs into the front panel, apart from the switching; for example, there was the question of surplus capacity to be considered, and readers will know that there would be the unwanted capacity existent between the fixed vanes of both condensers and the front panel, and this would be particularly detrimental in the case of the reaction; this point is stressed, as some constructors may wish to deviate from the original design; they may however do so providing a non-metallic front panel is used, and certain modifications are made to the reaction winding of the coil; this will be more clearly understood when dealing with this part of the assembly.

The cabinet is of wood, covered with leatherette, and costs approximately one shilling; little difficulty should be experienced in cutting and drilling the switch-slot as will be understood by reference to Fig. 3.

Wave-change Switching

Now with regard to the wave-range and method of wave-change switching. Once again consideration has been given to the question of appearance, and by modifying a commercial loudspeaker switch, it was found that this could be fitted snugly into the top of the 1¼ in. former used for the coil. The wavebands chosen range from approximately 160 to 450 metres, and 650 to 1,800 on the long wave, whilst a centre-tapped medium-wave winding is used to obtain maximum input signal strength.

It will be noticed that the control of the wave-change switch is done by the 2-pin plug which is fitted into the top of the set, the idea here being that the aerial and earth connections to the set can be made through the medium of the plug and thus extra sockets or terminals are not required and the connecting up of the receiver is therefore simplified still further. The plug is of course supplied with the switch.

The chassis is retained in position in the cabinet by the two fixing screws securing the wave-change switch, and although the coil is not designed to be a permanent fixture to the chassis, surprising rigidity is maintained after assembly.

Battery connections are made simply by plugs and sockets, this applying also in the case of the two speaker leads, as by experiment it has been found far better than using terminals, principally by reason of the compact nature of the design.

L. T. Battery

The all-important question of weight received extra consideration, and to get over the difficulty occasioned by the apparent necessity for an accumulator for supplying the L.T., it was decided to commission an inexpensive cycle lamp battery and adjust the voltage by a suitable resistance; details of this are clearly given in Fig. 4. The life of this battery under continuous load—that is to say, if the set were left on—would be six hours; consequently the requirements of the average cyclist regarding entertainment on the road and when picnicking, are amply met, and the user has the added advantage of being able to rely upon the battery over a matter of days or even weeks of disuse, whilst an accumulator would require periodical charging; and so far as the difference in weight is concerned, it will be agreed that this is very appreciable, whilst danger of creeping acid or possible damage to the accumulator plates is obviated.

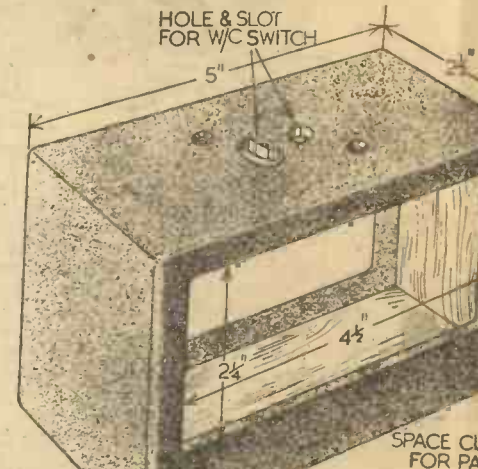
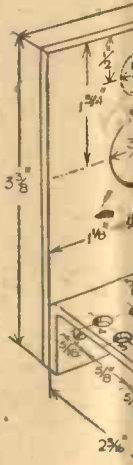


Fig. 3.—Details cabinet for the rec

Suitable carriers may be obtained from a well-known store for the sum of 6d., one being required for housing the receiver and L.T. battery—grid bias not being essential on 75 volts H.T.—whilst, of course, there is room for a 3-volt midget battery. The other is required for the H.T. battery, and in the case of headphones being used whilst on route, there is ample room in the H.T. carrier, provided that the headbands are previously removed. It is proposed to explain further in this article, how best to employ this receiver for outside entertainment, and to use to advantage the surprising output of the receiver.



The overall weight of the receiver alone is 1½lb., and even this weight will be appreciably reduced if aluminium is used throughout. Just a few words about the aerial and earthing prior to giving constructional details.

Experiments have proved that under normal working conditions—which can be taken as the operation of this set within a fifty-mile radius of any broadcast station—an aerial length of 10ft. will be found admirable for good quality moving-coil output, whilst a longer aerial will, of

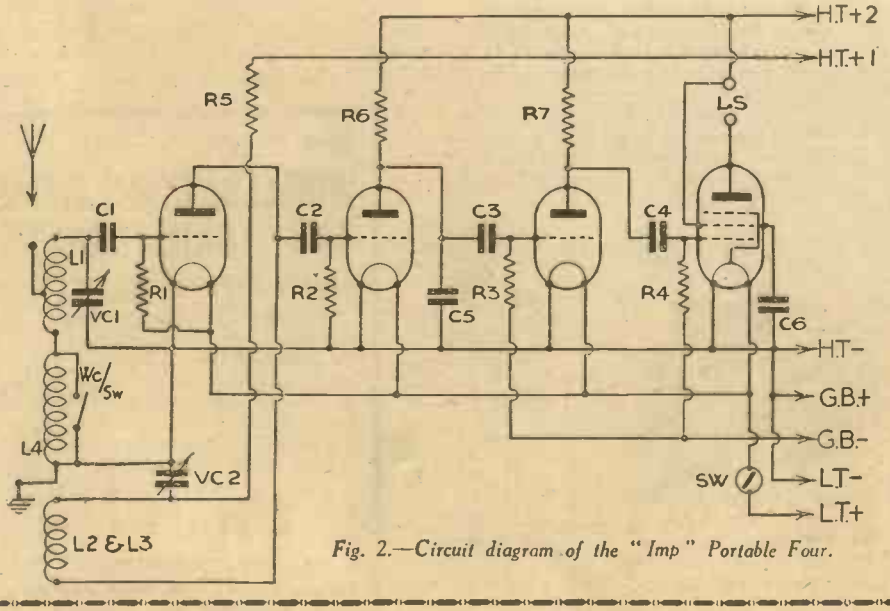


Fig. 2.—Circuit diagram of the "Imp" Portable Four.

R-VALVE PORTABLE

Found Ideal for Cyclists, Hikers contained Light-weight Receiver

course, be advantageous in the search for foreigners and such as coastguard stations and amateur reception, although this set is specifically designed for quality local reception as previously mentioned.

Constructional Details

The only metal parts to be fashioned are the front panel, chassis, and condenser brackets, and it must be emphasised here that exactitude in measurements and drillings is essential. Occasional elementary advice will be included in the following notes to help those readers with little or no experience in this class of work, whilst experienced readers may gather some useful hints from the data given.

Unless otherwise stated, aluminium will be taken as the basis of the design throughout, and this should be from 16 to 18 gauge. The panel and chassis could, if desired, be obtained already cut to size, or a sheet of aluminium (see Fig. 5) measuring 7 1/16in. by 4 3/4in. should be cut and bent in accordance with the measurements given. To do this the aluminium sheet must be first of all "squared," and this may be done by the use of either an engineer's square or by checking the overall measurements beforehand with a rule.

The sheet of aluminium should be placed in a vice, preserving the finish by the aid of a piece of felt placed between the jaws, and having scribed the cutting and bending lines, cut along the line indicated in the diagram. A thin band-saw blade should be used when cutting the metal. The lower half of the piece of aluminium is to be used for the chassis, and this likewise should be placed in the vice, and the two runners bent over as illustrated. This should be done by placing the sheet of aluminium between two pieces of wood—protecting the finish by utilising a strip of felt—then with a hammer, and another piece of wood acting as a softening medium to the hammer blows, the two runners should be tapped over as shown.

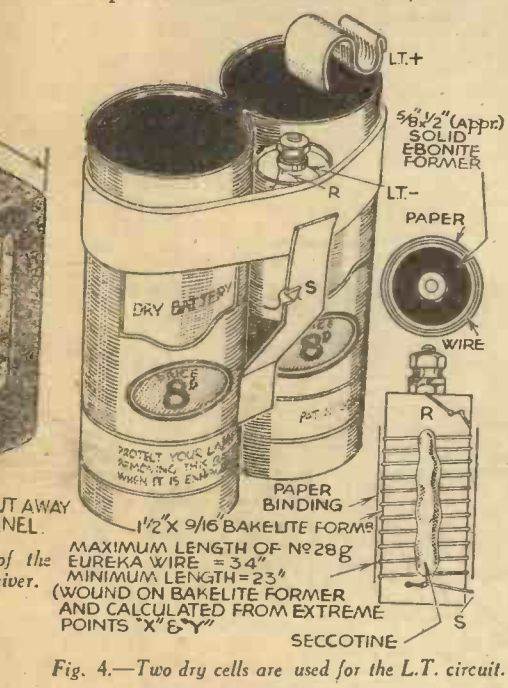


Fig. 4.—Two dry cells are used for the L.T. circuit.

Marking Out and Drilling

Having cut the panel and prepared the chassis, the rough edges and any burrs caused by the saw should be filed down with fine cross-cut file, finally checking all edges with a square. The drillings next have to be undertaken, and dealing with the front panel, it will be seen on referring to Fig. 6 that the two holes for the condenser knobs will have to be hand-fashioned. The panel should be placed upon a hard, flat wood surface, covered with a piece of felt to prevent scratching, the centre lines being marked off lightly with a scriber and steel rule, or square, on the "inside" surface, then at the points of intersection, clearly defined in Fig. 6, panel fixing holes should be drilled with a 1/8in. bit, after centre-punching. The largest size drill should be used for the two condenser knob holes, which can then be fashioned with a rat-tail file to the required diameter.

The chassis should be placed over a suitable block of wood prior to drilling, and the first holes to be made are those for the valveholders; it should be noted that one hole is 1/16in. in diameter, whilst the other three are 5/16in. The lines of intersection will, of course, have been marked and centres

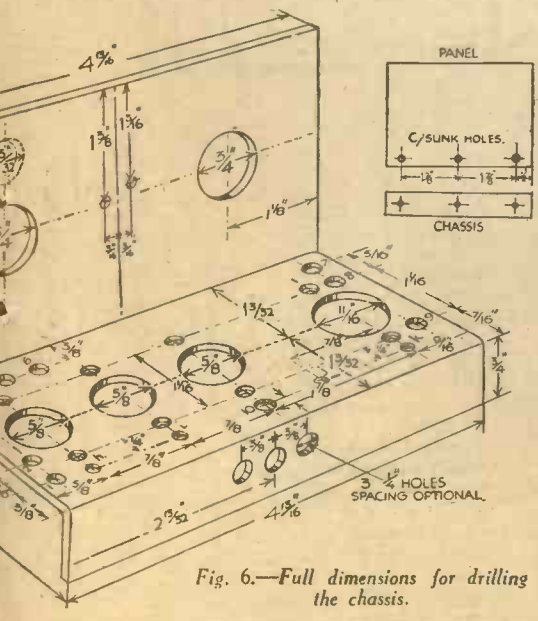


Fig. 6.—Full dimensions for drilling the chassis.

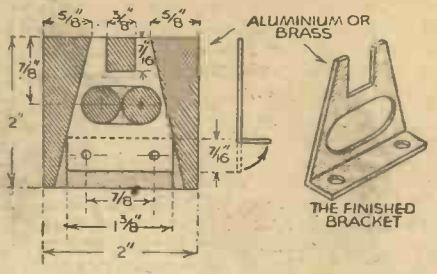


Fig. 7.—Cutting and drilling details for the condenser brackets.

punched prior to these drillings, and all remaining holes excepting the three on the rear runner of the chassis can now be made with a 1/8in. bit. The eight fixing holes for the valveholders must then be countersunk, and, finally, the three holes for fixing the front panel, and the holes for the leads on the rear runner, can then be made, 1/8in. and 1/4in. bits being necessary for all drillings, excepting those for the valveholders.

The front panel can now be fitted to the chassis with three 1/8in. countersunk 6BA brass screws and nuts; if possible, small spring washers should be fitted under the nuts on the inside of the chassis for rigidity.

Referring to the wiring diagrams, the four valveholders should be positioned and fixed to the chassis with 1/4in. 6BA countersunk brass screws and nuts, and it is optional whether these holders are mounted above or below the chassis. Looking down on the chassis and reading from left to right, it will be seen that the first three valveholders are 4-pin, and are mounted with the large "G" sockets to the bottom right-hand corner, whilst the fourth valveholder has the two large sockets centralised (for further details see Fig. 12). The brackets for the condensers should

(Continued on next page.)

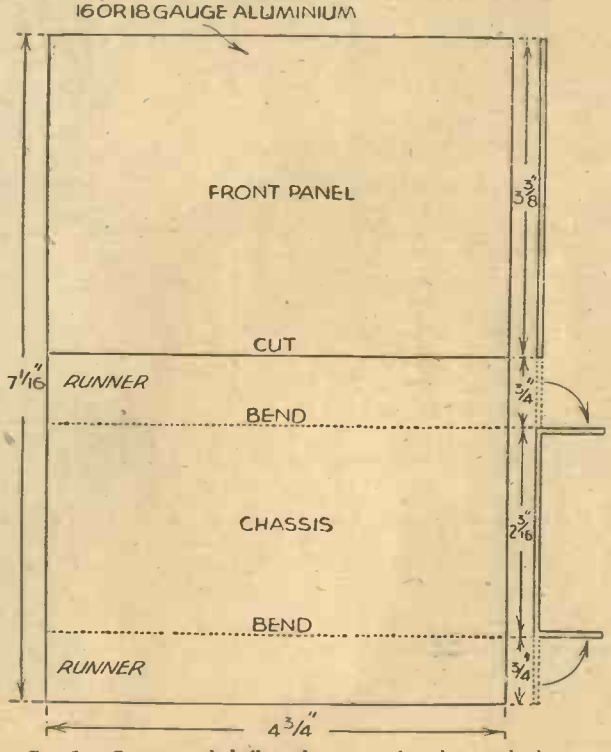


Fig. 5.—Cutting and drilling dimensions for the metal chassis.

(Continued from previous page.)

then be fitted with their flanges towards the rear chassis runner, and the same type screws as used for the valveholders fix these brackets into position through holes h, i, j and k. (Fig. 6.)

Wiring Connections

The chassis is now ready for wiring, and the filament sockets of the valveholders must first be wired up. All wiring, unless otherwise stated, should be executed with Glazeite wire, or 22-gauge tinned copper wire; sleeving being occasionally used throughout, and a yard of this should be kept at hand.

A short length of wire should be soldered to the bottom left socket of each of the three valveholders XD, XL and XP, and soldered to the fixing nuts; this wire should be kept as close to the valve-pin and chassis as possible. Next solder another short length of wire from the upper filament socket of the fourth valveholder to the fixing nut, keeping close to the chassis. The wire running from and connecting up the other filament sockets F+ (see Fig. 12) must be insulated with systoflex unless Glazeite is used, again keeping the wiring close to the chassis. A 10in. length of rubber-covered flex should be threaded through the left-hand socket on the rear runner looking at the underside of the chassis; one end of this flex connects to the second valveholder fixing nut, the other end terminates in a Clix type 14 spade terminal (Black); another 14in. length of flex should be taken through the same hole, one end terminating in a red spade terminal of the same type, the other end being passed through hole No. 6, and connected to one tag on the L.T. switch.

A short length of flex should then be taken from the commoned filament socket (F+) through hole No. 5 to the other contact of the L.T. switch. Next connect the .0003 mfd. condenser C2 by threading a short length of systoflex over the condenser connecting wire and soldering one end to the "A" socket on the first valveholder, and the other to the "G" socket on the second valveholder—XD and XL respectively. The condenser C3, which is .002 mfd., must similarly be connected between the "A" socket and the "G" socket of the second and third, or XL and XP valveholders respectively, again using great care to see that sleeving is carried right up to the sockets; this point applies throughout the wiring. A .02 mfd. condenser C4 should then be placed snugly between the third and last valveholder, connecting up to the "A" and "G" sockets as shown in the wiring diagram below.

The grid-leaks R2, R3 and R4 should be wired up in the same way, and it should be noted that R2 is centralised between the first two valveholders.

(To be continued.)

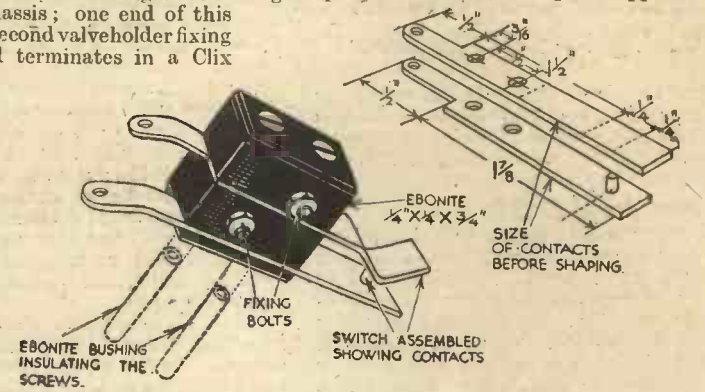


Fig. 8.—Full constructional details of the switch.

LIST OF COMPONENTS

FIXED CONDENSERS.

Two .0003 mfd (Tubular) 4601/s
One .002 mfd. (Tubular) 4601/s.
One .02 mfd (Tubular) 4601/s
One .01 mfd. (Tubular) 4601/s
One .1 mfd. (Tubular) 4603/s.
} (Dubilier)

RESISTANCES
All ½-watt Type

Two 50,000 ohm
One 12,000 ohm
Two 2 megohm
One 250,000 ohm
One 1 megohm
} (Polar N.S.F.)

VARIABLE CONDENSERS
Two .0005 mfd. 1 5/16in. spindle length (J.B.)
The spindle length is important.

(VALVEHOLDERS)
Three 4-pin Midget type V6
One 5-pin Midget type V6
} (Clix)

SWITCHES
One type 28 Control Panel and Plug (Clix).
One type S80.T. Toggle (on-off) Switch (Bulgin)

VALVES
One type X.D. (Midget)
One type X.L. (Midget)
One type X.P. (Midget)
One type X.Y. (Midget)
} (Hivac)

PLUGS
Five: HT—Black; HT+Red; HT+ Yellow; No. 3. GB—; GB+; No. 3.
} (Clix)

SPADE TERMINALS
Two: LT—, LT+. No. 14 (Clix).

CONNECTORS
Four: 2 red and 2 black. No. 22 (Clix).

BATTERIES
One 75-volt H.T. (Exide).
One 3-volt type: 800
One 4.5-volt Torch (Optional)
} (Ever-Ready).

SPEAKER
Moving-coil Speaker (Stentorian W.B. Midget).

MISCELLANEOUS

METAL WORK
16 or 18 S.W.G. Aluminium (Peto-Scott).
(Machine or plain finish)

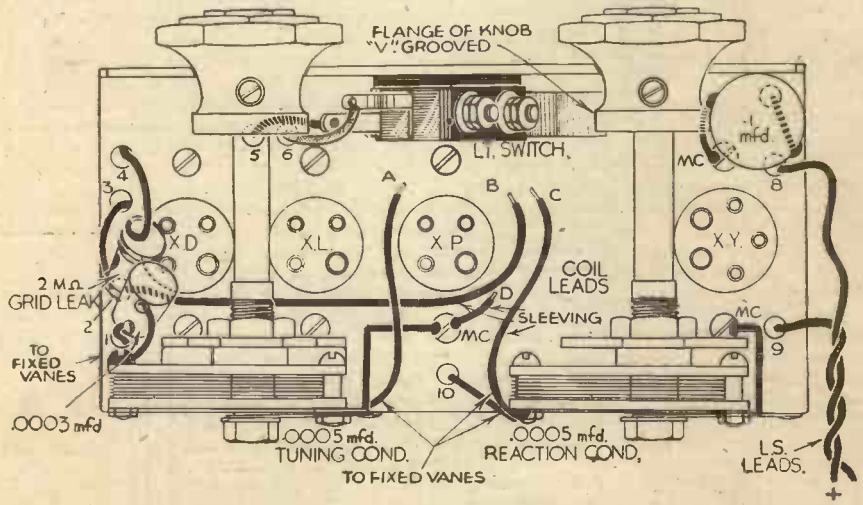
FORMERS
One 2½in x 1½in. diameter bakelite former.
One 1½in. x 9/16in. diameter bakelite former.
One solid ebonite former, ⅝in. x 1½in. approx.

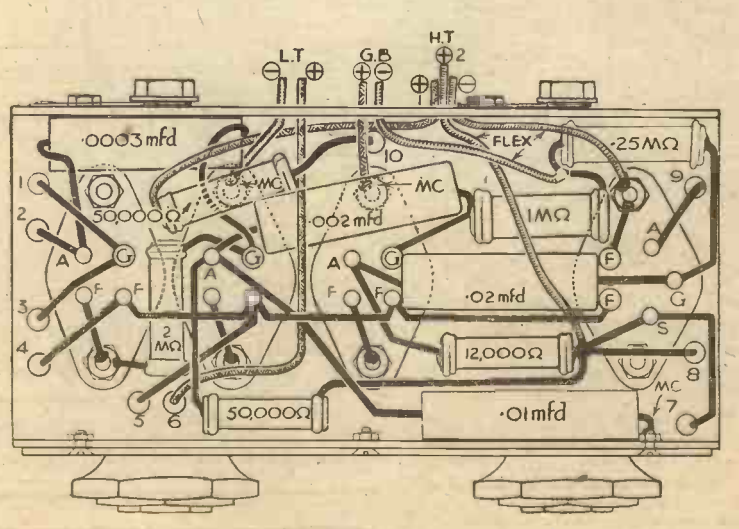
BRACKETS
Two type E.H.9 (Bulgin).

KNOBS
Two hexagon. Type No. K.40. (Bulgin).

WIRE, ETC.
One 2oz. coil of 32 S.W.G. enam. No. 757 (Bulgin).
One 2oz. coil of 35 S.W.G. enam. No. 758 (Bulgin).
One coil of insulated wire.
One yard of 28 S.W.G. Eureka wire.
Insulated sleeving.

WIRING DIAGRAMS OF THE "IMP."





FLASHES ROUND THE GLOBE

Amateur Station Celebrates Tenth Anniversary

T14NRH, Heredia (Costa Rica), recently celebrated its tenth anniversary by a special world-wide broadcast. A transmission may now be heard from this studio on most nights between G.M.T. 01.00-05.00 on 31.02 m. (9.67 mc/s). It styles itself: *La Voz de Costa Rica*, and announces in Spanish, English, and French. Broadcasts are opened with a bugle call and as a rule the studio closes down with the playing of "The Last Post." When referring to Heredia the announcer adds the qualifying fact that "it is the city of flowers in the land of coffee trees." Address: Señor Amando Cespedes Marin, Apartado Postal 40, Heredia (Costa Rica).

El Progreso Cubano on Higher Frequency

COBC, the short-wave relay of CMBC, Havana (Cuba), hitherto working on 32.09 m. (9.35 mc/s), is now found operating on 30.12 m. (9.96 mc/s). As an interval signal the station uses indiscriminately a bugle call, the crowing of a cockerel, chimes and occasionally a cuckoo call. If International Postal Reply coupon is sent, the station will verify reception; the address is: Apartado Postal 132, Havana (Cuba).

News Bulletins from Salamanca

Calling *Radio Nacional, Salamanca*, EAIBO, a Nationalist studio in that Spanish city, broadcasts an English news bulletin nightly at G.M.T. 21.15 on 42.43 m. (7.07 mc/s).

New Czech Short-wave Station

The Pardubico Radio Club at Prague (Czechoslovakia) is carrying out experimental broadcasts every Monday from G.M.T. 21.30 on 80 m. (3.75 mc/s).

India Tries Out New Channels

Both VUB, Bombay, and VUD, Delhi (British India), are making experimental transmissions on channels above 80 metres, the former testing on 90.63 m. (3.31 mc/s), and the latter on 86.46 m. (3.47 mc/s). In addition Delhi has been heard testing from G.M.T. 02.30 on 31.28 m. (9.59 mc/s) and Bombay on 48.98 m. (6.125 mc/s).

Another Bugle Call

HH3W, Port-au-Prince (Haiti), on 31.10 m. (9.645 mc/s), now opens its broadcasts with a bugle call retaining the four chimes previously used for this purpose as an interval signal. The station is on the air from G.M.T. 18.00-19.00, and again from midnight to 03.00 daily. Announcements in the French language with translations into Spanish and English. Address: Boite Postale A/117, Port-au-Prince (Haiti), West Indies.

Schenectady Adopts New Channels

The N.B.C. and WGY transmissions may now be heard on 13.95 m. (21.51 mc/s) from G.M.T. 13.00-17.00 daily, and on 31.4 m. (9.555 mc/s) from G.M.T. 00.30-05.00; the former are destined to European listeners, and the latter to the Latin States in South America. A new schedule which commenced on March 2nd, shows slight alterations inasmuch as W2XAD, on 19.57 m. (15.33 mc/s), provides a programme for South America from G.M.T. 17.30-24.00 and W2XAF, on 31.48 m. (9.53 mc/s), offers a continuous broadcast for Europe from G.M.T. 21.00-05.00.

A "Stand-by" Mains Two

Constructional Details of an Unusual Type of "Corner" Receiver that has Many Uses. A Cabinet of the Type Described could be Used for Accommodating Various Other Types of Set - - By FRANK PRESTON

THERE are many occasions on which a second or "stand-by" receiver is useful to the experimenter. Perhaps the big set is being modified or rebuilt, or it might be in experimental use. On the other hand, it might be desirable to have a second set in the dining-room. In any case, there is no doubt that there are many advantages to be gained by having two sets in the house.

From this it will be seen that the receiver is intended for fitting in a corner, where it also forms a small shelf. The containing case was built up almost entirely of 6 mm. five-ply which was oak-faced. When completed, this was stained and wax-polished so that it matched the oak furniture.

Resistance Reaction Control

Turning back to the circuit you can see

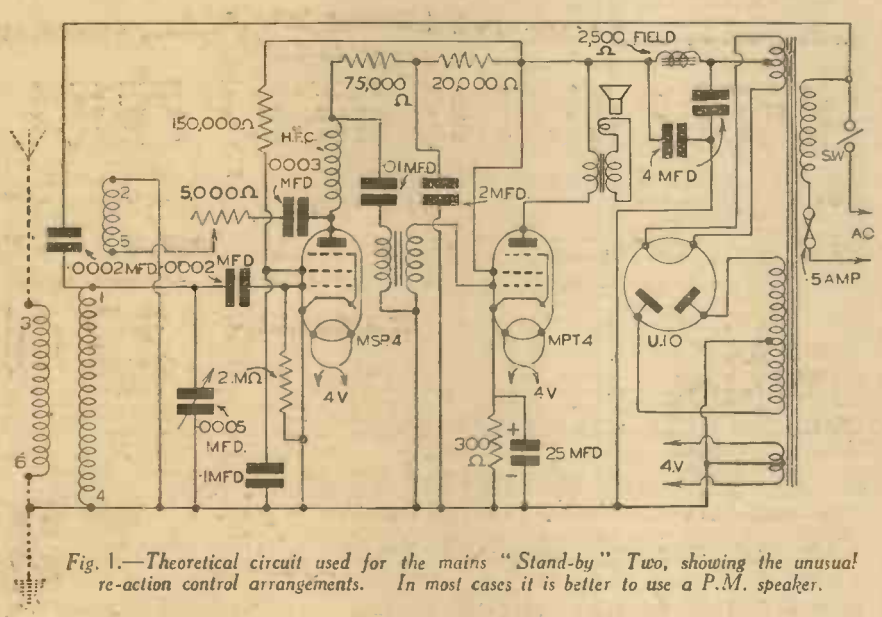


Fig. 1.—Theoretical circuit used for the mains "Stand-by" Two, showing the unusual re-action control arrangements. In most cases it is better to use a P.M. speaker.

That shown in the accompanying illustrations was made for general use, and was intended for the reception of the two local stations only. As can be seen from Fig. 1, a standard two-valve A.C. circuit arrangement is used, both valves being pentodes; the first is an H.F. pentode used as detector and the second is a power or output pentode. As the receiver was required for reception of the medium-wave Regional and National stations only it was decided that a six-pin plug-in coil should be used. The tuning condenser is of the mica-dielectric pattern, and is fitted with a knob having a pointer. Consequently, it is possible, after tuning in the two "locals," to mark the front of the set with pointer positions.

Simple Tuning System

At first it was thought that it would be preferable to use two pre-set condensers for tuning, with a change-over switch to bring either into circuit, but as it was found afterwards that a number of alternative stations could be received when employing an aerial, the arrangement shown was decided on. Another advantage of using a variable condenser is that its knob can be "balanced" with that of the combined reaction control and on-off switch. As a result a very neat and simple-looking set was produced, having the general appearance indicated in Fig. 2.

that the reaction control, which also serves for volume control, is unusual in that it consists of a variable resistance included between the reaction winding and a small fixed condenser joined to the detector anode. A control of this kind operates satisfactorily provided that the variable resistance is smooth in action; the Polar-N.S.F. proved very good in this respect. It is the model V/1 which is suitably graded for the purpose, and can be obtained fitted with an on/off switch. In this case the switch is used in the primary circuit of the mains transformer.

A parallel-fed transformer is used between the detector and the output pentode, a 75,000-ohm anode resistor being used in series with a 20,000-ohm decoupling resistor. The screening grid is fed through a 150,000-ohm resistor. All are of 1-watt rating. An energised moving-coil speaker is used, this having a 2,500-ohm field which acts as an effective smoothing choke without reducing the anode voltage to too great an extent. Actually, the total anode current taken by the two Osram valves shown was found to be between 30 and 35 mA when measurements were taken, so the voltage drop across the speaker field is about 90 volts. And as the U.10 rectifier has an output of about 300 volts at 30 mA, there is almost 200 volts available for H.T. It must be pointed out that the energising wattage for the speaker field is too low for maximum efficiency, but proved to be sufficient to permit of fair volume when the set was fed from the "mains" aerial and used 12 miles from the transmitters.

Speaker Energising

Unless it is known that the available speaker is particularly sensitive it would generally be better to use a small permanent-magnet speaker and to replace the field winding by a 30-henry choke in series with a 2,000-ohm 5-watt resistor.

The mains transformer is, of course, provided with a 250-0-250 volts secondary for H.T., as well as with two 4-volt A.C. windings, one of which is rated at up to 5 amp. (for the valve heaters), and the other at 1 or 2 amp. (for the rectifier filament). The two smoothing condensers used consist of a double electrolytic unit of the cardboard-box type, which is very compact. None of the other components calls for special comment.

Plywood Cabinet

The containing case is the most unusual part of the receiver. It was built up from five pieces of 6 mm. five-ply board and some lengths of 1in. square wood. Top and bottom were made from a 15in. square, sawn across the diagonal, as shown in Fig. 3. After cutting, strips of the 1in. square material were cut to fit, as shown in Fig. 4

(Continued on page 20)

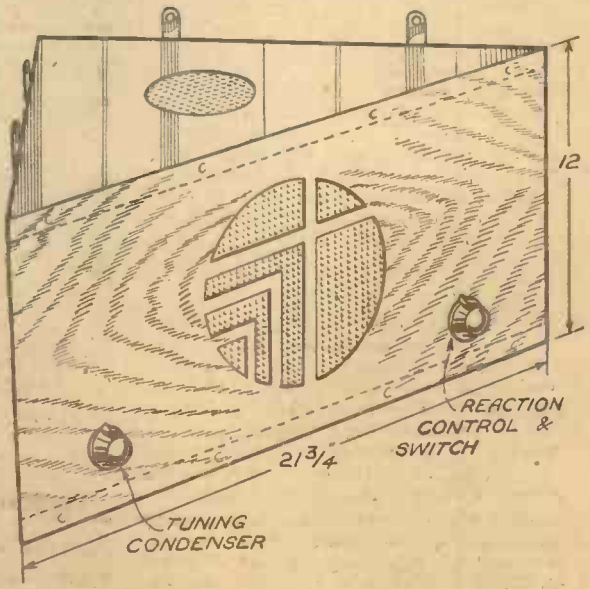
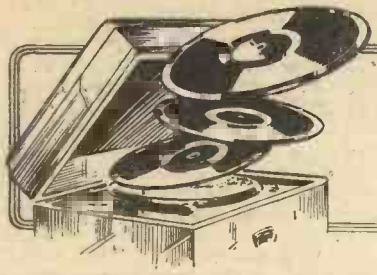


Fig. 2.—How the finished "corner-cabinet" set appears. Note the simple controls.



Impressions on the Wax

Parlophone

SONGS from two films are featured by Richard Tauber on his latest recording on *Parlophone RO* 20381. They are "Giannina Mia" from the film "Firefly," coupled with "My Gypsy Dream Girl" from the film "Command Performance." Tauber sings both in English with orchestral accompaniment. Other records by well-known tenors are Joseph Schmidt singing "La Danza" and "L'Ariatella" on *Parlophone R* 2495, and Jan Kiepura singing "Che gelida manina" (Your Tiny Hand) from La Bohème coupled with "Ach so fromm" (Like a Dream) from Martha on *Parlophone R* 20380.

Orchestral recordings are supplied by the Berlin State Opera Orchestra who, conducted by Prof. Robert Heger, give a fine rendering of Schubert's "Rosamunde" (ballet music) on *Parlophone R* 2484-5. The same orchestra, but this time conducted by Prof. H. Abendroth, has also recorded "Wedding Waltz" on both sides of *Parlophone R* 2486.

Variety

HARRY ROY and his Band are in the news with that big American hit song, "Bei Mir Bist Du Schoen," on *Parlophone F* 1026. On the reverse appears "She's Tall, She's Tan, She's Terrific," from the film "Cotton Club Parade." This band has also made "Mama, That Moon is Here Again," and "You Took the Words Right Out of My Heart," on *Parlophone* F 1027, both tunes being from the film "Big Broadcast of 1938."

Another popular band, Nat Gonella and his Georgians, chooses for his latest record "The Snake Charmer," with vocal by Nat Gonella and The Three Jackdaws, and "Let 'er Go," on *Parlophone F* 1028.

"Hutch," the popular radio star, has two records this month, "The Girl in the Alice Blue Gown" and "With You," from the film "Brief Ecstasy"—*Parlophone F* 1039, and "Once in a While," and "It's a Long, Long Way To Your Heart"—*Parlophone F* 1038.

Two lively recordings are supplied by Billy Thorburn, who, on a piano with drum accompaniment, gives a waltz and quick-step medley on *Parlophone F* 1037, and Joe Daniels and his Hot Shots, who give their version of "Alabamy Bound" and "Power House," on *Parlophone F* 1045.

H.M.V.

THE technique of brass bands has reached such excellence in recent years that it is good to see one of the most famous of their number—Callender's Senior Band—recording for "H.M.V." For this, their first record, they have chosen "Bells of St. Malo" and "Amparito Roca" (The Sheltered Cliff)—*H.M.V. BD* 513. The first of these is a stately gavotte and the other a Spanish piece in march tempo.

Barnabas von Geczy's Orchestra, which specialises in the "Café" type of light music, play "Adua" and "Black Orchids" very effectively on *H.M.V. B* 8717. Another very tuneful record is a selection from the film "Rosalie" for which Cole Porter wrote the music—*H.M.V. BD* 509. It is played by the New Mayfair Orchestra.

Those who like the piano accordion will enjoy the "Hits" Medley played by George Scott-Wood's Accordion Band on *H.M.V. BD* 508.

One hears very little of Haydn's piano music in these days on the recital platform, but Paderewski has now made a record of the "Variations in F Minor," on *H.M.V. DB* 3183. Whilst listening to this beautiful record, it seems almost incredible to believe that Paderewski was playing this piece to delighted audiences years before there were any gramophones or records.

Records of the theatre organ are becoming increasingly popular, and this month brings two good examples. Reginald Foort at the B.B.C. Theatre Organ plays a "Hit Parade," introducing songs of the moment on *H.M.V. BD* 511, and Al Bollington at the organ of the Paramount Theatre, London, plays a tuneful selection from the film "Rosalie," on *H.M.V. BD* 504.

A STAND-BY MAINS TWO

(Continued from page 18)

and attached by means of 1in. 6-gauge countersunk-head screws. The ends of the square material were simply butted together, the ends being sawn approximately to the correct angles and then accurately shaped with a chisel. When top and bottom had been prepared, the two sides were cut out. One of these was 15⅛in. by 12in., and the other was 15⅜in. by 12in.; this was to allow one to overlap the end of the other, again forming a butt joint. In both cases the sides were allowed to overlap slightly the top and bottom and to project slightly at the front when screwed into place.

Assembling

Next the front was cut to about 21¾in. by 12in. so that it would project slightly beyond the sides. The sides were then slightly bevelled with a sharp, finely-set plane so that they would be a snug fit against the front. The front was then screwed to the top and bottom, also being allowed to project slightly. After the whole box had been tightly screwed together the projecting edges were run over with a sharp plane. The result was a smooth triangular prism.

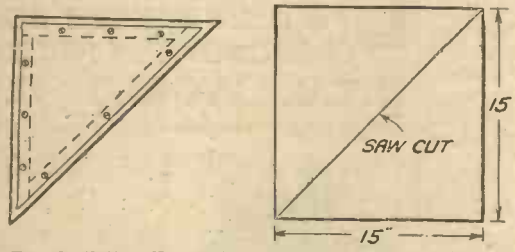


Fig. 3 (left).—Top and bottom are cut from a five-ply square. Fig. 5 (right).—Plan of the container.

While it was in this state, two 3in. circles were drawn, one on each end, and a 7in. circle was drawn in the centre of the front panel. A ½in. hole was bored just inside each of the circles, so that large holes could be cut out with a keyhole saw. The two smaller holes were for the purpose of allowing circulation of air through the box past the valves, and the larger hole was, of course, for the speaker.

Some readers might prefer to make the holes before screwing the parts together, but if a vice is not available the parts are not easy to hold, while they are quite rigid when the whole box is assembled. This is a matter for individual choice. When the holes had been sawn, the edges were smoothed down with a half-round file and glasspaper.

Unusual Mounting

Two ⅜in. holes were then drilled in the front panel to take the tuning condenser and the reaction-control-switch unit. When this had been done, the complete box was well rubbed down, first with medium and then with very fine glasspaper. It was then ready to receive the receiver components, most of which were mounted on the side pieces near to the corner. The mains transformer, however, was mounted on the bottom, but also near the corner, so that there was sufficient clearance for the speaker. As some of the parts were fairly close together it was found desirable to do some of the wiring before all components were assembled.

Speaker Mounting

A piece of open silk gauze was then glued over the insides of the holes in the top, bottom and front. The speaker unit was attached to a square piece of soft fibre board, this being fixed to the front panel by means of 1½in. 4BA bolts—heads outside of course. The two controls were next mounted on the panel and fitted with flexible leads, which were long enough to be connected to the appropriate components when the panel was held as close as possible to the box.

In the original set, aerial and earth terminals were not provided, the only external connections to the set being the twin flex fitted with mains plug. If it is proposed to make provision for aerial and earth leads, a terminal-socket strip should be fitted to the bottom of the case.

After the set had been tested and found O.K., the two control knobs were removed and the container stained and polished. It might be thought better to do this before fitting the components and wiring, but the object in leaving this job until last was to avoid scratching of the case and undue marking of the screw holes if it were found necessary to remove the front in order to make any alterations or small adjustments.

Staining and Polishing

As oak-faced plyboard was used, the stain consisted of equal parts of ammonia and black enamel (not cellulose) mixed together. This was applied with a soft brush, any excess being immediately wiped off with a hard duster. The stain had to be stirred repeatedly, and it is important that the work be carried out in an open place or near an open window; ammonia fumes are particularly pungent! After staining, the surface was well rubbed down and the wood allowed to become thoroughly dried, after which it was given a liberal application of good-quality wax floor polish. The final surface was produced after several hard rubs with a soft duster.

Four small iron plates were fitted to the top and bottom of the box, these serving for mounting the set on the wall after drilling and inserting Rawlplugs.

It is not proposed to give full constructional details or wiring diagrams of the set itself, since the main object of this article was to describe an unusual form of cabinet which has many advantages. Besides being fitted in a living-room it would be ideal for use in a kitchen, in which case an oiled-silk bag should be fitted over the speaker unit and the speaker opening should be backed with the same material. This is to prevent steam from causing rusting of the speaker magnets.

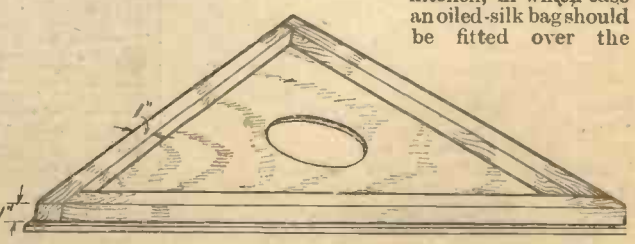


Fig. 4.—Method of fitting the 1in. square pieces to the top and bottom.

Practical Television
March 19th, 1938. Vol. 3. No. 92.

Give and Take

IN a determined effort to popularise television this year, and realising that the broadcast of outside events is such a popular programme feature with viewers, the B.B.C. have arranged for their O.B. vans to be in evidence at many of the outstanding events arranged for the coming months. The Boat Race, sports, boxing matches, and so on are to be featured, and in this way will give an added impetus to the already rapidly growing television trade. So far no restrictions have been placed on the portrayal of the television programmes, and it was therefore a matter of surprise to find that just prior to the televising of the England versus Wales women's international hockey match at Kennington Oval, the following message was transmitted and appeared on all television receiver screens:—"The reproduction in any form of the outside broadcast which follows, including projection in places of public entertainment, is strictly prohibited." It is learned that this statement will precede all similar television transmissions in future which take place outside the B.B.C.'s own studios, and refers to those places where a charge is made for admission. The ban is said to be with a view to preventing copyright infringement, but any form of restriction made in the early days of a public service is sure to have some form of repercussion, and will militate against its popularisation. Surely it would have been better to settle questions of copyright on an amicable basis with all the parties likely to be involved instead of bringing the problem out into the open in such a fashion. Perhaps before long other counsels will prevail in an endeavour to remove what is generally admitted to be an intricate matter.

Television Telephone Improvements

THE Germans are still concentrating on effecting improvements in their television telephone service which now operates between Berlin, Leipzig, and Nürnberg, and which it is hoped to extend shortly to the cities of Cologne, Frankfurt, Munich, and Hamburg. Mechanical scanning is employed through the medium of a standard form of apertured disc. Due to the application of the principles of secondary emission to the photo-electric cells used with this equipment which was made by Fernseh A.G., it has been found possible to dispense with the arc lamp and replace it with an ordinary type projection filament electric lamp. This has simplified the apparatus very materially, as well as reducing the intensity of the light spot which scans the person being televised. If this is too bright it tends to reduce the clarity with which the face of the person telephoning from the other end of the line is observed. Perhaps in due course further experiments will be undertaken with a view to replacing the mechanical scanner with an all-electric device, but since the pictures now obtained are so sharp and clear there is little incentive to make a major change of this nature.

No Major Production Plans

THE film trade was very disturbed the other day with news that the B.B.C. were preparing plans to make them independent of the film industry should the latter's objection to the televising of films continue. It was also stated that amateur film makers are being encouraged to sell their films to the B.B.C. for television purposes. This report has now been denied, however; it being explained that since the inauguration of the B.B.C. television service a small unit has been in existence for the sole purpose of supplying short sections of film needed for special programme purposes. These are very cunningly dovetailed into a studio production of direct camera work to give the viewer the illusion of continuity, and broaden the interest of the item which is being broadcast. There have been several examples of this lately, especially with plays where studio action must perforce be rather confined. A better viewing "atmosphere" is established under these conditions, but great care has to be exercised in choosing the right film, and this is where the B.B.C.'s own small unit plays a part by preparing its own pictures in small shorts. There are no plans for extending the unit on the lines suggested by the rumour which started recently.

Time-base Generators

THE generation of scanning voltages or currents for imparting the correct line and frame movement to the spot of fluorescence in a cathode-ray tube has been the subject of very considerable investigation. Both the hard and soft valve types have found their place in the complete receiver equipment, and most of these are based on the fundamental principles which have been established for some time in connection with these devices. A simple but ingenious scheme was revealed recently, however, in which a back-coupled valve was made to generate oscillations of a very peaky nature, and these were then made to charge a fixed condenser through a dry rectifier arranged to be conductive to high voltages only. The condenser is then discharged through a saturated diode or constant current pentode during the intervals between successive impulses. This is said to produce the required saw tooth oscillations in the output circuit which can then be applied to the cathode-ray tube deflection system in the orthodox manner.

Following the B.B.C.

ON several occasions it has been rumoured that tests are being undertaken on the Continent with a view to providing television programmes which will be received over very wide areas by using high aerial installations and very large powers on the ultra-short waves. These stations were then to be financed by advertisers providing sponsored programmes on lines similar to those now operating from several Continental stations. The French Postmaster-General has clarified the situation, however, by stating that no permit will be granted to private stations as all television is to be developed as a State service. He is thus following the lead of this country, although if carried out on dignified lines advertisers' television programmes could provide an excellent entertainment medium as well as removing a financial difficulty that must arise when questions of service extension come to the fore.

Boys at West Central School, Bath, are wireless enthusiasts. They meet evenings and make receiving sets of all descriptions—portables and short-wave—and now they have completed an excellent transmitter radiating on 42.06 metres (7132 kc.). Their call sign is 2COU, and their science master, Mr. Cyril Page, is applying for a full transmitting licence. Indoor tests have been excellent.

TELEVIEWS

Fog Penetration

THE fog perils of those on the sea or in the air have for a long time been the inspiration of inventors who have endeavoured to provide instruments which will enable seamen or aviators to "see" objects or landscapes obscured by nature's worst enemy—a fog blanket. One of the latest schemes to be revealed is said to enable an airman to view the earth's surface although this may be obscured completely by clouds or fog. For this purpose reflected infra-red rays are employed; the rays passing through an infra-red filter to be focused on to a photo-electric cathode made specially sensitive to this end of the spectrum. Like the electron telescope, the electron image released from the cathode surface is made to move forward to a small screen which fluoresces and gives a picture in miniature of the obscured scene. Built up into the form of optical eyepieces, it is claimed that the voltages required for operation can be derived from compact and portable batteries. Since the idea is based on an established principle of electron optics there is every hope that its development to a practical stage will eventually provide vision in the simple manner desired.

Colour Television

THE colour television equipment described in this journal in the issue dated February 26th was also demonstrated to ordinary Press representatives and members of the Television Society a few days after the Editor had seen it. A distinguished member of the audience was Lord Selsdon, and following the demonstration Dr. Tierney, chairman of the society, voiced the opinion that the colours shown were more natural than those seen with present-day colour films. In connection with colour receivers for big-screen television, a Baird scheme which has now been made known allows the light from the arc or projection lamp to pass through a double refracting crystal. This, as readers know, splits the beam into an ordinary and extraordinary ray. For a two-colour television system these beams are then passed separately through blue and red filters to be subsequently modulated in a Kerr cell by the television signals which correspond to the blue and red pictures radiated via the scanner and radio transmitter from the distant studio. The separate coloured beams are then fed through another doubly refracting crystal so as to become combined prior to being projected on to the receiving screen via a rotating mirror drum.

Recording and Obliterating

IN the early days of television (relatively speaking, of course) several schemes were put forward, and it was shown quite convincingly that the science of television was not necessarily bound up with the laws which then governed cinematography. For example, to prove the number of pictures per second which had to be sent by television to avoid flicker, one very interesting theory was promulgated in 1930 by Baird himself. It was to the effect that if a screen was used upon which it was possible to impress a permanent or semi-permanent image, then a recording point could be preceded by an obliterating point. That is to say, on each traversal of the screen the previous image could be obliterated by a point or scanning spot immediately preceding the recording point. The limit of picture speed is then fixed by the rapidity of movement of the person or scene being televised, and not by any question of flicker. The idea at that time with but little practical knowledge available seemed rather startling, but the advance in electronic technique in so far as it is applied to television camera design shows that the idea may well become one of practical politics. A suggestion put forward for this purpose is to interpose a second electron-emitting screen in front of the main cathode-ray tube screen which fluoresces at each point of electron impact. Between the two screens oscillations of a very high frequency are maintained from an external source. The action of the cathode-ray beam is to trigger these oscillations, and so initiate a closed chain of secondary emission which will persist until it is blacked out by a second or obliterating scanning beam.

Brighter Pictures

As the *whole* screen is illuminated all the time, and merely has its degree of light intensity altered point by point during scanning, instead of the overall brilliance at any one instant being due to a single scanning spot as at present, it is quite reasonably claimed that brighter pictures will be obtained for much lower operating voltages than is used with the more orthodox equipment. Although embryo in conception, the scheme is one which certainly needs close investigation for improvements are being sought continually in every branch of science which the principles of television have invaded.

THE STORY OF EXPLORATION AND ADVENTURE

A stirring new part work to be published by George Newnes, Ltd.

IN the records of man's achievements, the epic stories of travel to remote places, of explorations and discovery throughout the world by land, sea and air make most fascinating reading. The whole stirring story of exploration is now to appear as a serial publication—the first time such a work has been attempted.

On March 31st Part I of THE STORY OF EXPLORATION AND ADVENTURE will be published. Edited by Sir Percy Sykes, K.C.I.E., C.B., C.M.G., Gold Medallist of the Royal Geographical Society and an outstanding authority on travel, it is assured of authenticity and will undoubtedly become the standard work of this enthralling subject.

It will cover exploration from the very earliest times to the present, and in the modern sphere contributors will be, wherever possible, the very men and women who themselves took part in the expeditions.

For example, there is no greater authority on the Everest flight than Lt.-Colonel Blacker who was one of the intrepid band of pioneers to brave every danger in the attempt to be the first to see Everest from the air. Lt.-Colonel Blacker, therefore, contributes on Everest.

Other authorities who are writing for THE STORY OF EXPLORATION AND ADVENTURE include Rosita Forbes, Bertram Thomas, Dr. Hamilton Rice, Sir Denison Ross, Capt. Kingdon-Ward, Sir Leonard Woolley, Evelyn Cheesman, Sir Chas. Close, Sir William Gowers, Hans Helfritz, Lady Hosie, Viscount Kelburn, Dr. H. R. Mill, J. A. Williamson, and many others. Never before has such a brilliant staff of specialist writers been recruited.

This publication will not be confined to the achievements of British explorers—the subject is too vast for that—and it is the aim of Sir Percy Sykes to present to the public a work which, while authoritative in the highest degree, will appeal to old and young alike.

THE STORY OF EXPLORATION AND ADVENTURE will be complete in about 32 fortnightly parts at 1s. each, and we advise you to order it at once from your usual newsagent or bookseller. Every part will contain, besides brilliantly-written text and beautiful photographs, sections of pictures in the lifelike photogravure process, and a fine plate in full colour.

Order THE STORY OF EXPLORATION AND ADVENTURE now!

Radio Clubs and Societies

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

THE CROYDON RADIO SOCIETY

THE vice-chairman, Mr. G. A. Hoskins, presented another popular programme on records for the Croydon Radio Society's meeting on Tuesday, March 1st, in St. Peter's Hall, Ledbury Road, South Croydon. After the overture of "The Thieving Magpie," by Rossini, came the Schubert part of the evening, including a symphony, two lieder, and particularly well received was Elisabeth Schumann's singing of "Ave Maria." The second part of the evening was of lighter fare, beginning with a lively medley of Sousa marches. Then Jack Hylton's orchestra rendered "Memories of Sullivan," and despite Mr. Hoskins's assurance that it was not Hylton's jazz band performing, members were suspicious. Certain sounds peculiar to the mind of the jazz cult suggested that Gilbert and Sullivan were very nearly being syncopated! To clear the air came a selection, "Immortal Strauss," by the Viennese Waltz Orchestra, just to show what was meant by real dance music. Thanking Mr. Hoskins, the chairman, Mr. P. G. Clarke said modern composers had to-night supplied none of the items, as both for light and heavier music the old composers had been appealed to. At the next meeting, on Tuesday, March 22nd, the programme is "Progress in Commercial Set Design," by Mr. Marks, of C. A. Mackenzie, South Croydon. Latest receivers will be demonstrated. Hon pub. sec.: E. L. Cumbers, Maycourt, Campden Rd., S. Croydon.

KINGSTON AND DISTRICT AMATEUR RADIO SOCIETY

A MOST interesting lecture was given before the society by Mr. Bowen, of the Mullard Service Co., entitled "Valve Application in Television Receivers," at the meeting held on Wednesday last, March 2nd. Mr. Bowen illustrated his lecture with lantern slides and gave members of the 56 m/c Group much food for thought.

Our next meeting will be held at the Three Fishes Hotel, on Wednesday, March 16th, at 8 p.m., when Mr. J. F. Stuart-Williams, G5JW, will lecture and demonstrate on "Cathode-Ray-Oscilloscope for Amateur Use."

Owing to leaving the district Mr. Clark has given up managership of the 56 m/c Group, which has been taken over by Mr. B. J. Applin, G5TI. Full particulars of this group from the hon. secretary, D. N. Biggs, G6BI, 44, Pooley Green Road, Egham, Surrey.

THE EXETER AND DISTRICT WIRELESS SOCIETY

AT the meeting of the Exeter and District Wireless Society, held on Monday, February 28th, an illustrated lecture was given by Mr. D. R. Barber, B.Sc., F.R.A.S., of the Norman Lockyer Observatory, the title of which was "Radio and the Stars."

This lecture was profusely illustrated with some of the best slides which it has ever been the good fortune of the Exeter Wireless Society to witness, and Mr. Barber developed his subject commencing with the sun and showing how sun spots and other developments influenced radio reception. The lecturer showed how in displays of the Aurora Borealis both radio and land line circuits were affected by the magnetic disturbances, and many interesting graphs were displayed, proving that there was a definite correlation between sun spot periods and maximum and/or minimum radio reception.

Another interesting theory which Mr. Barber touched upon was that of Professor Störmer, and if this theory is correct, the explanation of radio echoes is quite simply explained. In conclusion, Mr. Barber asked all members of the society to concentrate keenly on ultra-high-frequency radio reception, as he thought it quite probable for radio transmissions of a solar nature to be received and the direction from whence they come proved by means of a frame aerial.

A large and enthusiastic audience acclaimed Mr. Barber's lecture as one of the best the Society has ever been given, and it is hoped he will again talk at some future date.

Further high spots in the programme are particularly March 21st, "Industrial Rectification," by W. S. Pyrah, Esq.; March 28th, "Electronics," by Messrs. Mullard; and April 4th, "Telegraphs, Wire and Wireless," by H. Ridge, Esq.

Meetings are held each Monday at No. 3, Dix's Field, Exeter, and all those interested should get in touch with the secretary, Mr. W. Ching, 9, Sivell Place, Heavitree, Exeter.

THE DERBY SHORT-WAVE RADIO AND EXPERIMENTAL SOCIETY

OUR lecture on Tuesday night, March 1st, was given by our President, Mr. E. V. R. Martin, G2TL, the subject being aerials, before a splendid attendance of members.

Points from his lecture included Marconi aerials, Hertz aerials, dipole, matched impedance feeders, &c. During the meeting four new members were proposed to probationary membership. We should like to appeal to any reader in this district who is doing any listening on 5 metres and who has picked up the transmissions of our President, G2TL, to forward them to us, or come along and see us, as they would be greatly appreciated. H. Turner, secretary, Nunsfield House, Boulton Lane, Alvaston, Derby.

EASTBOURNE AND DISTRICT RADIO SOCIETY

MR. F. E. WINGFIELD (G3CX) gave a lecture on the "Elements of Transmitter Design" at the general meeting of the above Society on February 28th, at the Science Room, Cavendish Senior School, he showed by means of diagrams the evolution of the different oscillators from the fundamental reacting detector circuit. First he described the production of oscillations in this circuit, then the Hartley, normal and series-fed. He explained the T.P.T.G. oscillator, and praised its stability.

He detailed his own experiments on transmitters. First the triode and pentode circuit for a C.O.; then the different forms of Frequency Doubler. Next he described the design of P.A. stages and output. He dealt with several different forms of aerial: Hertz, Zepp., 2BI, etc., and gave particulars for making a Collins coupler.

The Society is hoping to establish two-way communication with Hastings Radio Society, and at the next meeting, March 28th, there will be a discussion on the problems arising from the above lecture, and the possibility of carrying out this extremely useful contact.—Hon. Secretary, J. P. Glickman, Kersal, Brodrick Road, Hampden Park, Eastbourne.

(*Continued on facing page, col. 3*)

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).

A Reader's Den: Correspondent Wanted

SIR,—I enclose a photograph of my den, which may prove of interest to other readers. My receivers are an R.C.C. and transformer coupled straight three, 11 to 100 metres, battery operated; a Cossor all-wave, S.G.-v-pen, A.C. mains; and a

A corner of Mr. Corbett Ford's wireless den.

Philips S.G.-v-pen, covering 10 to 2,000 metres by plug-in coils—battery operated. I would like to correspond with any member of the B.L.D.L.C. who holds an A.A. licence, regarding experiments. I will also be glad to exchange S.W.L.s' QSL cards.—CORBETT FORD (John Street, Dunoon).

Station VP3BG

SIR,—Sime time ago I sent a report to VP3THE, and the following reply received from VP3BG, Crystal Broadcasting Co., British Guiana, may be of interest to other PRACTICAL AND AMATEUR WIRELESS readers:

"On behalf of VP3THE, I must thank you for your report on their broadcast on November 26th, and verify. When the Expedition returns to the city one of their veri cards will be sent to you. The Expedition is in British Guiana with the object of studying the diseases of the native Indians, and the medical cures. They are at present in the Rupununi District, which is more than 400 miles from Georgetown. We shall be pleased to hear from you again as to the reception at your end of our daily 49-metre transmissions."—CECIL A. BRADBURY (Burton-on-Trent).

"Down to Earth"

SIR,—I was very interested in Mr. D'Arcy Ford's letter, published in your issue dated March 5th. I think that I can beat Mr. Ford by one foot. He says he uses an aerial 100ft. in length laid along the earth. Well, a few months ago I used an aerial that was *under the surface of the earth.* I constructed this aerial from 9ft. of gas-pipe with an L-bend screwed on one end. Ordinary insulated aerial wire was passed through this, and through a large cork which was afterwards plugged in the end of the pipe, leaving 6in. of wire. Insulation tape was wound round this to prevent actual contact with the earth. This was knotted, so that it would not slip back through the pipe. A small piece of pipe was screwed in the bend and the aerial wire was passed through this, and through another cork which was plugged in the top of the pipe. The aerial lead was then taken to the set and the pipe buried to a depth of 1ft. This gave as good results as an outdoor aerial, but was not directional as was Mr. Ford's. It certainly strengthens the theory that wireless waves travel over the face of the earth, and sets another, by suggesting that the waves travel *through* the earth. The set that this aerial was tried on was a commercial universal receiver, and the overall length of the aerial, including the lead-in, did not exceed 14ft.—LESLIE TEARNEY (Dartford).

Station W1XAL

SIR,—Some of your readers may be interested to know that talks on wireless are being transmitted each week on Friday from W1XAL on 25.45 metres. The reception is very clear. Full details of these talks, as well as special diagrams, can be obtained by writing to: Station W1XAL, University Club, Boston, Massachusetts, U.S.A.—L. DILLON (Carlow).

CUT THIS OUT EACH WEEK

Do you know

—THAT in America newspapers or news-sheets are broadcast and reproduced on domestic apparatus.

—THAT a system has been tried for reproducing television pictures in colour on a standard cathode-ray tube.

—THAT special motors are now being manufactured in this country for driving condensers for push-button tuning systems.

—THAT hum can be caused by a moving-coil speaker which is not provided with a humbucking coil.

—THAT a tapped output choke enables various impedances to be matched whilst retaining the useful features of an output filter circuit.

—THAT a split secondary winding on a push-pull transformer will enable each valve of the push-pull stage to receive individual bias for matching purposes.

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 of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor,* PRACTICAL AND AMATEUR WIRELESS, *George Newnes, Ltd., Tower House, Southampton Street Strand, W.C.2.*

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

RADIO CLUBS AND SOCIETIES

(Continued from page 24)

RADIO, PHYSICAL AND TELEVISION SOCIETY

A MOST interesting lecture was delivered to the Society on Friday, March 4th, when Mr. W.W. Standen, a representative of Messrs. Catterson-Smith, spoke on "Electric Furnaces." The lecture was rendered particularly interesting by the use of lantern slides which had been specially made for this lecture.

Mr. Standen dealt with the properties of various refractory materials and heating agents and explained some of the difficulties to be encountered by the furnace designer. Refractories must, he explained, be capable of withstanding sudden and violent changes of temperature without disintegrating, moreover, when deciding upon both the heating agent and the refractory due regard must be paid to the substance to be heated, otherwise chemical action may take place which may spoil either the material being heated or the furnace itself. The lecture concluded with a brief outline of the uses of electric furnaces in connection with the manufacture of such articles as beer-glasses, mustard-pots and artificial teeth.

Meetings of the Society are held every Friday evening during the winter months at 72A, North End Road, West Kensington, London, W.14, when there are lectures upon radio and allied subjects. New members will be welcome any Friday at 8.15 or particulars may be obtained by writing to the Hon. Secretary at the above address.

LONDON TRANSMITTING SOCIETY

ON March 3rd a film showing several well-known amateur transmitting stations was exhibited. On March 17th a talk entitled "An Outline of 50-Watt Transmitters" will be given. All members must possess A.A. or full transmitting licence. We meet Thursdays at 8 p.m. at above address. New members are welcome to come along and meet us. G. Yale, hon. sec., 40, Raeburn Road, Edgware.

CARDIFF AND DISTRICT SHORT-WAVE CLUB

ON February 10th a very enjoyable evening was spent at Blackwood, and the entertainments provided were particularly appreciated by the fourteen members who travelled up from Cardiff.

Future meetings of the club are as follow:

March 17th.—General Meeting Cardiff Society.

March 24th.—"Hamfest" and display of N.F.D. and London Station Films.

March 31st.—Lecture entitled "56mcs. General Inferences," by G2JJ.

April 14th.—R.S.G.B. District 10 meeting.

April 28th.—Demonstration of short-wave receivers by A. J. Williams.

May 12th.—R.S.G.B. District meeting.

May 26th.—Lecture entitled "B.C.L. Interference Cures," by GW8AM.

We have been informed by Messrs. Lissen, Ltd., that the four-valve battery set to be loaned to the club will be despatched shortly. This receiver may be borrowed by individual members if desired. Its wave-range covers the 10, 20, 40, 80 and 160-metre amateur bands. Hon. Sec., H. H. Phillips, 132, Clare Road, Cardiff.

Practical and Amateur Wireless
BLUEPRINT SERVICE

PRACTICAL WIRELESS	*Date of Issue.*	*No. of Blueprint.*
CRYSTAL SETS.		
Blueprint, 6d.		
1937 Crystal Receiver	9.1.37	PW71
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprints, 1s. each		
All-wave Unipen (Pentode)	—	PW31A
Beginner's One-valver	19.2.38	PW85
Two-valve : Blueprints, 1s. each.		
Four-range Super Mag Two (D, Pen)	—	PW36B
The Signet Two (D & LF)	29.8.36	PW76
Three-valve : Blueprints, 1s. each.		
The Long-range Express Three (SG, D, Pen)	24.4.37	PW2
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2 LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow)	22.5.37	PW35
Summit Three (HF Pen, D, Pen)	—	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	20.5.37	PW39
Hall-Mark Three (SG, D, Pow)	12.6.37	PW41
Hall-Mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans))	*June* '35	PM1
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	PW53
Battery All-Wave Three (D, 2 LF (RC))	—	PW55
The Monitor (HF Pen, D, Pen)	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P)	14.8.37	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen)	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	PW69
The "Colt" All-Wave Three (D, 2 LF (RC & Trans))	5.12.36	PW72
The "Rapide" Straight 3 (D, 2 LF (RC & Trans))	4.12.37	PW82
F. J. Camm's Oracle All-Wave Three (HF, Det, Pen)	28.8.37	PW78
1938 "Triband" All-Wave Three (HF Pen, D, Pen)	22.1.38	PW84
Four-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P)	1.5.37	PW46
Fury Four (2SG, D, Pen)	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B)	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull)	—	PW43
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P)	20.9.36	PW67
All-Wave "Corona" 4 (HF Pen, D, LF, Pow)	9.10.37	PW79
Acme "All-Wave 4 (HF Pen, D (Pen), LF, Cl. B)	12.2.38	PW83
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen)	—	PW18
A.C.-D.C. Two (SG, Pow)	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow)	—	PW35C
D.C. Premier (HF Pen, D, Pen)	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen)	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	—	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2 LF (RC))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
All-World Ace (HF Pen, D, Pen)	28.8.37	PW80
Four-valve : Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	24.7.37	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	9.2.35	PW47
A.C. All-Wave Corona Four	6.11.37	PW81
SUPERHETS		
Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three-valve)	5.6.37	PW40
F. J. Camm's 2-valve Superhet	13.7.35	PW52
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F. J. Camm's "Vitesse" All-Waver (5-valver)	27.2.37	PW75
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valve)	—	PW43
D.C. £5 Superhet (Three-valve)	1.12.34	PW42
Universal £5 Superhet (Three-valve)	—	PW44
F. J. Camm's A.C. £4 Superhet 4	31.7.37	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitone" Universal Four	16.1.37	PW73
SHORT-WAVE SETS.		
Two-valve : Blueprint, 1s.		
Midget Short-Wave Two (D, Pen)	—	PW38A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2LF (RC and Trans))	7.8.37	PW63
The Band-Spread S.W. Three (HF Pen, D (Pen), Pen)	29.8.36	PW68
PORTABLES.		
Three-valve : Blueprints, 1s. each.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)	—	PW65
Parvo Flyweight Midget Portable (SG, D, Pen)	19.6.37	PW77
Four-valve : Blueprint, 1s.		
Featherweight Portable Four (SG, D, LF, Cl.B)	15.5.37	PW12
"Imp" Portable 4 (D, LF, LF, Pen)	19.3.38	PW86
MISCELLANEOUS.		
S.W. Converter-Adapter (1 valve)	—	PW48A
AMATEUR WIRELESS AND WIRELESS MAGAZINE CRYSTAL SETS.		
Blueprints, 6d. each.		
Four-station Crystal Set	12.12.36	AW427
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150-mile Crystal Set	—	AW450
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprints, 1s. each.		
B.B.C. Special One-valver	—	AW387
Twenty-station Loudspeaker One-valver (Class B)	—	AW449
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans)	—	AW388
Full-volume Two (SG det., Pen)	—	AW392
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Big-power Melody Two with Lucerne Coil (SG, Trans)	—	AW338A
Lucerne Minor (D, Pen)	—	AW426
A Modern Two-valver	—	WM400
Three-valve : Blueprints, 1s. each.		
Class B Three (D, Trans, Class B)	—	AW336
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	—	AW404
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£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher; Baseboard Model (SG, D, Pen)	—	AW417
1934 Ether Searcher: Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
Mullard Master Three with Lucerne Coils	—	AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All-Britain Three (HF Pen, D, Pen)	—	AW443
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM318
Simple-tune Three (SG, D, Pen)	*June* '33	WM327
Economy-Pentode Three (SG, D, Pen)	*Oct.* '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	—	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen)	*June* '35	WM389
Certainty Three (SG, D, Pen)	—	WM393
Minitube Three (SG, D, Trans)	*Oct.* '35	WM396
All-Wave Winning Three (SG, D, Pen)	*Dec.* '35	WM400

These Blueprints are drawn full size.

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

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

QUERIES and ENQUIRIES

Television Aerials

"I have been experimenting with television and find that the dipole aerial I have made is apparently defective. I cannot get a really good picture to keep in frame and find that the tuning affects things. The set is home-made and I have had it lined and tested properly. I wonder if you can give me any hints regarding the aerial system."—G. M. (Highbury).

AT your address you should not experience any difficulty regarding the aerial system, but if the input circuit is matched for use with a centre-tapped dipole you may find that the method of leading away the feeder will affect results. Use the special twin feeder supplied by Messrs. Belling and Lee and erect your dipole so that the feeder may be brought away at right angles from the centre of the dipole in a direction opposite to that to which the transmitter is situated. It should run at right angles for at least three feet, before dropping to the receiver. Interaction between the lower part of the dipole and the feeder is the most likely cause of your failure to tune satisfactorily.

Converting a Dial

"I have a set in good working order and would be glad to know how I may convert the dial figures into metres. They run from 0 to 180, and I am told that these are not metres, and as I particularly want to hear a certain station I am uncertain where to find it on the dial."—G. W. (Blackley).

THE figures on your dial are purely arbitrary and it is not possible to make an accurate interpretation of these into metres. What you can do, however, is to locate two or three stations of known wavelength, and then by means of a sheet of ordinary graph paper can draw up a curve in which the relation between the present markings and wavelengths in metres (or frequency in kilocycles) may be accurately found. It must be remembered that the scale now is evenly divided, whereas the wavelengths will follow a special law, and if you examine a wavelength-calibrated dial of modern design you will find that the space allotted for, say, 50 metres at the top of the medium-wave band is very much smaller than the space for a similar bandwidth at the bottom of that band.

Annoying Neighbours

"The neighbours next door frequently complain about our set being too loud. They even complain before nine o'clock at night. The set is home-built and gives about 5 watts high-fidelity output. Is there any law against this, because I would like to know as they threaten to summon us."—F. H. (Northfield).

MANY local councils have passed by-laws concerning the nuisance of loud radio apparatus, and although in certain districts this only applies to demonstrations given by radio dealers, there are also cases where domestic apparatus is included. In many cases an action for annoyance would also succeed on common grounds, and therefore some steps should be taken to prevent the annoyance. Fortunately it is possible to retain the output and to prevent your neighbour from hearing the trouble. You will probably find, unless the party wall is very thin, that the neighbours can only hear the lower notes, in the form of "thumps" at odd intervals. You could drape the wall in question with a heavy curtain, or cover it with some of the special prepared boards obtainable from a good builder's materials supply stores, and this would remove, or at least greatly reduce, the trouble. You may find that by moving the set alone, you could effect an improvement. The success of an action would also depend upon the view of the local magistrate; in some cases it may be held that 5 watts is not excessive for domestic purposes, or that before 10 o'clock is quite a reasonable hour.

RULES

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

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

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

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

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

Valve Positions

"Does it matter in which position a valve is used—upside down or otherwise? What sort of lead would I need to extend the tuning condenser, volume and reaction controls 18 inches above the set?"—C. H. C. (New Romney).

THE majority of modern valves may be used in any position. A.C. or mains valves should, however, be so placed that ample ventilation is afforded, whilst small battery valves are not critical regarding position. The filaments are held in a spring device which keeps them taut no matter what the temperature, but some older valves may, if placed on their side, develop a short-circuit between filament and grid due to a sagging filament. To extend the controls in question it would probably be preferable to fit small pulleys on the original controls and fit new knobs and spindles in the required position, with cord drives from one to the other. This would avoid upsetting the performance of the set due to the additional lengths of wire. The pulleys and cords from a well-known constructional toy will be found suitable.

Birmingham Radio Clubs

"I should be glad if you could let me have the names and addresses of secretaries of short-wave clubs in Birmingham. I should like to join one, and although these particulars have, I know, been given before, I cannot trace them."—A. H. W. (Brookfields).

THERE are, according to our records, two clubs near you, the Slade Radio Society, Hon. Sec., G. Game, 40, West Drive, Heathfield Park, Handsworth, and the Smethwick Wireless Society, Hon. Sec., E. Fisher, 33, Freeth Street, Oldbury, nr. Birmingham.

Aerial Connections

"I have fitted a new aerial, provided with a twin feeder line, and am not quite certain regarding the best way of connecting this to my set, which has aerial and earth sockets. It is a commercial set and the input coil is screened. Will it be in order to connect the ends of the feeder to aerial and earth, and omit a standard earth connection?"—G. E. (York).

THE arrangement may work satisfactorily, but this will depend upon the design of the aerial or input circuit. If the aerial is joined to a small aperiodic circuit, or a small coupling coil is connected between the aerial and earth sockets, the arrangement will work reasonably well. If, however, the aerial socket is joined to a small condenser which, in turn, is joined to the grid coil, best results will not be obtained. You may find it worth while to wind a small coupling coil over the existing coil and connect the ends to a new pair of sockets to which the feeder may be joined. You do not state what wavelength is covered by the set, nor the type of aerial you have built, and for the ordinary broadcast wavelengths the arrangement may not prove any more efficient than the orthodox aerial and earth connections.

Band-pass Coil Connections

"I have found in my junk-box an old band-pass tuning unit, consisting of two coils mounted on an ebonite base in the form of a letter 'V.' The coils are wound with blue-silk wire, and there are terminals on top of each coil former, and three terminals on the base. A switch is built in. Can you give me the connections for this as I should like to use it in an experimental set I am building?"—J. D. (N.W.5).

THE coil would appear, from your description, to be the original Lewcos band-pass filter unit. The terminals should be marked A, E, C, G and R, and the aerial and earth are joined to the terminals marked A and E, whilst the reaction condenser should be joined to the anode of the valve and to terminal R. The two sections of the gang-condenser should be joined to terminals C and G, the latter being then joined to the grid of the valve through the usual grid condenser. You may find that this particular coil is not ideal for modern conditions, the minimum wavelength of the medium-wave band being 235 metres, and thus you will be unable to tune down to several popular stations.

The coupon on page iii of cover must be attached to every query.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," Tower House, Southampton Street, Strand, London, W.C.2.

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PLESSEY 3-valve Battery Sets, complete in sealed cartons with three Mazda valves, moving coil speaker, Pertrix batteries and accumulator, in exquisite walnut cabinet, 57/6.

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TELSEN A.C/D.C. Multimeters, 5-range (tests anything radio or electrical), 8/6; loudspeaker units, 2/6; Acc (P.O.) microphones, complete with transformer ready for use with any receiver, 4/6; headphones, 4,000 ohms, 3/- pair.

VALVES.—Full range for American receivers, 6/- each.

MORSE Tappers, complete radio-telegraph set (flasher, buzzer and tappers), with batteries, bulb, code, 3/-.

BARGAIN Parcels of Assorted Components, including coil, resistances, condensers, chokes, wire, circuits, etc., value 21/-; 5/- per parcel.

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AND PRACTICAL TELEVISION

RADIO NEWSPAPERS—See Page 31

Practical and Amateur Wireless

Edited by F. J. CAMM

Technical Staff:
W. J. Delaney, H. J. Barton Chapple, Wh.Sch., B.Sc., A.M.I.E.E., Frank Preston.

VOL. XII. No. 288. March 26th, 1938.

ROUND *the* WORLD *of* WIRELESS

The "Sprite" Three

IN this issue full constructional details of F. J. Camm's latest receiver will be found, together with a free blueprint. It will be seen that this particular set has been designed for the beginner, and all unnecessary "trimmings" have been eliminated, leaving the main essentials of a three-valver which will give splendid results on the normal broadcast wavelengths. When we refer to the omission of trimmings we do not, of course, mean that every part has been pared down to the economical minimum without reference to efficiency. In spite of the fact that the minimum number of components has been employed the efficiency has not in any way suffered, and to many constructors the fact that decoupling components, for instance, have been eliminated will prove useful, as separate battery feeds have had to be used in place of the common H.T. which could be used with decoupling arrangements, and this often enables the maximum voltage to be applied and thus each individual valve may be worked at its best. There are several other interesting facts to be found in this little receiver which should take its place as a model for those who are graduating from the simple one-valve set to the more advanced type of receiver which is now in common use.

Television Relays

THE recent announcements concerning the relaying of televised public events are stated to have upset manufacturers catering for big-screen work. Whether or not it will be found possible to overcome the copyright problem, or whether big-screen television will suffer a set-back from this present arrangement, remains to be seen.

New Television Grant

A SUPPLEMENTARY grant of £295,000 to the B.B.C. solely for television development was recently announced. It is to be hoped that this additional sum will enable improvements in programmes to be made with consequent increase in sales and eventually in a reduction in price of the complete receivers.

Relays for Accrington

THE Clayton-le-Moors District Council have been asked to grant permission to Uni-Relays, Ltd., to operate a wireless relay service in the district, and the request has been granted. This firm has taken over the whole of the relay services in the Accrington area.

P.A. Installations

A NUMBER of interesting public-address installations have recently been carried out by the well-known manufacturers of P.A. equipment. Trix have installed a complete radio and amplifier unit for instructional purposes at the Sutton Training Centre, whilst Tannoy erected some interesting demonstration equipment at the B.I.F.

ON OTHER PAGES

Cads' College

THE B.B.C. announce that "Cads' College," whose old school tie has been made famous by the Western Brothers, is to be the scene of a forthcoming series of six fortnightly Variety broadcasts. John Watt is arranging the production during the spring quarter, and listeners will be taken over the "College" for the first time during the early days of May. The shows, running for forty-five minutes, will be written and composed by the Western Brothers.

Television Announcer

MR. DAVID HOFMAN has been appointed announcer in succession to Mr. Mitchell on the television programmes. Mr. Hofman, who is thirty years of age, has had ten years' experience on the stage and in films, including eight years in Canada and the United States. He has also been a radio announcer at Station CFCF, Montreal.

To Timbuctoo by Car

MR. H. E. SYMONS has been making a racing trip across the Sahara in a private car from Algiers to Nigeria in just over three days. He will tell of his experiences in a broadcast to schools on March 25th. He will explain how it is possible in a few hours to go from the smooth, sandy plains of the story books to regions of tremendous mountains 12,000ft. high, and will describe lakes in the heart of the desert where one may shoot wild duck and even angle for fish.

New Danish Short-wave Transmitters

As, according to reports received at Copenhagen, broadcasts destined to the United States of America have been very poorly received so far, the Broadcasting Company has earmarked a portion of the profits accrued in 1937 for the construction of a new and more powerful short-wave station to work on 16.9 m. (17.755 mc/s) and 19.78 m. (16.17 mc/s). These will be equipped with beam aerials.

When the Clocks go Forward

In France and Belgium, Summer Time will be adopted on the night of March 26th-27th, when the clocks are put forward one hour, and the time coincides with that of Central Europe. In the British Isles the change will not be made before Sunday, April 10th.

More Channels for Radio Colonial

The new Essarts-le-Roi high-power short-wave transmitter, destined to take the Paris Radio Colonial broadcasts, may be found testing almost daily between G.M.T. 11.30-14.30, and again during the later afternoon and evening hours. The channels which are being tried out are: 16.87 m. (17.78 mc/s); 19.83 m. (15.13 mc/s); 25.33 m. (11.845 mc/s); 31.41 m. (9.55 mc/s), and 49.67 m. (6.04 mc/s).

ROUND the WORLD of WIRELESS (Continued)

A New London Landmark

STRIKING proof of a firm belief in the prosperity and progress of the radio and electrical industry is afforded by the recent announcement of the erection, on a site of some 15,500 square feet at the northern end of Shaftesbury Avenue, London, of one of the most modern and best equipped office buildings in the whole of the Metropolis.

To be known as Philips House, it will form the new headquarters of Philips Lamps, Limited, the well-known manufacturers of radio receivers; electric lamps for domestic, street and industrial lighting; medical and industrial X-ray apparatus, etc.

With its main frontage on Shaftesbury Avenue, the 9 floors of the new building will rise to a height of 100 feet, dwarfing the buildings in the vicinity and providing a notable landmark on the changing face of the West End of London.

B.B.C. Orchestra to Visit Plymouth

WE are informed that the B.B.C. Symphony Orchestra, under the direction of Sir Adrian Boult, will give a concert in the Guildhall, Plymouth, on Wednesday, April 20th, at 8 p.m. The programme will consist of the following works: Overture, "Benvenuto Cellini" (Berlioz); Symphony No. 40 in G minor, K.550 (Mozart); Symphonic Poem, "Tyl Eulenspiegel" (Richard Strauss); "Music for Strings" (Arthur Bliss); and Good Friday Music, from "Parsifal," and "Entry of the Gods into Valhalla," from "Rheingold" (Wagner). Tickets and all information can be obtained from Moon and Sons (Pianos), Ltd., 6-8, George Street, Plymouth.

Miss Vera Lynn, the well-known vocalist who is heard on the air with Ambrose and his Orchestra.

Our Broadcasts to South America

DAILY transmission in the Spanish and Portuguese languages destined to Central and South America was inaugurated by the B.B.C. on the night of March 14th-15th. For this purpose two transmitters were operated simultaneously on 31.55m. (9.51 mc/s) with directional beam aerials. The Spanish news bulletin commenced at G.M.T. 01.30, and was followed at 01.45 by a similar one in Portuguese.

In the same manner the U.S.A. has also instituted a series of propaganda broadcasts through W2XE, Wayne Township (N.J.), working on 25.36 m. (11.83 mc/s). Every Friday for Brazil a fifteen-minute transmission is given in the Portuguese language from midnight G.M.T., and daily from Monday to Friday inclusive a news bulletin is beamed on to the South American Latin States in Spanish on the same channel at G.M.T. 23.45.

INTERESTING and TOPICAL NEWS and NOTES

An artist's impression of the New London Headquarters of Philips Lamps, Ltd.

Variety from Oxford

THEATRE Variety will be broadcast from the New Theatre, Oxford, on March 23rd. This theatre is one of the best equipped in the provinces and puts on many London shows and pre-London premières. The chief artists in this variety bill are Bertha Willmott and George Heriot.

Leicester Symphony Orchestra

FOUNDED in 1921, Leicester Symphony Orchestra has Dr. Malcolm Sargent as its Musical Director and Conductor. For three or four years it combined its concerts with those of Leicester Philharmonic Society. Part of the concert on March 24th will be broadcast from the De Montfort Hall, Dr. Sargent conducting.

Orchestral Music

WILLIAM WALTON'S Symphony will be broadcast at the Sunday Orchestral Concert on March 27th (Regional) by the B.B.C. Orchestra conducted by Sir Adrian Boult. The programme will also include Schubert's Second Symphony in B flat.

Theatre Variety

MIDLAND and Regional listeners will hear a strong variety bill from the New Theatre, Northampton, on April 1st. It will include Big Bill Campbell and his Hill Billy Band, Velda and Van, George Beeton and Pat Kirkwood.

Film Music

THE sixth and last of the series of music written for British films will be broadcast on April 5th (National) when the programme will consist of a Suite from "Fire over England," by Richard Addinsell, and the music from "Things to Come," by Arthur Bliss. Olive Dyer (soprano) will sing, and the London Symphony Orchestra will be conducted by Muir Mathieson (by courtesy of London Film Productions, Ltd.).

Organ Recital

WORKS by Rheinberger, Vierne, Ernest Walker and Maleingreau will be played by Aileen Bransden on the organ in the Concert Hall, Broadcasting House, on April 8th (Regional), and the sixth recital in the series, "Round the London Organs," will be given on April 4th (National) by Berkeley Mason, from the Maida Vale studio.

"A La Carte"

A MIXED Menu of Light Fare will be provided in "A La Carte" on April 2nd, by Reginald Williams and his "Futurists" Dance Band; Compton Evans and Ray Monelle, "In original songs at the piano"; Cyril Fletcher, "In more odd odes"; The Three Nomads, "In close harmony"; Dorcen Pullen, "Impersonations."

SOLVE THIS!

PROBLEM No. 288.

Jackson built a three-valve battery set, and when switched on obtained very weak signals. He made several tests, but could not find the trouble. Valves were tested and found in order and he therefore bought a small voltmeter in order to make more accurate tests. When he tested the voltages at the valves he found less than 1 volt on the filaments, and, therefore, assumed that the accumulator was faulty. On test, however, this proved fully up to standard and fully charged. What was the most likely cause of the trouble? 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. 288 in the top left-hand corner, and must be posted to reach this office not later than the first post on Monday, March 28th, 1938.

Solution to Problem No. 287.

Although Atkins had purchased all correct components, he had overlooked the fact that as the coil unit was ganged, the gang condenser had to be wired with the oscillator section across the correct coil. These condensers are available with the oscillator section in the front or at the rear and he had wired the sections wrongly in view of this fact.

The following three readers successfully solved Problem No. 286, and books are accordingly being forwarded to them: R. E. Watkinson, 120, New Road, Portsmouth, Hants.; K. Richardson, 25, McGhie Street, Hednesford, Staffs.; F. Kilroy, 4, Industrial Street, Hollinwood, Oldham.

RADIO NEWSPAPERS

Although the Principle is Old, the Americans are Experimenting with New Apparatus for Broadcasting Newsprint and Similar Items for Domestic Purposes

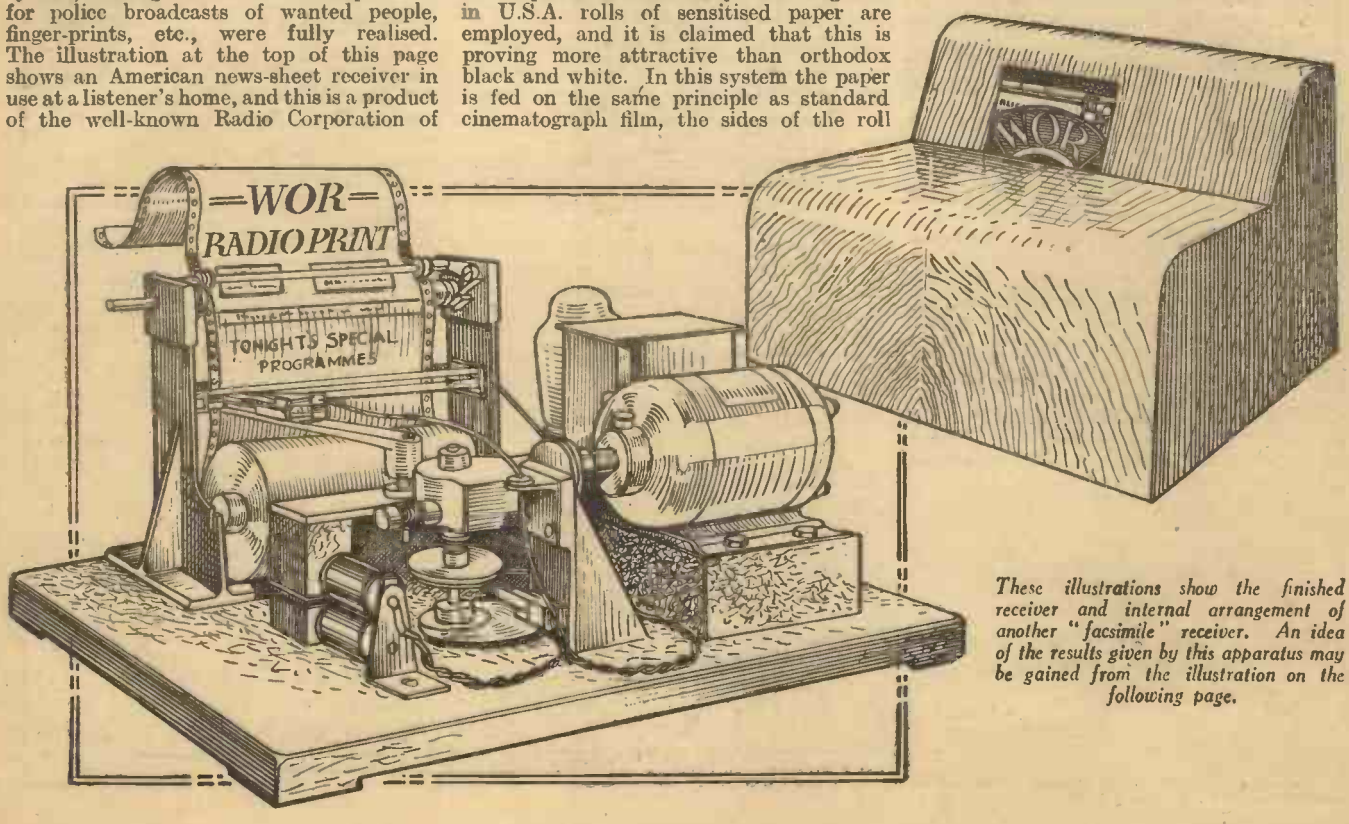
CRITICS of television often put forward the claim that a printed picture or news would be of much greater utility. They mention, for instance, the case of the business man who comes down to breakfast without much time to spare, but who is keenly interested in the latest stock prices or other news. They say that a printed news-sheet containing such material, broadcast about breakfast time, would furnish him with the details he requires for use on the journey to the office or at his leisure. The television broadcast, on the other hand, demands the entire attention of the "listener," and if he is unable to spare the time when the broadcast takes place the transmission has to be lost. Each item does, however, fill a definite place in one's life, and it is unfair to make comparisons between them. About ten years ago the B.B.C. realised the value of a news-service which would provide listeners with printed details and transmissions were carried out for some time from the Daventry station. The receiving device which was then on sale was known as a Fultograph, and briefly the system consisted of a metal cylinder round which a piece of paper was placed. A needle was brought into contact with the paper and the cylinder slowly revolved and the passage of a current from the needle to the cylinder brought about a chemical change in a solution with which the paper was saturated, and this produced a picture or print in a blue tone.

Modern Systems

There were certain drawbacks to the system, although at the time its importance for police broadcasts of wanted people, finger-prints, etc., were fully realised. The illustration at the top of this page shows an American news-sheet receiver in use at a listener's home, and this is a product of the well-known Radio Corporation of America. To cover all forms of material the system is known as "Facsimile," and it will be seen that a sheet of paper is gradually fed out of the machine and carries late news as well as illustrations. Unlike the original system used in this country, the reproduction is in black and white and is almost indistinguishable from standard newsprint. This is accomplished by using a stylus which travels over the paper and between which a sheet of carbon is interposed. In another system being used in U.S.A. rolls of sensitised paper are employed, and it is claimed that this is proving more attractive than orthodox black and white. In this system the paper is fed on the same principle as standard cinematograph film, the sides of the roll being perforated and a rotating drum with toothed edges providing the driving power. The illustration at the foot of this page shows the roll as it comes out of the machine, together with the associated equipment. The illustration at the side shows the appearance of the finished instrument, the roll being ejected from the small cut-out or escutcheon in the upper part of the cabinet.

Here is one of the R.C.A. "newspaper" receivers in use.

(Continued overleaf)



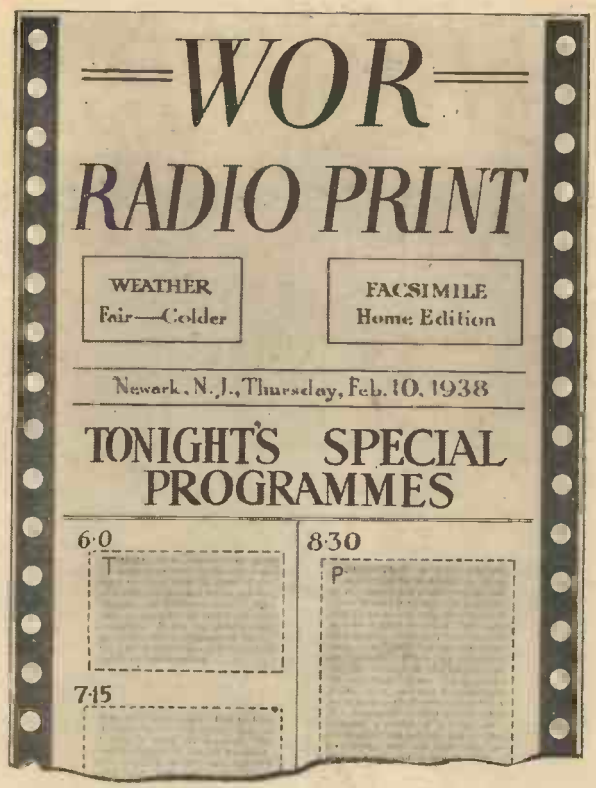
These illustrations show the finished receiver and internal arrangement of another "facsimile" receiver. An idea of the results given by this apparatus may be gained from the illustration on the following page.

RADIO NEWSPAPERS

(Continued from previous page)

Time-operated

In all the systems now in use in America, time-operated switches are employed to bring the apparatus into use. In this country the original system had a synchronising mechanism which was brought into action by a special tuning note, but the operator had to start up the apparatus before the transmission commenced. To avoid interference with existing radio programmes the American broadcasts take place in the early hours of the morning, and the time-switch avoids the necessity of the operator sitting up to switch on and off. The apparatus is joined to the loudspeaker terminals as in the original Fultograph system, and synchronising notes or impulses are also employed to start the stylus at the right point on the paper. In principle the arrangement is standardised, the carrier of the transmitter being modulated by a special frequency which also carries the modulations of the picture of news material being broadcast. This is effected by a standard photo-electric cell arrangement, the original "copy" being passed between the cell and a light source. The signal variations are rectified in the radio receiver in the usual way, and this results in impulses being fed to the output stage which, if passed to a loudspeaker, would sound somewhat like an ordinary Morse signal at very high speed. These impulses operate a magnet system which transmits to the stylus the impulses corresponding to the original signal fluctuations and thus re-creates on the paper the message or picture. A synchronous motor, or a synchronising impulse, keeps the roller at the receiver in step with the feed at the transmitter.



This is the form taken by the "newspaper" produced from the apparatus shown on the previous page.

What Future?

Whether the idea will obtain a greater hold on the American public than it did on the English listeners, or whether the apparatus now in use is more effective than the original apparatus, will not become evident for some time, but no doubt there is a definite sphere for this additional branch of radio, not only in disseminating news but in providing the experimenter with a field into which he may turn his energies now that radio from the sound point of view has been brought to such a high state of perfection. At the moment there are fifteen stations in America making these broadcasts and five manufacturers are making the receiving apparatus. There can be no doubt that the scheme is practicable, and that in the near future we shall have radio newspapers in this country.

Important Broadcasts of the Week

NATIONAL (261.1 m. and 1,500 m.)
Wednesday, March 23rd.—B.B.C. Symphony Orchestra visits Aberdeen: A Concert from the Music Hall, Aberdeen.
Thursday, March 24th.—Concert Party programme.
Friday, March 25th.—Lines on the Map; Communication by Telegraphy and Wireless, feature programme.
Saturday, March 26th.—Women's Hockey: A commentary on the match, Scotland v. England.

REGIONAL (342.1 m.)
Wednesday, March 23rd.—A commentary on the Lincolnshire Handicap.
Thursday, March 24th.—Queen's Hall Royal Philharmonic Concert.
Friday, March 25th.—Dance Band programme.
Saturday, March 26th.—Orchestral and choral programme, from the Town Hall, Birmingham.

MIDLAND (296.2 m.)
Wednesday, March 23rd.—Variety from the New Theatre, Oxford.
Thursday, March 24th.—Snooker: A commentary on the match, Joe Davis v. Horace Lindrum, from Wolverhampton.
Friday, March 25th.—Can we keep men on the land? A discussion.
Saturday, March 26th.—Piers Plowman, a contemporary vision of John Ball, Wat Tyler, Jack Straw, William of Wykeham, Wyclif and Chaucer and William Langland.

WEST OF ENGLAND (285.7 m.)
Wednesday, March 23rd.—Choral and Organ concert, from Bedford Road Methodist Church, St. Ives.
Thursday, March 24th.—Dance Cabaret, from the Imperial Hotel, Torquay.
Friday, March 25th.—Variety from the Theatre Royal, Exeter.
Saturday, March 26th.—Bath Musical Festival, from the Pavilion, Bath.

WELSH (373.1 m.)
Wednesday, March 23rd.—Welsh light programme: Spring.
Thursday, March 24th.—Ein Pentre Ni.

McAvoy-Harvey Fight

The contest for the Light Heavyweight Championship of Great Britain between Jock McAvoy, the holder, and Len Harvey, will be televised from the Harringay Arena on April 7th. This outstanding match is the first professional boxing event to be televised. By courtesy of Harringay Arena, Ltd., the whole of this fifteen-round contest will be seen by viewers, beginning at 9.30 p.m. Three cameras will be used, one for comparative close-ups and the others will give general views of the ring and the audience.

A special television commentary will be given by Lionel Seccombe and his commentary will be explanatory rather than descriptive. He will tell viewers why certain blows were delivered, explain the tactics of the boxers and, in the intervals, sum up what viewers have seen in each round. The B.B.C. mobile television unit will use the radio link between Harringay and Alexandra Palace and, as the distance to be covered is less than two miles, it is expected that unusually good pictures will result.

The Locals entertain, from the Memorial Hall, Penygroes.
Friday, March 25th.—For Welsh Farmers: Plough v. Pasture, a discussion.
Saturday, March 26th.—Organ recital from the Odeon Theatre, Llandudno.

NORTHERN (449.1 m.)
Wednesday, March 23rd.—A running commentary on The Lincolnshire Handicap, from Carholme, Lincoln.
Thursday, March 24th.—Boxing: An eye-witness account of the Flyweight Contest, from Liverpool.
Friday, March 25th.—Why do you believe that? Questions and answers on to-day's moralities.
Saturday, March 26th.—Northern Philharmonic Concert from the Town Hall, Leeds.

SCOTTISH (391.1 m.)
Wednesday, March 23rd.—Gaelic Concert.
Thursday, March 24th.—The Scottish Country: The Heart of the Great Glen, an impression of the life of the district.
Friday, March 25th.—Scottish Dance Music.
Saturday, March 26th.—Spring on the Air, or The March of Time, a seasonable miscellany in song and sketch.

NORTHERN IRELAND (307.1 m.)
Wednesday, March 23rd.—Say it with Song.
Thursday, March 24th.—Airs of Ulster: Orchestral programme.
Friday, March 25th.—Country Concert: Cullybackey. County Antrim.
Saturday, March 26th.—Organ recital from the Ritz Cinema, Belfast.

The Romance of A FAMOUS VOLUME

The Sixth Edition of the WIRELESS CONSTRUCTOR'S ENCYCLOPÆDIA is Now Ready

THE need for a further edition of the WIRELESS CONSTRUCTOR'S ENCYCLOPÆDIA, the 6th edition of which has just made its appearance, indicates the esteem in which this remarkable volume is held by wireless set constructors, designers, manufacturers, school-teachers, and draughtsmen all over the world. It is probable that this volume has broken all records for sales of technical books, for approaching a quarter of a million copies have been sold in every part of the world. Service men, wireless operators on board ship, transmitters, amateurs, and professionals have all availed themselves of this conveniently arranged treasury of wireless knowledge, each edition of which has faithfully recorded and defined the ever-growing nomenclature of wireless, electricity and television. Each edition has recorded changes in design and new principles. It is a book which you may consult and read. It is a text-book and an *aide memoire* valued alike by the beginner, the amateur and the professional.

Alphabetical Arrangement

The alphabetical arrangement of the contents enables the reader immediately to locate the information he needs. Additionally, appropriate items are cross-referenced so that in consulting one particular subject you are guided to cognate subjects. It is not a book which is padded with irrelevancies; the entire book of 396 pages is literally packed with valuable information which everyone interested in wireless needs to have on hand. The WIRELESS CONSTRUCTOR'S ENCYCLOPÆDIA is a book which even the ordinary listener cannot afford to be without. The new edition has been entirely revised, information added, and new terms defined.

Better Paper and Binding

This 6th edition is also produced on better paper, and in an even better binding. In it you will find information on making transformers, coil data, list of broadcasting stations, list of important dates and anniversaries, directory of radio clubs, international call-signs, the principles of push-button tuning, an explanation of decibels, Ohm's law, valve base data and connections, complete list of colour codes, how to solder, complete series of circuits, how to test a receiver, remote control, how to make a tape machine, details of wood-screws, all about aerials and accumulator charging, facts, figures and formula, the amateur wavebands, B.A. screw sizes, methods of coupling—these are only a tithe of the subjects dealt with.

Practical Information

The WIRELESS CONSTRUCTOR'S ENCYCLOPÆDIA is not just a book of definitions, for suitable subjects are expanded to include constructional and practical details. It is a book for the fireside hour, as well as for a place on the shelf with works of reference. It has become the standard work on the subject of wireless, and at the price of 5s. it would be difficult to find better value. The abbreviations, the symbols, the terms, and the methods, of wireless in its various forms are here explained in non-technical language. Those who own previous editions should possess this latest edition to keep their knowledge abreast of the times.

Over 500 Illustrations

The book is packed with over 500 diagrams, practical as well as theoretical. There is a section on home-recording, remote control, making a Wheatstone bridge, chassis construction, coil making, choke making, twist drill gauge sizes, curing noises, planning the output stage, extension speakers, speaker matching, meters, switches and switching, polishing and staining, cabinet making, making a DX unit; if you want the definition of impedance or a neper, or a weber, or a lumen, or a lux, or gauss; if you require to know the unit of power, or the formula for inductance, or the connections for a particular valve; if you desire to know the velocity of light and sound, or the merits of particular aerial systems, or to find a decimal equivalent, or the formula for fixed condensers, the principles of a particular circuit, how to cure break-through, or the definition of fasciculation, copper wire data, how to calibrate a receiver; if you wish to find out what is a calory, or a hum-bucking coil, or a visual-tuning indicator, or a voltage doubler, or Wollaston wire, or Lecher wire, or details of the bel or the phon—if, in fact, you wish to know anything about wireless, the WIRELESS CONSTRUCTOR'S ENCYCLOPÆDIA is there to help you. It is, indeed, a most valuable and interesting work of reference.

Sixth Edition Now Ready

The first edition was published five years ago. Six large editions have appeared in that time. It is unlikely that any other work of a similar character has appeared nor one that has attained such large sales and such an immense measure of world-wide popularity. The 6th edition of the WIRELESS CONSTRUCTOR'S ENCYCLOPÆDIA is now on sale, and is obtainable from, or through, any newsagent, or from the Publishers of PRACTICAL AND AMATEUR WIRELESS.

It costs the very small sum of 5s., but saves you many pounds in service fees alone.

LOCAL-DISTANCE SWITCHING

Suggested Methods for Modifying a Receiver so that it May Be Used for Selective Long-range Reception as well as for Local High-quality Results - By W. J. DELANEY

IN many cases it is not possible to keep two separate receivers in operation, and it is realised that a set designed for local quality reception cannot be used for long-distance reception, mainly on account of the fact that the sharply-tuned circuits that have to be employed provide top-note cut-off. There are several schemes, however,

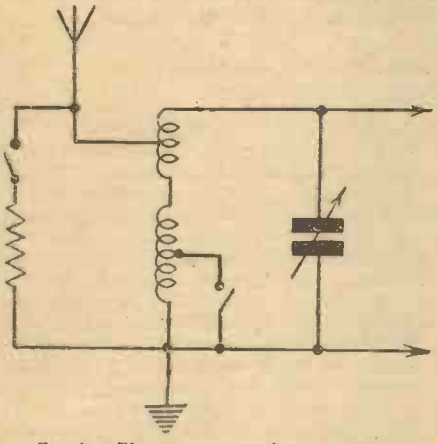


Fig. 1.—Flattening tuning by connecting a resistance across the tuning coil.

which may be adopted so that one set may be made to do the work of the two styles just mentioned, and the arrangement to adopt will depend, of course, upon the type of set needed for the long-range work. In many cases a simple S.G., Detector arrangement will be used, and on grounds of economy band-pass tuning will not be fitted. The circuit employed for tuning will therefore consist of a good selective single coil in the aerial circuit, followed by the usual H.F. transformer or tuned-anode feeding the detector stage. By tapping the aerial coil the selectivity may be sharpened up for ordinary work, and it will be assumed that such a receiver would not be expected to give the highest quality, even when adapted

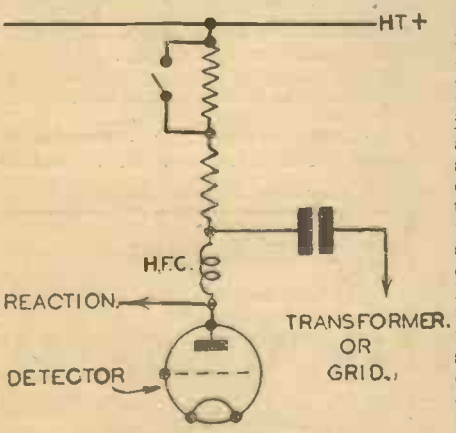


Fig. 4.—The detector anode circuit may be changed for "local" work as shown here.

for local-station work. The simplest method of converting a set of this type would be to connect a resistance across the aerial circuit, the effect of which is to flatten the tuning and thus enable locals to be received without high-note cut off. The value of the resistance should be fairly low—some few hundred ohms. The most effective value may have to be found by trial, and will depend upon the coil and the aerial-earth arrangements.

Detector Changes

In most cases 500 ohms will be found suitable, and a simple on-off switch connected between the resistance and the aerial or earth will enable the circuit to be adapted at a flick of the switch. The detector stage in such a set will normally be left unaltered, but if desired to give better quality a change to the arrangement known as "power-grid" may fairly easily be made. For this an extra resistance should be included in the anode circuit—either in series with the existing coupling resistance (in an ordinary R.C. circuit) or in series with the transformer primary. The power-grid scheme

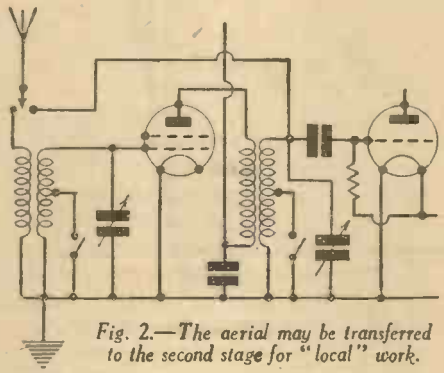


Fig. 2.—The aerial may be transferred to the second stage for "local" work.

operates more effectively with R.C. coupling, and therefore if a direct-fed transformer is employed a change to the parallel-fed scheme should be considered. The normal load resistance will then operate when reaction is needed (for increasing the range and for sharpening the selectivity) and for quality results the switch across the additional resistance should be opened, thus providing the higher anode load. A change in the value of grid condenser to .0001 mfd., and the grid leak to 1 or even .5 megohms will increase the efficiency of this scheme, and in some cases the switch in the aerial circuit already mentioned may be ganged with the anode switch so that both may be operated together. The Bulgin type S.80.B will prove suitable for this as the two switches may be placed close to the appropriate circuits and operated from a single knob.

Eliminating H.F. Stages

In addition to the need for improving quality on the locals it is also sometimes found that maximum H.F. amplification is unnecessary for these stations. The result is that the volume control is set right back to minimum and then in many cases it provides insufficient reduction. It may be possible in such cases to cut out the H.F. stage or stages entirely, the aerial being transferred to the detector tuning circuit and a filament-breaking switch being included to avoid the use of unnecessary current. This scheme will, in fact, prove very valuable to many listeners who find that the normal cost of running their receivers is on the high side, and it permits of extra L.F. amplification being employed, with consequent gain in quality and power, whilst still permitting the receiver to be employed, when desired, for long-range reception. It will be important in this type of circuit to use a low-resistance switch in the filament circuit, otherwise it may be found that when the H.F. valves are switched on they do not pass the maximum current, and when under-run the efficiency may prove very low. Again, the type of switch already mentioned may be used in gang to transfer the aerial and control the filament circuit.

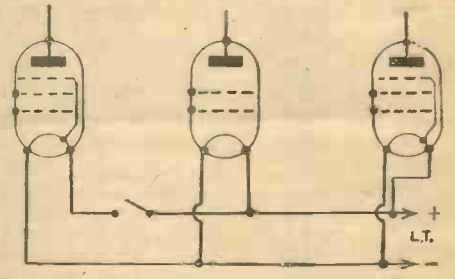


Fig. 3.—Economy may be effected by cutting out the H.F. valves.

It will also be possible by means of these switches to change the detector anode load at the same time, so that two separate receivers will, in effect, be contained in one circuit, changed at a touch of the switch from one to the other.

(Continued on page 40)

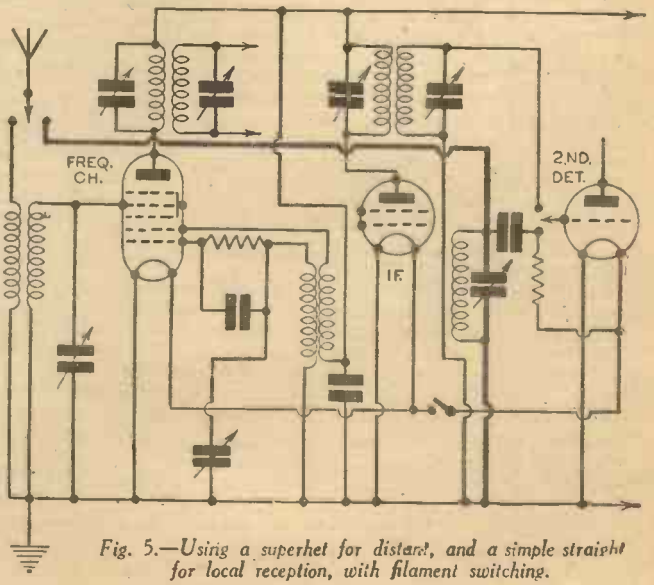


Fig. 5.—Using a superhet for distant, and a simple straight for local reception, with filament switching.

ON YOUR WAVELENGTH

By Thermion

Maurice Reeve Broadcast on April 27th

THOSE who feel as I do that the piano is the most perfect musical instrument, and certainly the most perfect from the point of view of the microphone, will welcome the announcement that Maurice Reeve, who has appeared before the microphone many times before, is to give a further broadcast at 3.15 p.m. on April 27th. I know that many of my readers will be disappointed that they will not be able to listen in to this programme, because of the hour, and I am hopeful that the B.B.C. will on another occasion broadcast this artist's performance in the evening and/or on Sundays.

In my opinion this wizard of the piano is without peer. Anyone who has seen him play, particularly his spectacular playing of difficult compositions with the left hand only, will agree with me. His technique, his wide repertoire, his handling of the popular and the classical are really exceptional. The only difference which I can discern between him and other pianists is that he is without the ballyhoo. I really enjoy his broadcasts and his playing, and every piano lover is with me when I say that we do not hear enough of him. His is one of the few first-class turns.

Some Terminological Terrors

I THOUGHT my vocabulary was Brobdingnagian, but I am utterly cowed by some words which I saw in the paper the other day. After all, whilst each nation is endeavouring to intimidate others by the size of its armaments, we really should invent some really big words for international politicians to hurl at one another further to instil fear. The microphone is now being used extensively for propaganda purposes, and the nation which can invent the longest and most frightening words ought to win. I am aware that our own dictionaries contain some good examples of tergiversatory terminology. If for example, you wish to estimate something as worthless and do not wish really to offend the person concerned you can use the word *floccinaucinihilipilification*. It's in the dictionary so it must be so! Then, of course, our chemists love to show how clever they really are by expressing a chemical compound by adding together the names of all the little bits in the compound and making one word of it. Much the same as doctors like to refer to salt as *sodium chloride*, and charge you 2s. 6d. for a pinch of it. However, here are some examples which I saw in the paper the other day: bombocataclysmic, abracadbramrantesque, metagrabolifigraptulating, stupeficracopomptilious, juggernautiblastodermatic, annihilococufizibobostramatory. Those are some really handsome words to hurl at your enemies, and I can imagine the enemy scuttling like rabbits, and leaving their rifles behind at the mere sound of them.

That Quality Receiver

A READER who, for obvious reasons desires to remain unknown, has sent me a letter relating to that which we published from H.S.B., of Llansamlet, concerning "The Superhet's Rival." He tells me that after a very late supper he picked up PRACTICAL AND AMATEUR WIRELESS for a further perusal, and just as he was slipping away into the oblivious state, with the copy almost falling from his hands, he was brought to consciousness on reading the aforesaid letter. He invites me to visit him and wade through the reams of correspondence which has been inflicted on him by one of our correspondents, and he thinks I should split my sides with laughter. Shakespeare is a back number, and Edgar Wallace and the Editor are the only people who can turn out words with similar rapidity. This reader apparently had a letter published in this journal some time ago and as a result one of our readers got into touch with him. What this latter gent wants is a quality 2 H.F. tuning unit, 14-watt amplifier, with a first class speaker, for £10, and thinks that my correspondent ought to supply it. In return the reader would demonstrate the set without charge for publicity. He was politely turned down, and failed to realise why he could not be supplied with an eight-valve super-quality chassis for 10 guineas. I remarked last week that a man who wants quality for nothing will not get it. He certainly will not get it from me.

Educational Programmes

I have received details of the Radio course radiated by W1XAL under the auspices of the World Wide Broadcasting Foundation, and which we dealt with in a previous issue. The course is radiated on a 6,040 kilocycle band. Radio lectures are given each Friday at 5.0 p.m. E.S.T. over the 11,790 kilocycle band. This is probably a better time for British listeners. Section 3 of the course began on March 7th, and Sections 1 and 2 will be repeated on Friday evenings. Section 2 of the course deals with power supplies, radio-frequency oscillators, crystal oscillators, radio-frequency amplifiers, radio-telegraph transmitters, plate modulation, grid modulation, radio-telephone transmitters; whilst section 3 deals with transmission and reception, detection, autodyne receiver, tuned radio-frequency receiver, superheterodyne receiver, super-regenerative receiver, transmission of radio waves through space, automatic volume control. Section 4 deals with cathode-ray tubes, television transmission, television reception, trans-receivers for ultra-high-frequency antenna systems, direction finding by radio, automatic finding by radio, frequency measurement.

Television Expansion

ACCORDING to a recent statement in Parliament it is expected by the end of March that the licence figures will reach 8,540,000, whereas it was originally estimated that the peak would be 8,400,000. The debate was regarding a supplementary estimate for £360,000 and the Postmaster referred to the two new items of expense which they had to meet.

The first was the expansion of television which will account for £295,000, whilst the broadcasting of news in foreign languages would account for £15,000. It was suggested that 8 per cent. of the net licence revenue should in future go to the B.B.C. to help pay for the additional work on television. It was suggested that even now the studio accommodation at Alexandra Palace is inadequate. Major Tryon stated that the technical standards of television (as already announced in PRACTICAL AND AMATEUR WIRELESS) have been standardised for three years, which gives security to producers of sets and encourages them to make more and cheaper television receivers.

The trade has already appointed a sub-committee to discuss means of developing television, and at its first meeting dealt with the somewhat difficult question of interference with television reception caused by short-wave sound receiving sets. Let us hope that these problems will be solved by the time that Radio-olympia opens.

Television and News Bulletins

THE following announcement has been made by the B.B.C. :

"Viewers may be inconvenienced by the evening television programme starting at 9.0 o'clock, at which time they might want to hear the sound news. At present they sometimes have time to hear the 10.0 o'clock news summary when television has closed down, but we are gradually extending the programmes to run to 10.30 p.m., which would leave them the alternative—television or news—but not both. There are practical reasons for starting not later than 9.0 o'clock, but we are anxious to study the convenience of viewers as far as possible. We could arrange for a news bulletin to be put out on the television sound wavelength at the end of the television programme, but before making definite arrangements, we should like to know how viewers feel about it."

Viewers are asked to send a postcard to the Director of Television, Alexandra Palace, Wood Green, N.22.

Television Demonstrations

WHILST I am on the subject of television I think it would be a good plan for manufacturers to take steps to see that demonstrations of their apparatus are carried out by reputable firms with reputable salesmen. I can vouch for the following details. A member of the staff of PRACTICAL AND AMATEUR WIRELESS has a friend who was performing in a television programme and his wife wished to see the broadcast. She accordingly visited one of the large London stores who advertised a "radio and television salon." She was shown into a semi-darkened room and was seated with several other people before a television receiver with a picture which, apart from the fact that it was seriously out of focus, floated up and down continuously. Upon asking the salesman to adjust the focus and steady the picture she was told that this could not be done as "it was only a cheap set." (The price was nearly 50 guineas.) She then remarked that it was hopeless to expect anyone to purchase such a set and was told that they had some dearer ones in another room if she would like to see them! Such a state of affairs will not create a good impression among those who have not seen just how remarkably good television can be when properly adjusted and handled. I can supply the makers with further details if they desire them.

Notes from the Test Bench

Frame Aerial Windings

WE have often mentioned the rule-of-thumb principle for ascertaining frame aerial windings—giving 75ft. for the medium-wave and an additional 150ft. for the long-wave winding. It is essential to remember, however, that these lengths of wire may be found inaccurate if certain methods of winding are adopted. On the medium waveband good Litz wire should be employed and adjacent turns should be spaced by a distance equivalent approximately to the thickness of the wire. If the spacing is increased more wire will be needed. On the long-wave section the turns should be placed side by side and touching, using, say, 26 or 28 D.C.C. The gauge of Litz on the medium-wave winding will be found to affect the tuning range, but the variation is not so great as that given by the spacing.

Corona Coils

IN the Corona and some other receivers we utilised a two-gang coil unit which is provided with a self-contained switch. A number of cases have been reported where unsatisfactory results have been obtained, and on examination it has been found that the trouble is entirely due to the mounting of the coils by the constructor. The switch rod has to pass through both switch sections, and if the coils are screwed down slightly out of line the contacts on one switch unit may not close (or open) when those on the other unit are operated. The best plan to avoid this trouble is to screw down the coil nearest the front panel first, making quite certain that the holding-down screws do not distort the metal case. The switch rod should then be turned once or twice, whilst holding the rear coil, and when found to operate smoothly, letting the rear coil take up a natural position, the screw holes should be marked and the fixing screws fitted. The main point to remember is that the two coils have to be in line in such a manner that both sets of contacts operate together.

Speaker Horns

THE advantages of the horn type of speaker are well known to many constructors, but a point often overlooked, and one which often causes results to be inferior, is that the air column inside the horn must be "balanced" to the operating unit. Unless this is satisfactorily carried out the frequency response may be worse than when the operating unit—of either the small or the large cone type—is used alone without a baffle of any description.

Edison's First Talking Machine Broadcast

THOMAS A. EDISON'S first talking machine will be operated, April 18th, during a special broadcast over the American station, WLW, as a part of a special weekly series dramatising the life of the late inventor.

The Edison series, based on Francis Jehl's "Menlo Park Reminiscences," began on February 28th, as a part of the "Nation's School of the Air." These programmes are heard from 2 to 2.15 p.m., EST, Mondays.

Mr. Jehl, the only living associate of Edison during the time Edison invented the electric light and other electrical marvels, will take part in the special broadcast, April 18th, which will originate from the Edison laboratory in Detroit. He will operate the inventor's first phonograph.

That Edison discovered radio, although he failed to follow it up, will be demonstrated also by Mr. Jehl, who will operate a small set, using an early Edison electric light bulb as the detector tube. The radio waves which Edison discovered are known as the "Edison Effect," according to Mr. Jehl, who said the inventor did not continue his experiments with the discovery because it was a digression from the electric light.

Joseph Ries, educational director of WLW and WSAI, and James W. Beckman, director of public relations for the Crosley Radio Corporation, recently completed arrangements for the special Edison broadcasts when they visited Henry Ford's Edison Institute Museum and Greenfield Village.

The "IMP" Four-valve Portable

Further Notes on the Construction of the Novel Lightweight Portable, which was Described in Last Week's Issue

Under-chassis Wiring

IT is not proposed to detail all the under-chassis wiring, as this is clearly shown in the wiring diagrams, but it must be borne in mind that all wiring should be fully insulated from the chassis, unless common to the chassis, and kept well down, otherwise difficulty will be experienced in inserting and removing the finished set, so far as the cabinet is concerned. When soldering, it is advisable to use clean Fluxite, and so far as inexperienced constructors are concerned it will be found beneficial to tin the various points to be connected, prior to soldering. The connections from underside of chassis, and going through holes 1, 3, 4, 7 and 10 are made with bare wire covered with Systoflex, whilst the speaker leads from "A" terminal on the fourth valveholder through hole No. 9 and "S" socket on the same valveholder through hole No. 8, constitute two 5in. lengths of flex, terminating in two Clix sockets, type 22, the red socket being connected to that lead coming through hole 8, and the black through that of hole No. 9. Those wires going through holes 1, 3, 4 should be 1½in. long, the wire passing through No. 10 being 2in. long. Another wire is taken from the "S" socket on the 5-pin valveholder through hole No. 7, this being connected to one end of the .1 mfd. condenser C6. (See the above-chassis diagram, or blueprint.) The other connection from condenser C6 is soldered to the head of the valveholder fixing screw, and this wiring should be done with Glazcite reinforced with Systoflex. The connections through holes 3 and 4 are soldered to the two ends of the grid-leak R1, whilst the connection from hole No. 1 is taken to one end of the .0003 mfd. condenser C1, the other end of this condenser terminating at the fixing screw of the tuning condenser vanes, to which it is soldered. It will be noticed that a long lead passes through hole No. 2; this is for connection to the coil, and should be 2½in. long. A short length of bare wire should be connected from the moving vanes contact tag to the chassis in each case, and two 1½in. lengths of insulated wire are soldered to the fixed vanes solder tag on each condenser, the other ends being left open for connection to the coil ("A" and "C").

Plug and Socket Connections

Referring now to the remaining plug and socket connections, the two GB leads terminate in the three master plugs, Clix type, red for the positive lead, and black for the negative; the length of these leads is optional, but it will be found that all leads should be about 10in. long. A yellow Clix master plug should be connected to the end of the H.T. positive 1 lead, a red plug to the positive 2 lead, and finally a black plug is connected to the H.T. negative lead.

Having carefully checked over all wiring, the tuning knob may be fitted and the reaction knob "V" grooved for engagement with the L.T. switch. To do this a sharp penknife or razor blade will be necessary—not a three-cornered file—as the "V" groove has to be deep but not wide. It will be found that 3/32in. will be a sufficient width; the depth will also be about 3/32in. Fit the knob over the reaction condenser spindle with the vanes full out, then make sure that the end of the bent up contact falls into the groove without any side-play of the knob. The bottom contact of the switch must then be adjusted with a pair of pliers so that there is an air gap of not more than 1/16in. between both contacts; tighten up grub screw and apply a little vaseline to the flange of this knob to reduce friction and wear.

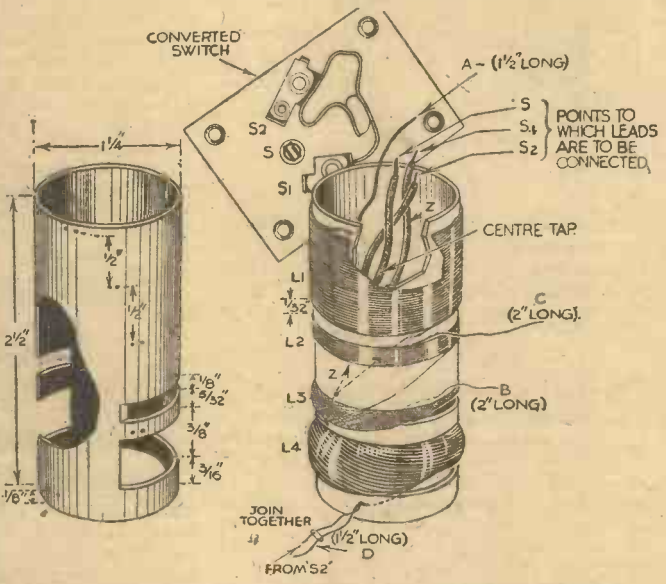


Fig. 9.—Details of coil construction and the converted switch.

A final check should be made by comparison with the wiring diagrams, also any pieces of extraneous solder and Fluxite should be removed.

Coil Construction

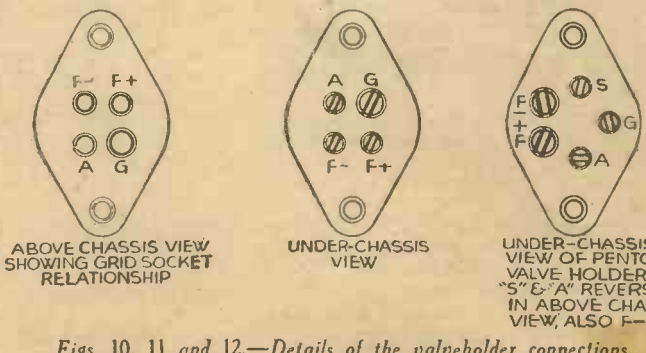
A 2½in. length of 1¼in. diameter bakelite or cardboard former must next be cut and slotted in accordance with the measurements given, the small wiring holes being drilled with a 3/64in. bit. The medium-wave winding L1 should first of all be made, the ends and centre-tapped wires being terminated by threading through the wiring holes twice. The reaction winding L2 should be wound in exactly the same direction as for all windings, and when the last turn on L2 has been reached, carry straight on into the narrow slot, and as evenly and as carefully as possible pile wind the 50 turns required for L3, terminating in the usual manner. L4 is wound with the same wire as L1, namely 32 S.W.G., and this should likewise be evenly wound whilst applying an even pressure. The finished coil should be identical with that shown in Fig. 9 and particular stress is laid on the close proximity between coils L1 and L2. The leads to the switch, which, as previously mentioned, is fitted into the top of the former, should be left sufficiently long to permit ease of wiring, and should be taken up the centre of the former and covered with Systoflex; this should be clear from the blueprint and pictorial illustration (Fig. 9).

Before assembling the coil on the chassis, and as this would mean fitting the power valve XP before carrying out battery tests, the L.T. cycle lamp battery resistance should next be constructed. Referring to Fig. 4 it will be seen that the bakelite former is used for the winding of eureka wire, and the solid ebonite former fits tightly into this former providing a suitable base for the terminal mounting. The eureka wire should be wound evenly and tightly on this former with the ends terminating through small wiring holes in similar fashion to the method adopted in the tuning coil wiring. A liberal amount of seccotine applied over the whole length of one side of wiring—or a coating of amyl-acetate—will ensure the winding retaining its position, and having bound the finished coil with paper or insulation tape, this may be then cleated between two cells of the battery, one end being fixed to the length of contact by snipping and turning over the strip of brass in the manner shown. A rubber band will serve admirably as the means of securing this resistance, but insulation tape would be a very suitable alternative.

Testing and Assembling

The first tests are for continuity and any possible short-circuits and intermittent disconnections, and the valves should on no account be inserted until satisfaction is

(Continued on next page.)



Figs. 10, 11 and 12.—Details of the valveholder connections.

THE IMP FOUR-VALVE PORTABLE

(Continued from previous page.)

obtained after these tests, and when ready for the coil.

Connect up the batteries in the following manner: The red spade terminal is clipped into contact at the top of the lamp battery, the other spade terminal going to the resistance terminal "R," which should be securely fixed; then short-circuit the two G.B. wander plugs coming through the centre hole on the chassis runner—this can be done by just clipping the two together and binding with a little insulation tape. Now bind together the yellow and red H.T. plugs with a piece of bare wire, plugging the end of the bare wire into the 75-volt tapping on the H.T. battery. The black H.T. negative plug goes into the negative socket on the H.T. battery, care being taken to see that the bare wire temporarily used for the 75-volt tapping does not in any way contact with any part of the external wiring or equipment.

The speaker should next be fitted with two leads and corresponding plugs for the sockets from holes 8 and 9. Now take a small 2 or 3-volt torch bulb to which has been soldered lengths of flex, and place the bared ends of the flex in the two top sockets in either of the three first valve-holders—looking on to the top of the chassis they are shown as F—, F+ in Fig. 10, the sockets being nearest to the panel. Turn the reaction knob—that is the one on the left of the front panel—to the right, and the torch bulb should light up. Any short-circuit between the H.T. positive and L.T. positive will be indicated in this test by the torch bulb blowing. There should be little likelihood of any other serious fault resulting which would ruin the valves, providing instructions have been fully adhered to; over or under-biasing of the valves would result if the grid-leaks R1, R2 and R4 are either short-circuited—that is to say, shortening down to the chassis at the point of contact with the valve sockets marked "G" in the blueprint—or if the H.T. leads, such as those going to the resistances R5, 6 and 7, contact with these "G" sockets through either excessive solder or extraneous pieces of wiring.

The coil can now be placed into position, after, of course, plugging in the XP valve in the third valveholder, the position being indicated by the dotted circle shown in the top view of the chassis in the blueprint.

The connections corresponding to those shown in Fig. 9 should be done in alphabetical order, and it will be found that one or two of the leads coming from the coil may conveniently be shortened. These wires should be scraped at the end, then covered with Systoflex and soldered to their respective points, slipping the Systoflex down over the soldered joints, and finally positioning the wave-change switch.

The wire "A" is threaded close to the top of the coil, and care will have to be taken to see that the metal work of the switch does in no way short-circuit this part of the coil.

The remaining valves, XD, XL and XY, may be now plugged into the corresponding valveholders, and great care must now be taken in reconnecting all the leads, including those for the speaker, and commencing with the L.T. positive—to prevent this lead from accidentally flashing across the H.T. There is just another point here which is of importance, and that is to see that the reaction knob is turned to the extreme left, disengaging the L.T. switch, before these connections are made; it is also essential that the loudspeaker be plugged in before making the final test.

The earth wire, which may be taken from any suitable earthing point, should be fitted into the socket corresponding with the large plug pin (see Fig. 13), whilst the aerial will go into that corresponding to the thin plug pin of the wave-change switch plug adapter.

Operating the Receiver

If the contacts on the L.T. switch have been aligned carefully, it will be found that the receiver will switch on after turning the reaction control through as little as two degrees to the right, and any further

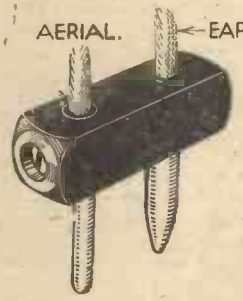


Fig. 13.—The Clix speaker plug, used as aerial-earth connector.

increase in the rotation will naturally build up reaction, the right-hand knob being the tuning control. When the wave-change switch plug is at an angle to the edge of the cabinet the receiver is on long wave, and when in line with the edges of the cabinet, the receiver is on the medium-wave band.

Whilst conducting experiments in reception, the speaker leads should be kept away from the aerial or XD valve section of the receiver, as stray high-frequency, or what is known as "feed-back," will cause a parasitic howl resulting in acute distortion. No dial has been included in the design of this set as it was not intended for foreign reception, but by careful manipulation of the tuning control and reaction it will be possible to pick up a few of the more

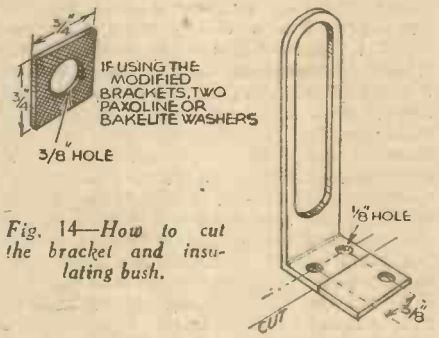


Fig. 14—How to cut the bracket and insulating bush.

powerful transmissions, including some amateurs, as previously mentioned.

With regard to the leather carrying bag, for inclusion in the cyclist's equipment, it will be seen on referring to Fig. 1 that two modifications have been made, one being the cutting away and fitting of the small leather flap, with means of fastening afforded by two press-studs.

At the bottom of the bag will be noticed a hole reinforced with a disc of leather, and this is for the two leads which go to the H.T. battery. As previously mentioned, the H.T. battery is kept in another similar bag which is fitted in the most suitable position, such as amongst his pannier bags, or even in one of these pannier bags. The H.T. leads should be taken from the H.T. battery along the crossbar, being secured by a few turns of insulation tape to the cycle framework. At the ends of these two leads two Clix type 22 sockets, one red and one black, should be connected and passed into the receiver bag, the receiver H.T. leads plugging into their respectively coloured sockets. The receiver is then placed into the bag with the knobs towards the side with the flap, and finally, the small battery for the L.T. should be placed down between the receiver and the side of the bag, connections, of course, being made before doing so.

As this receiver has been designed for 75 volts H.T. (when cycling) and 120 volts H.T. with 72-volt tapping for H.T. positive, one plug (yellow) for home use, the red and yellow plugs should be removed, and the two wires joined together and terminated in the red plug only. It must be mentioned here that with 120 volts H.T., 4½ volts grid-bias will be required, and this may be supplied by a standard 4.5-volt torch battery.

The grid bias leads may be plugged into 1½ volts, either provided in the type of H.T. battery purchased, or else they may be connected to one cell of an ordinary 4½-volt torch battery, as mentioned above, the red lead going to the centre point on the cell, and the black to the zinc casing of the cell. It will be found, however, that it is best to remove the plugs and short-circuit these two leads together, binding the naked wires with insulation tape to prevent these fouling any part of the receiver, as it has not been deemed necessary to include a back to this set. The coils of aerial and earth wire can be carried in either the rider's pocket or in the pannier bags, two lengths of 10ft. of Electron wire being advisable, the ends of these terminating in the wavechange switch plug (Fig. 13). If a good earth connection is not available when picnicking, the earth wire should be coiled and laid flat on the ground, and the aerial wire may be placed in any position, but preferably a vertical one. If a midget moving-coil speaker is to be included in the equipment, this should be protected from vibration and dust, and any injurious effects liable to be sustained when touring or camping; headphones, of course, may be simply carried in the pannier, or H.T. battery bag.

In conclusion, there is just one point regarding the fixture of the receiver bag to the cycle. It will be found possible to do the flap up over the crossbar, and if this method is adopted it is advisable to stitch two further straps and buckles, one on each corner of the flap, as this will prevent the ends turning up and the bag becoming distorted.

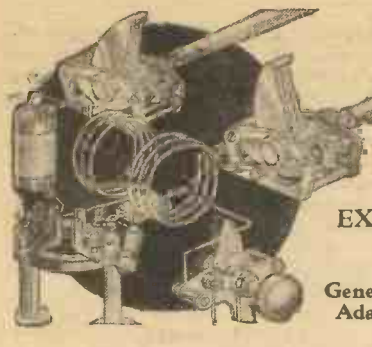
SHORT-WAVE NOTES

Moscow Tries to Dodge Interference

In view of the fact that the U.S.S.R. International talks are frequently marred by deliberate interference several channels are now adopted for these broadcasts. On most evenings Moscow may now be picked up working on 19.95 m. (15.04 mc/s), 25 m. (12 mc/s), 31.25 m. (9.6 mc/s) and 39.89 m. (7.52 mc/s). At present, the 50 m. (6 mc/s) channel has been abandoned.

A Powerful Ultra-Short-waver

For the purpose of providing the cities of New York and New Jersey (U.S.A.) with high-fidelity broadcasts free from all interference, the Radio Corporation of America proposes to erect at Alpine (N.J.) a 50-kilowatt transmitter to operate on frequencies between 41.02 and 43.98 mc/s.



Short Wave Section

EXPERIMENTAL ULTRA-SHORT-WAVE WORK

General Constructional Work and an Experimental U.S.W. Adaptor are Dealt with in this Article by A. W. Mann.

ULTRA-SHORT-WAVE technical development has been rapid, necessitating the readjustment of ideas and the evolution of a new technique. The day of the junk type short-wave receiver is past. Rather has it become a precision instrument, and the same applies to modern ultra-short-wave receiving apparatus. The beginner who is experimentally inclined, is apt to regard the construction of an ultra-short-wave receiver beyond his constructional ability. This is to some extent true, and it is advisable to gain practical experience in the construction of standard

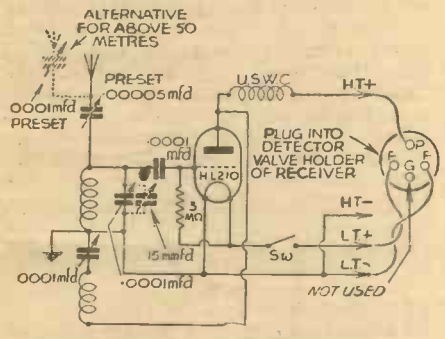


Fig. 1.—An ultra-S.W. adaptor circuit as referred to by the author.

short-wave receivers before contemplating the building of ultra-short-wave receiving apparatus.

Making a Start

It is, of course, possible to make standard receivers of the regenerative type function down to 10 metres or even five metres, and whilst a remarkable standard of efficiency can be obtained when using a well-designed standard receiver on ten metres, it is most desirable to use specially-designed apparatus for five metres, and below, in order to obtain the maximum of over-all efficiency.

To begin with it is best to concentrate on detector efficiency, for upon the efficiency of the detector stage depends in no small measure the over-all efficiency of the complete receiver, be it short or ultra-short-wave type. With this idea in mind the adaptor system has much to recommend it from the technical point of view, and in addition, enables ultra-short-wave reception to be carried out at low cost. Whilst the experienced experimenter can more or less make any straight circuit oscillate below ten metres, it is unlikely that the beginner will be able to do so, and because of this the choice of a suitable circuit may cause difficulty.

The writer has used the circuit shown in Fig. 1 as a basis of experiment, many times, and over long periods. It is simply a straightforward regenerative detector arrangement, but there are certain modifications which adapt it to ultra-short-wave requirements.

Series-aerial Capacity

For example, in many standard short-wave circuits employing series-aerial capacity coupling, a pre-set condenser of .0001 mfd. capacity is specified. This capacity, however, is much too large for ultra-short-wave purposes, and whilst tight coupling should in all instances be avoided, it is most desirable to bear this in mind, relative to ultra-short-wave receivers.

For this reason a series-aerial condenser of .00005 mfd. capacity is specified. Another item of importance from the ultra-short-wave standpoint is the H.F. choke, which generally provides efficient choking from 12 metres to 80 metres, or a little higher. Messrs. Lissen market a suitable H.F. choke in their Hi-Q series, which functions from below five metres up to 170 metres, whilst Eddystone and B.T.S. market special ultra-short-wave components of this type. Taking into consideration the low cost and efficiency of these components it is hardly worth while using the home-made type.

Tuning Capacities

In Fig. 1 the capacity specified for the aerial tuning condenser is .0001 mfd. and in parallel with it a 15mmfd. band-spreading condenser is shown.

A tuning capacity of .0001 mfd. may seem to be high, and consequently make tuning difficult. In this instance, however, the .0001 mfd. tuning condenser is used simply as a band-setter, and once the required band is located, all tuning over that band is done with the band-spreading condenser. With reference to the band-spread condenser construction, it is advisable to select a type which can be dismantled so that the distance between the fixed and moving vanes may be increased by means of small washers, in order to increase the amount of spread covered on the band-spread dial.

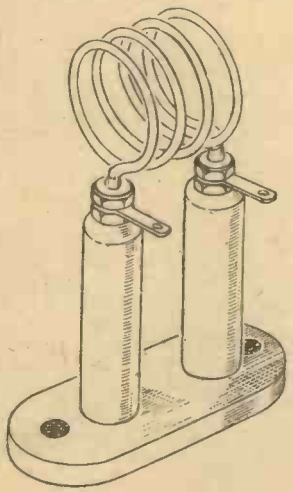


Fig. 3.—Suggestion for mounting U.S.W. coils.

There is, of course, an alternative for those who do not wish to employ band-spreading. It is to use a tuning condenser of .00005 mfd. or lower, in conjunction with a high-reduction ratio slow-motion tuning dail. This, of course, would call for modifications in coil construction.

Coils

There are two distinct types of ultra-short-wave coils from which to choose. The plug-in type with windings supported on ceramic formers, and the self-supporting type of heavy-gauge wire.

Fig. 3 shows a plug-in type coil wound on a valve base. It will be noted that the coil base is mounted on ebonite or ceramic pillars, which should be at least ¾in. to 1in. long.

Also shown is an arrangement which will enable the experimenter to employ aperiodic coupling experimentally. Note that the

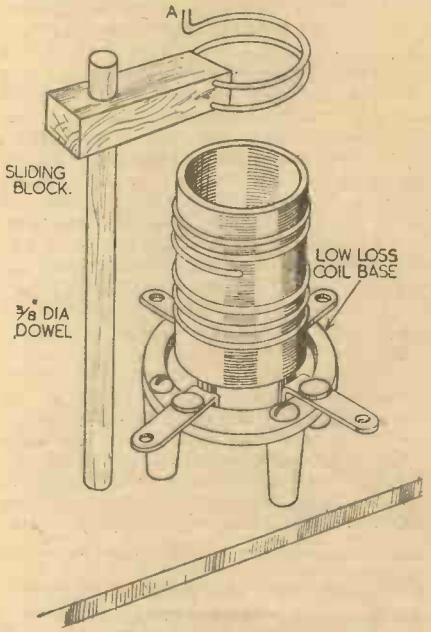


Fig. 2.—An experimental coil which provides for adjustable aerial coupling.

bottom end of the aperiodic coil is free and not coupled to the earth line.

This arrangement consists of a ⅜in. vertical wooden rod fitted with a small wooden block supporting the aperiodic coil. This block is a sliding fit to the rod, and thus allows the coupling between aperiodic coil and grid coil to be varied according to requirements.

COIL WINDING DATA

10 *Metres.*
Grid, 2½ turns. 20-gauge tinned copper wire.
Reaction, 2½ turns; same gauge.
Spaced thickness of wire.
Distance between windings, ⅛in.

5 *Metres.*
Grid, 1½ turns. 20-gauge tinned copper wire.
Reaction, 2½ turns; same gauge.
Distance between windings, 3/32nds.
Valve base former, .0001 mfd. tuning condenser and 15 mmfd. band spreader.

Self-supporting Coils
With regard to heavy-gauge self-supporting coils. The experimenter should make up a number of them. For example, using a length of ¾in. diameter dowelling as a former the following data will help:—

16-gauge tinned copper wire.
1 turn. 3 turns. 5,6 turns.
2 turns 4 turns. 8, 9, 10 turns.
Tuning capacity, .00005 mmfd.

In experimental arrangements of this nature a certain amount of cut and try coil winding is sometimes necessary. The chief consideration is to have a starting-off point which at least puts one pretty close to the mark. Without some data as a guide

(Continued overleaf)

SHORT-WAVE SECTION

(*Continued from previous page*)

it is a difficult and sometimes long-drawn-out business, especially when conditions on the bands are poor and erratic. Under the circumstances the data given in the accompanying table will prove useful, although, in some instances, it may call for slight modification.

The series of coils tabulated will enable the experimenter to cover from 5 metres or below to above 10 metres. Turns should be spaced the thickness of wire, as in the case of the coil shown in Fig. 3.

Alternatively, and by far the better way, is to use commercial coils and tuning condensers of recommended capacity.

Constructional Considerations

One of the essentials of short and ultra-short-wave construction is that of rigid mechanical construction, which is carried out in the arrangement of chassis and base-board assembly, shown in Fig. 4, in which self-supporting coils are mounted on special pillars. It will be noticed that brackets are shown by dotted lines. This bracket may appear to be larger than necessary, but in practice it is not so, and results in a rigid structure removing entirely any chance of crackles, and other noises, due to panel whip and fracture.

Although a wooden base-board and panel are here suggested, it is quite possible to use a metal panel and chassis. A standard or commercial design on such lines can be depended upon as being stable, and efficient, with inherent losses reduced to a minimum.

With an amateur experimental ultra-short-wave adaptor considerable losses may be experienced, especially during early experiments, to say nothing of the introduction of instability.

The wooden or ebonite panel and wooden chassis, the use of extension rods, either 4in. or 6in. types, together with flexible couplers to compensate for slight lining up inaccuracies, is advised.

Components

With reference to components only the best should be used. Tuning condensers must be electrically and mechanically sound, Raymart, Eddystone and B.T.S. can be strongly recommended, also Premier.

The writer has not dealt with the lay-out of components, but only general considerations. To do otherwise, would defeat the objective in mind when writing this article.

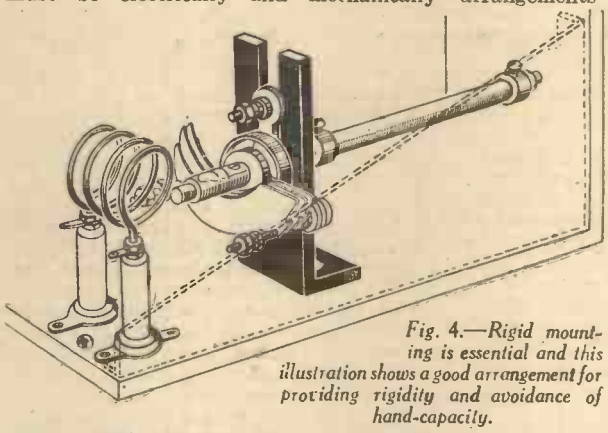


Fig. 4.—Rigid mounting is essential and this illustration shows a good arrangement for providing rigidity and avoidance of hand-capacity.

The performance of short and ultra-short-wave receiving apparatus is governed by various factors; all of which are important. Lay-out is one of them. A bad lay-out will result in low maximum performance, and may produce instability. A good lay-out is a contributory factor to successful operation and high efficiency.

The beginner is therefore advised to study the details of lay-out as applied to the detector stages of standard short-wave receivers, and experiment with different arrangements to suit ultra-short-wave requirements keeping leads short and direct. By following this procedure he will learn by practical methods what to do, and what to avoid.

The circuit shown in Fig. 1, if incorporating a .0001 mfd. tuning condenser, 15 mmfd. band-spread condenser, and an H.F. choke of the Lissen Hi-Q type, can be used for 5 metres to 170 metres reception.

To use an adaptor of this type in conjunction with an existing receiver, all that is necessary is to remove the detector valve to the adaptor valve-holder; connect the aerial and earth leads to the appropriate terminals of the adaptor and fit the adaptor plug into the receiver valveholder.

Generally, it will be found that short aerials and no earth connection provides the most satisfactory results.

AN INTERESTING AMATEUR STATION

THE accompanying illustration shows G6BW's amateur transmitting and receiving station. Captain Ben Wallich, F.R.G.S., is its owner and operator, and he has "worked" 45 States of the U.S.A. on 'phone. He also holds the W.A.C. (Worked All Continents) and W.B.E. (Worked British Empire) certificates of the R.S.G.B. This station is at present operating on 28 mc/s with 50 watts power. A novel feature of this station is the high-quality disc recording apparatus, seen on the extreme left, by which Capt. Wallich records his foreign contacts, as well as recording on discs complete programmes from commercial broadcast stations in the United States. It is believed that Capt. Wallich was the first person to record a two-way QSO with an American station using the ultra-short wavelengths.

Here is Station G6BW, showing the elaborate equipment which is employed.

LOCAL-DISTANCE SWITCHING

(*Continued from page 34*)

The Superhet

In a superhet receiver a similar scheme may be employed, the frequency-changer and I.F. filament circuits being opened for local work, and a simple tuned circuit included in the second detector stage to take the place of the secondary of the I.F. transformer generally used in this position.

Choosing the Switch

When switching tuned circuits a low-resistance contact is essential, and in a scheme of this nature the special types of ganged disc-switch will prove desirable, as these may be obtained with silver-plated or silver-gold contacts. The aerial will also have to be changed in a superhet and thus complete switching for local work would consist of transferring the aerial to a simple tuned circuit, transferring the second detector grid from the I.F. transformer to a condenser and leak joined to the new tuned circuit, and opening the filament circuits of the early valves. The arrangement is shown in Fig. 5, and it will be seen that although simple in effect, some care may be needed to place the new coil in a position where it will not affect efficiency when the set is used as a superhet, and also to prevent instability due to the extra lengths of lead which may be needed to run to the various switch points. Unfortunately, no rules can be given for wiring as each receiver will have to be considered on its own, and peculiarities in the layout allowed for. The details given should, however, enable any listener to modify his receiver so that it may give maximum performance in either condition, and it is to be hoped that the improved quality on the local stations will well repay the extra trouble involved in making the change over.

Practical Television

RECEIVING "SOUND"

A Simple 1-Valve Receiver for Television Sound Reception and Amateur Transmissions on 5 Metres.

VERY few components are required to construct this simple ultra-high-frequency receiver and, in fact, it can be made from odd components to be found in almost any enthusiasts' workshop. R, the grid-leak, should be about ½ meg., the grid condenser should be .0003 mfd., and must be a mica type. C2 should also

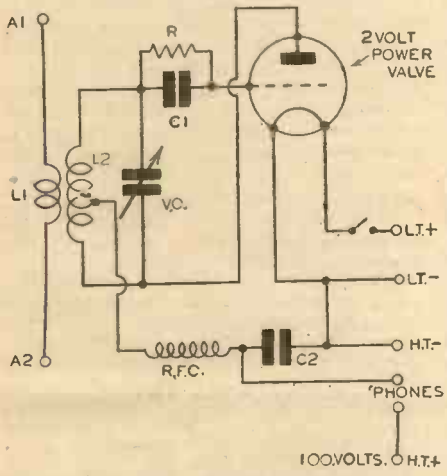


Fig. 1.—Theoretical circuit of the "Sound" 1-valver.

be of the mica variety with a capacity of .0005 mfd.

The radio-frequency choke (R.F.C.) may be home constructed in the following manner. Obtain a paxolin or ebonite former about 2½ins. in length and wind on 30 turns of fine cotton-covered wire about No. 36 gauge. The wire can be terminated at each end of the former with a blob of sealing-wax and the ends bound round a short length of 16-gauge tinned-copper wire ready for wiring direct into the circuit.

A reliable manufactured radio-frequency choke may be used if desired, but care should be taken to make sure that it is designed to work on these very short wavelengths.

The tuning condenser, VC, should have a capacity of about .0001 mfd. and should preferably be of good manufacture, having easy movement and a pigtail connection to the moving vanes. A slow-motion dial is essential if the best results are to be obtained.

The other essentials for the complete receiver are a wooden baseboard and a metal panel about 6ins. by 6ins., a push-pull or "click action" switch for cutting the L.T. supply, a 2-volt power valve (with full emission !), a 4-pin ceramic valveholder, a 2-volt accumulator, and 90 or 100-volt H.T. battery. A pair of headphones completes the requirements.

Building the Set

In constructing the receiver the grid-leak and condenser, R and C1, should be wired direct on to the valveholder and all leads must be kept as short as possible. It is recommended that wiring should be carried out with 14-gauge tinned-copper wire. The lead from the grid-leak and condenser to the tuning condenser must also be as short as possible. All the earth connections should be taken direct to L.T.— and the earth connection to the tuning condenser should be connected to the moving vanes terminal. This terminal should also be connected to the metal panel at some point. All forms of "fancy wiring" should be avoided and leads should be soldered and taken direct to their various points.

The coils L1 and L2 may be constructed of 12-gauge tinned copper wire and should be about 1in. in diameter and closely spaced. A convenient former for winding these coils is a 1in. test tube. L2 requires about 6 turns for reception of the television sound programmes, and about 4 turns for reception of amateur transmissions on 5 metres. The coil should be mounted direct on the tuning condenser, and owing to the stiff wire used it should be perfectly rigid in this position.

Care should be taken before sliding the coils off the former to see that enough length has been left at each end for connection to the tuning condenser.

L1 should be 3 turns for the television sound and 2 turns for 5-metre reception. This coil should be coupled fairly close to L2 and may be mounted on some small pillar insulators fixed to the baseboard, or any convenient form of mounting which appeals to the constructor.

The connection shown in the circuit diagram from the centre of L2 to the radio frequency choke may be attached to the coil by means of a small clip and a short flexible lead.

The above details for coils are only approximate and some experimenting may be necessary for exact sizes as conditions alter in individual receivers, but the sizes given are a good guide to commence with.

The Aerial

A doublet type aerial is recommended for best results with this particular receiver, and details are given in Fig. 2. The two top lengths of 4ft. 6ins. should preferably be made of 12-gauge tinned-copper wire, and the gap between the two top pieces, in the centre, should be 6ins. For the twisted flex downlead good quality flex should be used to avoid trouble from moisture. The two ends of the doublet are connected to terminals A1 and A2 on the receiver, these being the ends of L1.

Where room permits, some experiment may prove worth while for the best direction of the aerial in relation to the signals desired. The flex downlead may be any length, but naturally it should be kept as short as circumstances will permit. The whole aerial should be fixed high, and in a clear place away from trees and buildings, if possible.

Where it is not convenient to fit this type of aerial a single wire may be used and coupled through a midget variable condenser direct to L2. In this case L1 will not be required.

No difficulty should be experienced in "getting things going" if care has been exercised in the construction of the receiver, but a few general remarks may help to give the constructor an idea as to what should happen when the set is switched on.

As the receiver is a "super-regenerative" a fairly loud hiss should be heard in the 'phones, and this will continue until a carrier or modulated signal is tuned in. When tuning a signal the hiss will disappear except in the case of weak signals, when some hiss may still be audible. The television sound should be received quite well in most cases up to 30 miles radius of Alexandra Palace, and using this circuit, signals from A. P. have been received some 50 miles south of the transmitter. On 5 metres amateur transmitters should be heard on telephony, and the best time to listen for them is on Sunday mornings.

Ample volume for normal use should be obtained from this set, but if more volume is desired a stage of choke-coupled amplification with a variable audio-output control can quite easily be added to the existing arrangement.

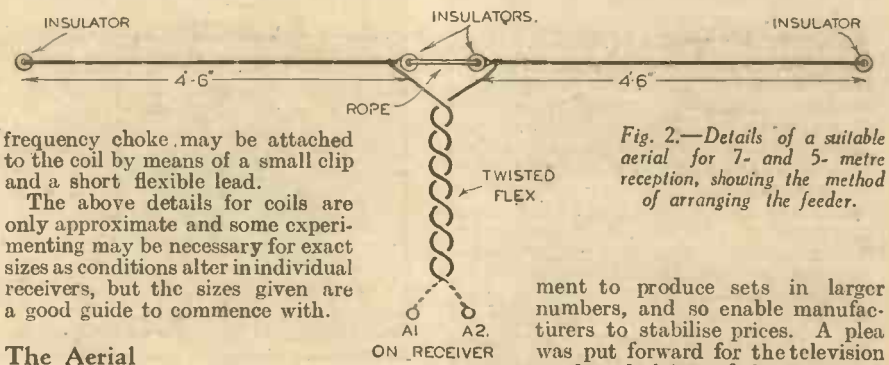


Fig. 2.—Details of a suitable aerial for 7- and 5- metre reception, showing the method of arranging the feeder.

TELEVISION EXPANSION

IT has now been stated officially that 8 per cent. of the net licence revenue will, in future, pass to the B.B.C. for television. This welcome grant will enable all the major developments which have been planned to be expedited, and in Parliament recently the P.M.G. was able to reply to those members who showed interest in fostering the growth of this new British industry. With Sunday programmes starting next month, and an extension of the evening viewing times, there would be encouragement to produce sets in larger numbers, and so enable manufacturers to stabilise prices. A plea was put forward for the television needs and claims of the provinces, but the Postmaster-General was unable to give any definite information on this point. He stated that further research work was necessary before anything approaching a nation-wide service could be undertaken. In addition, it was not yet possible to decide which was the better plan; either a system of local stations or a network of cables for programme signal distribution. In any case, expert advice and help was being enlisted to solve this problem, and no time was being lost in an effort to extend the amenities of the present service beyond London and the Home Counties.

TELEVIEWS

Still Problematical

WHILE technical developments in the field of television are still going ahead in the United States of America, financial and commercial reasons appear to be very effectively holding up its public exploitation. This is very largely due to the fact that any service which materialises in that country must be linked up with its advertising value. The sponsors want some form of definite proof that if they pay for visual advertising via ultra-short-waves the return will be on similar lines to that now existing for aural broadcasting. The Federal Radio Commission has not hampered development apart from placing a strict watch on the wavebands that are to be utilised for military and other services. To study the possibilities of the new advertising medium several demonstrations have been given where commercial products have had their "virtues" extolled in sight and sound. Another difficulty is the nature of the country, coupled with the marked screening effects by the tall buildings in the large cities. Perhaps some decision will be arrived at after the World's Fair to be featured in New York next year, for it is understood that television will be a prominent exhibit showing up-to-the-minute improvements coupled with the state of the art in different countries. Although two new mobile television vans have been built by the R.C.A. and delivered to the N.B.C. they have not yet been seen in action, which is exactly opposite to the immense amount of work carried out by the B.B.C. outside broadcast vans. The American public admits quite frankly that it is getting quite tired of waiting for television to leave the laboratory, and casts envious eyes on this country, and the programme expansion promised during the course of 1938.

A Sign of the Times

AT a boys' school in the Southend district, television lessons have now been added to the curriculum. Depending on the type of programme radiated, the boys are shown the results in graded groups. Even with only a single hour's afternoon transmission for the boys to observe there are many items of educational value to the young alert mind. The principal is anxious to present education in as palatable a form as possible, and where juniors are concerned there is no doubt that they will come to regard lessons and schooling as something very exciting when undertaken in this way. Recitals, plays, features of various crafts, geographical talks, etc., are well suited for the senior boys and although there are a number of technical colleges who now use television sets regularly for educational purposes in connection with their radio and television classes, it is felt that this is the first private school in England that has shown such initiative to install a receiver in this way. Incidentally, at the same school are two full-size talkie projectors as well as a radio receiving set in every classroom, so that it is very modern in its outlook.

In Their Stride

WITH the advent of brighter days the outside broadcast section of the B.B.C. television staff are just getting into their stride and have already given viewers a wholesome taste of things to come. Sports, cricket matches, boat races, rugger matches, the Trooping of the Colour, boxing matches, and so on are but a few of the items which the lucky possessors of television receiving sets will see on their screens. The arrangements for these broadcasts, however, were not made without encountering very considerable difficulties, of which two are outstanding. The first, a technical one, concerns the positioning of the cameras in order to avoid spoiling the views of interested spectators, coupled with the directional ultra-short-wave link which is beamed on to the Alexandra Palace receiving aerial at the top of the lattice mast. This method of transferring the generated picture signals from their source of camera generation is, at the moment, very prone to picking up interference so that the ultimate signal-to-mush ratio is far below the standard obtained with straight studio working. It is an open secret that the engineers are giving this matter their earnest attention so as to improve the standard of outside broadcasts, but in spite of this the results are good and give a viewing thrill which compensates for any defects. The second difficulty is associated with the opposition given by local authorities because of the feeling that a vision broadcast is going to reduce the number of spectators with a resulting loss of income. This is an unfortunate attitude, to say the least, and reveals a complete misunderstanding of public psychology. Surely anyone able to be an actual eye-witness of any event would always prefer to be on the spot in preference to watching a television picture. The "electric" atmosphere of mass entertainment will never be altered and the television broadcast is to meet the needs of those who for one reason or another cannot be present at the event itself. No doubt with the passage of time the attitude of the authorities will become reasonable and they will realise that the interests of the public have to be served and a more co-operative spirit will win in the end.

Provincial Interest

THE other day a lecture on television was given at Bristol to the Western branch of the Institution of Mechanical Engineers. After a well-planned talk on the subject, coupled with lantern slide illustrations and demonstrations on modern equipment, the lecturer agreed to answer any questions. The number and type of inquiry made left no doubt as to the keenness of provincial audiences to learn something of what television really means and how it can be applied to matters other than plain entertainment. It has been most marked for some time now that in every district outside the normal range of the B.B.C. high-definition signals there has been an enthusiasm for television which should, when satisfied through the medium of further stations, augur well for the industry which is working hard to expand its market. Technically, quite a lot can be done to educate these future potential users of television equipment into the way the equipment operates, and to that end certain types of lecture apparatus have been developed by the various companies for this purpose alone. In one case cathode-ray tube operation can be studied both qualitatively and quantitatively by operating a series of switches and controls located at the base of the instrument. Starting from a large unfocused spot about 5in. in diameter, scanning in the line and frame directions, variation of focus, line definition, frame speed and brilliance can all be undertaken in an ingenious manner. In another form of up-to-date demonstrative equipment it is possible to ascertain quite accurately the optimum focusing condition for a cathode-ray tube operated by magnetic means with the minimum number of watts dissipation. This is effected by means of an experimental external coil having a continuously variable air gap. Again, the importance of secondary emission from the tube's fluorescent screens may be shown easily with quite simple apparatus, while the effect of negative ions on the composition of the chemical powder compounds used for the screen can be investigated with the same equipment. In one piece of apparatus the liberation of the ions is carried out by allowing water vapour or gas to enter the tube and at the same time the effects of screen destruction or "burning" as a result of the intense electron bombardment may also be observed.

A television set has been installed at Leigh Hall College, Westcliff, Essex, to assist boys in their education. This is probably the first school in the country to have a television set.

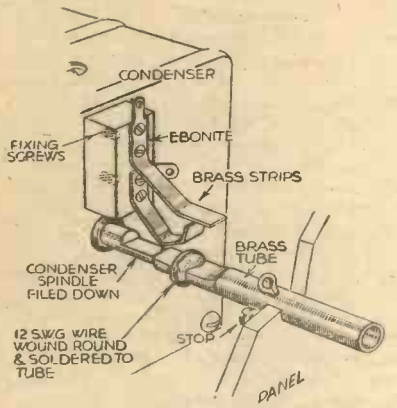
A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA — **READERS WRINKLES** — THE HALF-GUINEA PAGE

A Dual-purpose Switch

THE accompanying diagram shows a combined tuning control and wave-change switch which I made from "junk" parts.

The condenser spindle is filed flat for about 1in. and a length of brass tube (about 2in.) is then hammered to fit the filed spindle, as shown. At a distance of ¼in. from the end of the tube a piece of 12 gauge wire is wound round and soldered, and a split pin is passed through the tube to act as a stop.



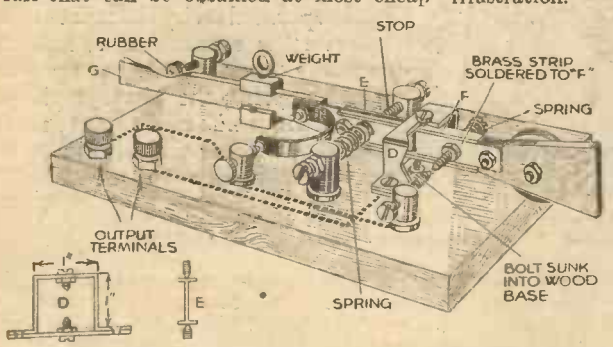
A combined tuning control and wave-change switch.

Two brass strips are then bent, as shown, and bolted to a small ebonite block which, in turn, is bolted to the condenser frame.

Wave-change is secured by pushing in for medium and pulling out for long, the knob being turned as usual for tuning purposes.—ERIC ROBERTS (Holyhead).

A Cheap Morse Key

A VERY easily constructed morse-key can be made out of the lengths of brass rail that can be obtained at most cheap stores. This rail is of H cross-section, and is very strong and easily worked. A small block of wood is used for the base, and valence curtain-rail brackets, bent to shape, make the other parts. The contacts are from an old shocking coil, and the other stops are terminals with threaded bolts and lock nuts. The part E swings on the sharpened points of two small bolts which fit into holes in the top and bottom of E. The vibrator spring consists of the contact arm off an old rheostat. The "dot" spring is a battery contact strip, and the weight consists of a curtain rail stop which just fits the straightened out bracket G. The paddle handle is a piece of cigar-box shaped to size, while the "dash" arm consists of a brass spring screwed to E and soldered to F. The latter part is held in place by the bolt and spring G. The damper post is a terminal with a rod through it, the rubber top holder of a pencil being soldered to the end, as shown in the sketch.—G. H. WHALEN (Liverpool).



This handy morse-key can be made with odds and ends.

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, Strand, 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.

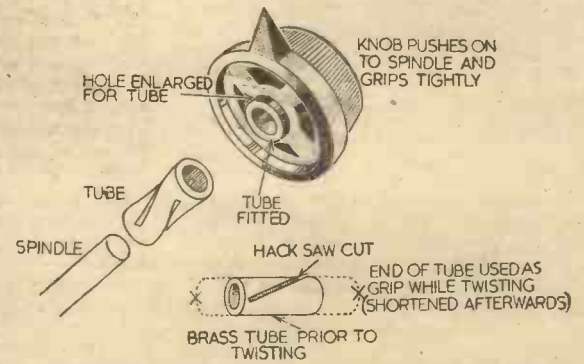
SPECIAL NOTICE

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

A Knob Fixing Device

THE condenser control knob of my receiver was secured to its spindle by a grub screw placed in such a way that a very short screwdriver was necessary to remove it for overhauling the set. This tool was repeatedly getting mislaid, so I devised the fixing device shown in the illustration.

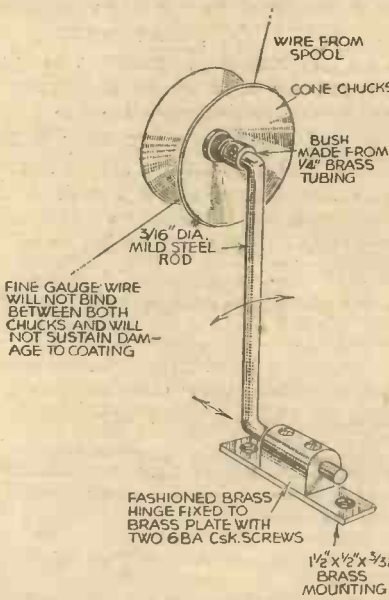
A piece of brass tube of a diameter large enough to fit into the knob and over the spindle is required, three saw cuts being made across it, as shown. Grip the ends in a vice and grips, or even two pairs of pliers, and twist the tube until the saw-cuts meet in the centre. The tube is then inserted to fit tightly into the knob, which then pushes on to the spindle, and grips tight enough for control purposes.—F. BRIDGES (Hendon).



A method of fixing control knobs without grub screws.

A Coil-winding Guide

THE accompanying sketch shows a neat and easily-made wire guide for coil winders. I used two old cone-chucks, and the original bushing supplied many years ago with these chucks, and by making two more brass bushes for retaining the "guide" on the mild steel rod, and shaping the hinge assembly out of a length of brass strip, and ⅛in. brass rod, I made this an adjustable fitment in order that it may be secured to either metal or woodwork without much trouble. I have had a similar attachment on my coil winder for some considerable time, and can vouch for its usefulness.—R. W. HENSON (Blackburn).



An easily made guide for coil winding.

F. J. CAMM'S

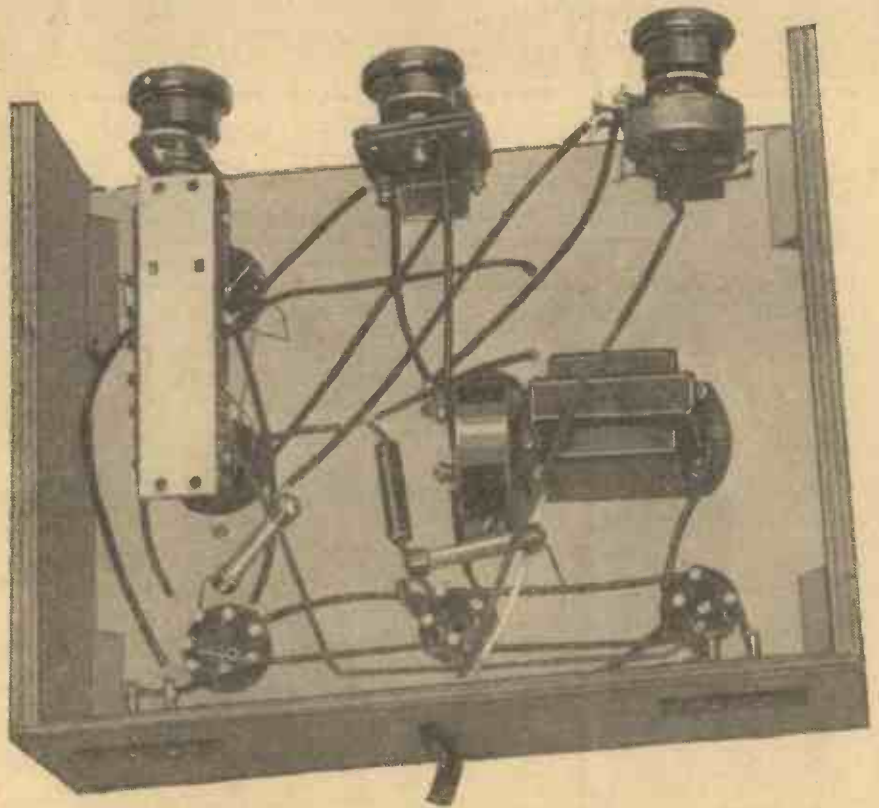
A Simple Three-valve Two-ban which is Easy to Build a

I HAVE remarked on other occasions that we are likely to forget as our own knowledge of a subject increases that a new generation of enthusiasts enters our ranks every year, and these enthusiasts lack the knowledge which we possess. It is our duty to encourage them, and to help them along to our standard of knowledge of the subject. For this reason it will be remembered that I instituted some years ago a series of sets which could be described as progressive, in that they started from an elementary receiver, whilst later articles indicated how they could be adapted and converted to include refinements such as A.V.C., tone control, etc. This instructional series was augmented by a series of blueprints of sets specially designed for the beginner. I need mention only a few. There was The Leader, The Prefect, The Monitor, and The Tutor. Many thousands of these have been built and they have all given extreme satisfaction.

I have not forgotten the enthusiast who has been attracted to the pastime in 1938. I have produced especially for him the very simple design of receiver which I have christened the "Sprite." There is nothing in the name, but it will enable you to identify it should you wish to write to me concerning it. As will be seen it is not a complicated receiver, and I have planned it so that the results will be immediate. For that reason I have cut out complications, and in the form in which you see it, it represents a basic circuit which will give you satisfactory results immediately you switch on. My guarantee is such that if it does not do so you will first of all know that you have gone wrong somewhere, and, secondly, that you may avail yourself of my advice and service if you fail to get it working.

It is a simple three-valver for the medium and long-wave broadcast bands only. The short waves can be received by means of the short-wave converter described elsewhere in this issue. I am not of the opinion that beginners require to listen in on short waves. That follows when they have become more experienced.

In order further to simplify the construction and adjustment all refinements have been eliminated and the circuit represents the very minimum from which you can expect to obtain good all-round results. There are separate battery leads for obtaining maximum performance in each stage; there is a tetrode in the output stage for economy and power, whilst the physical proportions of the set are reduced by the use of the metallised chassis system of construction. The chassis, being of metallised wood, is easily operated on by the amateur. The "Sprite" is economical to build and certainly economical in operation. The blueprint, the photographs, and the drawings will guide you to success. I should, however, like to offer some words of advice to the beginner. First, I advise them to make good soldered joints, and implicitly to follow the blueprint. You will not improve upon the design by altering the position of the wires; they are placed as shown for a particular reason. Nor should you take liberties with the design by varying the specification. If you are able to do that you are not a beginner!



This underside view shows the simple wiring which is needed for the receiver.

"SPRITE" THREE

nd Receiver for the Beginner, id Economical to Maintain

The next thing is to study the blueprint and the circuit, and endeavour to see how the theoretical diagram has been converted into a practical receiver. This will help you to read a theoretical circuit. Do not endeavour to rush the construction. After each wire has been inserted mark it off on the blueprint. You will then be certain that every wire has been correctly fixed. I have examined many receivers where one small missing wire has provided the answer to that awful silence which disappoints so many beginners when they switch on. Use the blueprint as a template. Lay it over the chassis and prick through to mark the position of the screw holes. You will thus ensure that the lengths of the wires are the same as in the original. This is important.

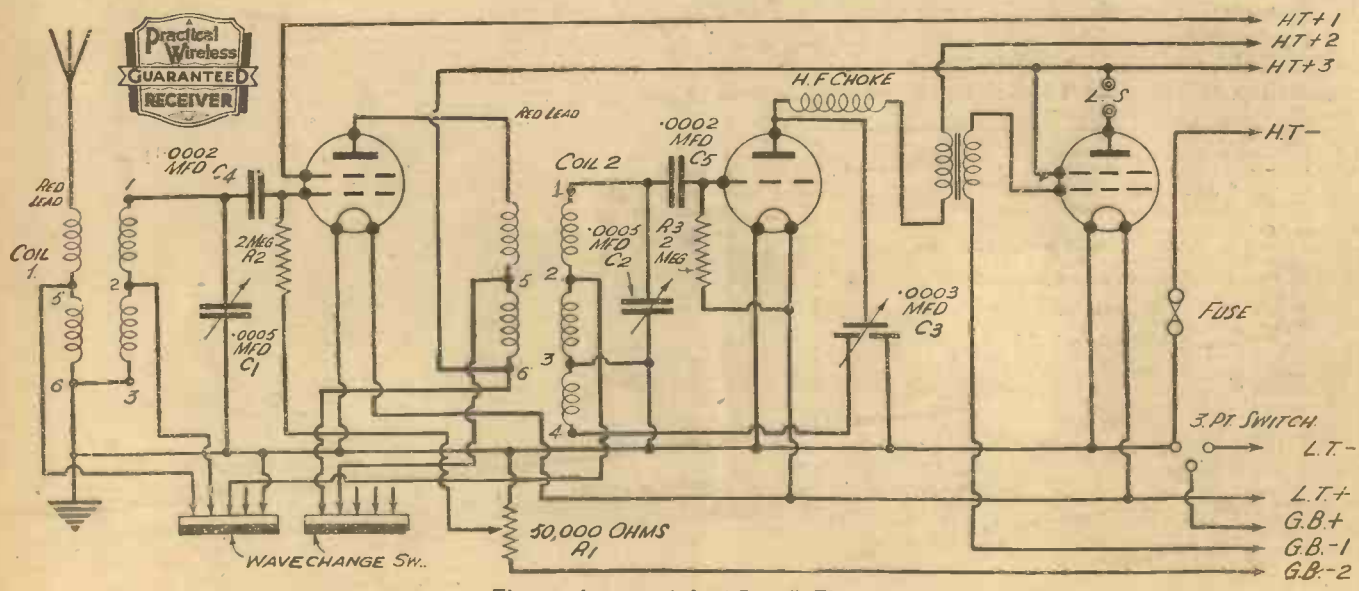
Use the valves specified, and follow the component list accurately when making your purchases.

This view shows how the main battery leads are attached and also discloses the underside components and wiring.

Note the clean and effective layout which is adopted in this new beginner's receiver.

The Circuit

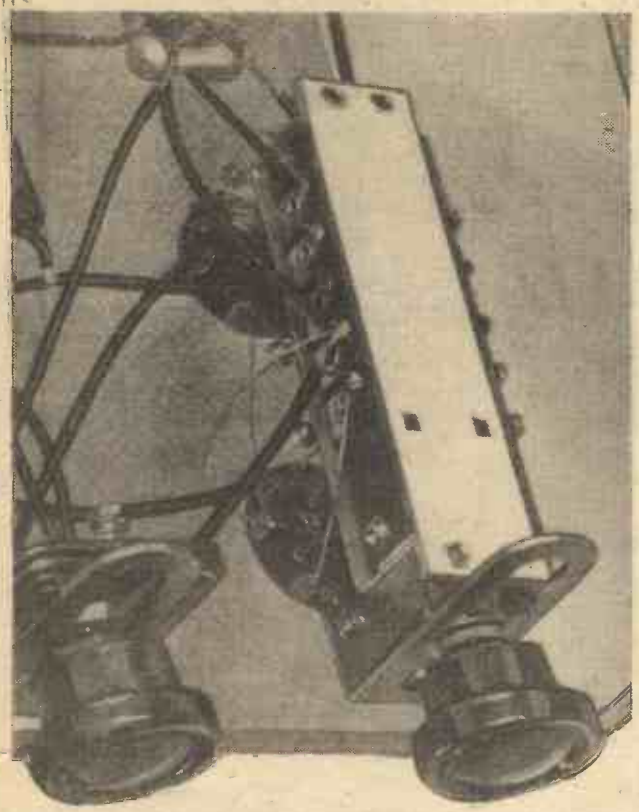
As usual with the receivers published in these pages, I give a detailed explanation of the circuit, followed by a detailed description of the constructional work, and thus the beginner who has never before made a receiver can start right away and not only make the set but understand exactly what the various parts do and how they work. Those who can read a circuit diagram will be able to see from the circuit which is given on this page that the three valves are arranged in the standard S.G., detector and output arrangement, the



Theoretical circuit of the "Sprite" Three.

first stage being occupied by a variable-mu H.F. pentode, the second stage by a detector triode, and the output stage by a modern tetrode. Two H.F. transformers are employed for tuning and in each case the primary winding is switched in addition to the secondary winding, thus giving maximum results on both wavebands. A special type of switch is employed for the waveband switching as the primary of the second transformer is in the H.T. circuit and thus the contacts for switching this must be insulated to avoid short-circuiting the H.T. supply. A special Bulgin switch enables this to be carried out and the photographic illustrations show the switch in position and also indicate the very simple wiring to it.

Ordinary transformer coupling is employed in the L.F. circuit and, as already mentioned, separate H.T. leads are employed for the various circuits so that each part may be individually adjusted to give the best performance. There are no other details which need be explained and, of course, the usual simplification of controls has been carried out by using a combined volume control and 3-pt. on-off switch, and the additional controls are for reaction, wave-change and tuning.



This illustration shows the method of mounting the switch and some of the wiring to it. The clearance holes for the coils may also be seen.

Constructional Work

Before mounting any components the chassis should be drilled, three holes 1¼in. in diameter and two 1in. in diameter being required. The larger holes are for the tuning coils and the H.F. valve, whilst the two smaller ones are for the detector and output valve-holders. Make a careful note of the position of the rear fixing bolt for the gang condenser and drill a hole at that point to accommodate a bolt which will be used for earthing purposes. This is an important connection as it forms the return lead for the gang condenser, the metal chassis and the various earth points underneath the chassis. Drill the remaining small holes through which leads pass from the gang condenser, making these ⅛in. in diameter. Next turn over the chassis and screw the three component-mounting brackets in position and screw down the H.F. choke and the L.F. transformer. Now drill the rear runner of the chassis to accommodate the two socket strips and make the ½in. hole in the centre of the runner through which the battery cable may pass. You may also bring the G.B. leads through this hole with the remaining battery leads, or can drill holes in the top of the chassis and place the G.B. battery on top of the chassis on the right—in which position there is ample room for it.

Screw the two socket strips in position and then attach the valve-holders. Remove the screens from the coils and carefully detach the coil from the base by pulling the connecting lugs through the slots.

THE "SPRITE" S.W. CONVERTER

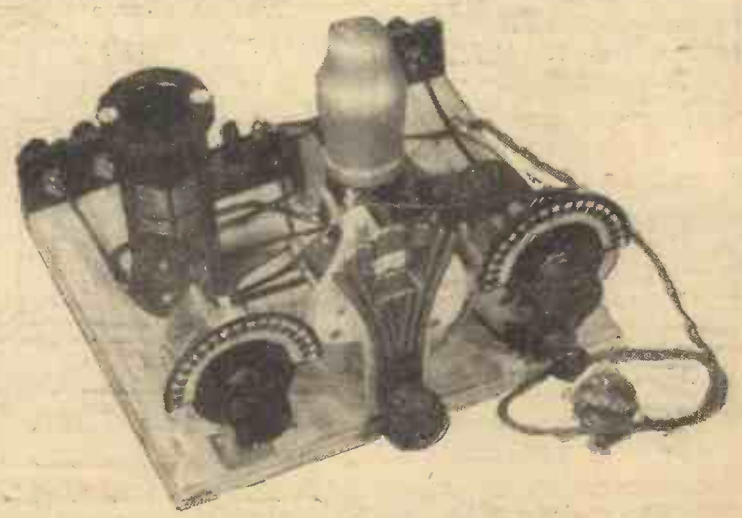
A Useful Unit to Enable the "Sprite" Three to be Used for Short-wave Reception.

IT is already well known by our readers that an ordinary broadcast receiver employing an H.F. stage may be adapted for short-wave reception by using a unit connected between the aerial and the aerial terminal. Such a unit is generally referred to as a short-wave converter, and the accompanying illustration shows such a unit produced by New Times Sales which is known as a "3 in 1" unit. It is designed for use as an adapter (for simple detector receivers), a converter or a single-valve receiver, and a complete kit may be obtained for 25s., inclusive of all coils and valve. The parts are assembled on a simple base-board 8ins. by 7ins., and the three condensers are mounted on brackets. A band-spread tuning arrangement is employed, with a series aerial condenser and a standard reaction condenser. There are very few components to be wired up, and the wiring plan, which is given on page 48, will enable the unit to be constructed without difficulty.

(Continued on page 48)

LIST OF COMPONENTS FOR F. J. CAMM'S "SPRITE" THREE.

Two Screened Coils, types C6 and C7, Bulgin, 10s.
One 2-gang Bar Type Condenser .0005 mfd., Polar, 12s.
One Micro-Horizontal Dial, Polar, 9s. 6d.
Three chassis-type Valveholders: One 4-pin, one 5-pin, one 7-pin, Clix, 2s. 5d.
Two Socketstrips (A.E., L.S.), Clix, 1s.
One Microfuse and Holder, 1s. 6d.
Three Component-mounting Brackets, B.T.S., 1s.
One Switch, type S.121, Bulgin, 6s. 6d.
One Differential Reaction Condenser .0003-mfd., Polar, 3s.
One 50,000-ohm Potentiometer and 3pt. Switch, Erie, 5s.
Two 2-megohm Grid Leaks, Dubilier, 2s.
Two Tubular .0002-mfd. (type 300) Fixed Condensers, T.C.C., 2s.
One H.F. Choke, B.T.S., 3s.
One L.F. Transformer, ratio 4 to 1, B.T.S., 5s. 6d.
One Metallised Chassis 10in. by 8in. with 3-in. runners, Peto-Scott, 4s.
Wire, Flex and Screws,
Three Valves: 210 VPT (Metallised), 210 DET (Metallised), 220 OT, Cossor.
One 6-way Battery Cord, 2s.
One 120-volt H.T Battery
One 2-volt L.T. Accumulator
One 9-volt G.B. Battery.
One W.B. Stentorian Speaker (Type No. 38J).



The complete converter unit.

PETO-SCOTT

Don't be misled . . . Remember every order is backed by Peto-Scott GUARANTEE of SATISFACTION . . . ORDER NOW WITH COMPLETE CONFIDENCE.

SUPPLIERS of BETTER RADIO SINCE 1919

S.G.3 All-Wave BATTERY CHASSIS

Assembled, Tested
WITH ALL VALVES
BARGAIN 79/6
5/- DOWN

CASH OR C.O.D. CARRIAGE PAID. OR Dep. 5/- and 11 monthly payments of 7/6.

4 WAVEBANDS : 14-31, 28-82, 200-550, 900-1,200 metres. Slow-motion drive S-1 and 100-1 ; Low capacity switch. Airplane dial (stations and wavelengths) ; 12 months' guarantee. BRIEF SPECIFICATION : Provides reception from all parts of the world. Variable Selectivity. Stove enamelled steel chassis. Screened coils. Low H.T. Consumption. Each chassis supplied complete with Screen Grid, Detector and Pentode output valves. Fully tested on all wave-bands before despatch.

THIRD OFF LIST PRICES 1938 FAMOUS NAME SETS

Buy now whilst the opportunity lasts.

Brand new 1938 All-wave Receivers, supplied in sealed manufacturers' cartons. Makers' guarantee.

DECCA 1938 Model 33:

3-valve All-Wave Battery Receiver. Three tuned circuits covering 19-49, 200-550 and 1,000-2,000 metres. High flux density permanent-magnet moving-coil speaker. Station-named and degree-calibrated dial. Real walnut cabinet, inlaid with ebony. Provision for pick-up and external speaker. *Less Batteries.*

List Price 7½ G N S OUR PRICE **£5 : 19 : 6**

or 5/- deposit and 18 monthly payments of 7/4.

BRUNSWICK 1938 Model BPU/1

6-valve All-Wave Transportable Receiver. Six-valve superhet for A.C. or D.C. Mains 100-250 volts (A.C. 40-60 cycles). Six tuned circuits. Three colour, individually illuminated. All-world-wavebands, 19-49, 200-550 and 1,000-2,000 metres. Station-named dial. Internal frame aerial incorporated with provision for external aerial if desired. Automatic volume control. Brunswick High Fidelity Dynamic Speaker.

List Price £13 : 2 : 6 OUR PRICE 8 G N S or **8/6 DOWN**

Balance in 18 monthly payments of 11/-.

DECCA 1938 Model 99:

6-valve All-Wave A.C. Superhet. 12 to 2,000 metres. Seven tuned circuits. A.V.C. Beautiful hand-polished cabinet. Decca commonsense tuning. . . . No complicated trouble-causing mechanism. Bold station-named dial. Spread-tuning, 4 separate easy-to-read wave-bands. Oversize elliptical cone dynamic speaker. Provision for external speaker and gramophone pick-up.

List Price £14 : 3 : 6 OUR PRICE 8 1G 2N S or **10/- DOWN**

Balance in 18 monthly payments of 12/3.

Illustrations of above and further FAMOUS NAME 1938 Sets at ⅓ off list price, available on request. SEND NOW FOR COMPLETE LISTS.

PETO-SCOTT TRICKLE CHARGER 10/-
Charge your L.T. for ½d. a week.
CASH OFFER. Guaranteed.

Nothing to wear out or go wrong. Never be "left without your Radio" because your L.T.'s run down. Will charge your 2-volt accumulator at ½ amp. while you sleep. 12 months' guarantee. 7 days' approval against cash. A.C. Mains, 200/240 volts ; 40/100 cycles. Overall dimensions : 3¾in. high, 2¾in. diam.

SPRITE THREE PILOT AUTHOR KIT

KIT "A" CASH OR C.O.D. CARRIAGE PAID £3:12:6 or 7/- DOWN

Balance in 11 monthly payments of 6/9

COMPRISING complete kit of Author's first specified parts, including Peto-Scott ready drilled metallised chassis, Coils, B.T.S. Transformer and Choke, Polar Condenser and scale, wire, screws, flex, etc., but less valves, batteries, speaker and cabinet.

KIT "B." As Kit "A" but including set of 3 specified valves only. CASH OR C.O.D. CARRIAGE PAID. £4 : 19 : 3 or 9/- Deposit. Balance in 11 monthly payments of 9/3.

KIT-BITS *Any item sold separately. Orders value over 10/- sent POST CHARGES paid.*

		s.	d.
1	Peto-Scott ready drilled metallised chassis exact to specification	4	0
1	B.T.S. All-Wave Choke	3	0
1	B.T.S. L.F. transformer, ratio 4 : 1	5	6
1	Polar 2-gang Bar Type Condenser, .0005 mfd.	12	0
1	Polar Micro-Horizontal dial	9	6
1	W.B. 38J Speaker	32	6

or 2/6 Deposit and 11 monthly payments of 3/-.

SPECIAL PURCHASE of WHOLESALER'S STOCK
HALF USUAL COST

A wonderful opportunity to purchase a shop-soiled only Rola, R & A and Magnavox Permanent Magnet Moving Coil speaker at 50% off list value. 8" Cone for Power or Pentode Output. **Our Special Price,** *Cash or C.O.D.* **17/6** *or* 2/6 *Deposit and 7 monthly payments of* 2/6.

2/6 DOWN

PETO - SCOTT 25/- MICROPHONE

Transverse Current Type
"BETTER THAN '———' £16 MODEL"

★ *Read below what the Editor of a famous Radio Journal says.*

"My first tests were most satisfactory. 'ALL the reports mentioned the quality was extremely good, rather BETTER THAN THE PREVIOUS MICROPHONE, *which originally* COST £16. *This is rather startling, for the* Peto-Scott *microphone costs only* 25 -.

TABLE MODEL. Complete with Transformer and G.B. Battery. *Cash or C.O.D.,* 25/- *or* 2/6 *Deposit and* 11 *monthly payments of* 2/6.

FLOOR STAND MODEL : As illustrated, with Transformer and heavily chromium plated floor stand extending to 6'. *Cash or C.O.D.* £2 2 0 *or* 2/6 *Deposit and* 11 *monthly payments of* 4/-.

2/6 DOWN

P.A. AMPLIFIER

6-7 Watts High Fidelity
General Purpose Amplifier to earn you extra money!

MODEL A.C. 67.—4 valves : Triode, Resistance Transformer-coupled to 2 triple Grid Power Amplifier Valves, in Push-Pull. Full Wave Rectifier. Special precautions have been taken in design to avoid parasitic oscillation in output stage. Fixed and pleasing tone balance. Pressed Steel chassis. Tapped, and Screened Mains Transformer. Electrolytic condensers. Volume Control. Mains consumption approx. 60 watts. With microphone, speech easily heard at over 500 feet. Tapped for A.C. Mains 200-250 volts. 40/100 cycles. Output 6-7 watts undistorted. Complete with Valves. Ready to connect to microphone or pick-up. Cash or C.O.D. **£4 : 10 : 0**

Or 7/6 down and 11 monthly payments of 8/6.

BUY NOW FOR THE SUMMER MONTHS.

LITTLE PRINCESS S.G.IV. PORTABLE.

25% off LIST PRICE. *25 STATIONS GUARANTEED.*

The set of the season for both indoor and outdoor listening. Station-calibrated dial. Attractive dark blue leatherette covered case. 'Phone jack for cutting out speaker, enabling you to listen in bed without disturbing the household.

Latest 4-Valve S.G. Circuit, 4 British Valves, Ball-bearing turntable. 7 in. P.M. Moving-coil Speaker. Self-contained aerial. Only 6½m/a. H.T. Consumption. Range 200-550, 1,000-2,000 metres. Size : 9¾ ins. high ; 11¾ ins. wide ; 7½ ins. back to front. Complete, with Oldham L.T., H.T. and G.B. Batteries, ready to play. **LIST PRICE £8 : 8 : 0.** **£6:6:0**

Or 7/6 down and 15 monthly payments of 9/-.

7/6 DOWN

S.T. 900 5-valve Battery ALL-WAVE Receiver

KIT "A.10" *Cash or C.O.D.* **£4 : 5 : 0**

Pilot Author Kit of Components, exactly as FIRST specified and used by Mr. J. Scott-Taggart, with Mr. J. SCOTT-TAGGART'S S.T. 500 AUTO-DIAL CARD, coils, Konectakit, wander plugs, accumulator connectors, extractor kit but less valves, cabinet and speaker. Complete with building instructions. *Cash Price, Carriage Paid* £4:5:0, *or* 8/6 *down and* 11 *monthly payments of* 8/-.

8/6 DOWN

S.T.900. 5 specified valves, £1:10:3, or 3/6 down and 11 monthly payments of 2/9.

FINISHED INSTRUMENT CONSOLETTE MODEL

Exactly to Specification. Celluloid dial. With valves and 10 B.T.S. Inductors, Peto-Scott P.M. Speaker less batteries. CASH PRICE, Carr. Paid, £10:10:0, *or* 21/- *down and* 11 *monthly payments of* 19/9.

21/- DOWN

Exact to Mr. John Scott-Taggart's specifications.

B.T.S. TROPHY RECEIVERS

Record-breaking Short Wave Sets

12-52 metres. An amazing advance in Short Wave technique. . . . record breaking receivers offered for the first time as commercial instruments for the enjoyment of Short Wave listening. Based on the circuit design used by the World's Champion Short Wave Station "Iongger." The Trophy 3 in two versions, A.C. Mains Model and Battery Model . . . designed for the reception of the World's Broadcasts on the Moving Coil speaker incorporated.

TROPHY THREE

Employs highly efficient 3-valve circuit providing unique results on 12-52 metre waveband, with coils supplied. World-famous specially wound One-shot Inductors available for tuning from 16-550 metres. Wavelength-calibrated scale. Moving coil speaker fitted and provision for headphones. Steel cabinet in beautiful crackle finish. Complete with 2 coils and fully tested.

BATTERY MODEL (Less Batteries) **£5 : 15 : 0**
Or 9/6 deposit and 12 monthly payments of 9/11.

A.C. MODEL 200/250 v. 40/100 cycles. **£6 : 0 : 0**
Or 10/- deposit and 12 monthly payments of 10/9.

PETO-SCOTT CO., LTD.,

(Pr.W.30) 77, City Road, London, E.C.1 Telephone : Clissold 9875.
(Pr.W.30), 62, High Holborn, London, W.C.1 Telephone : Holborn 3248.

"SPRITE" S.W. CONVERTER

(Continued from page 46)

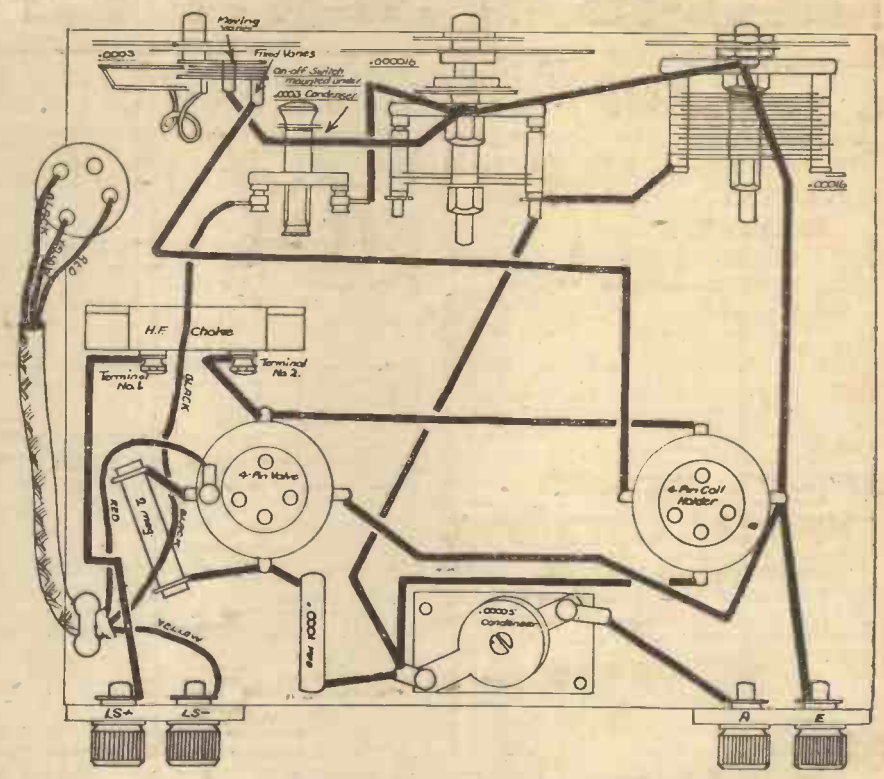
The wiring should be carried out exactly in the same manner as in the "Sprite" receiver, using the insulated sleeving for neatness and to avoid damage from accidental short-circuits. The two valveholders are interchangeable and should be mounted as shown in the wiring plan, that on the left being employed for the plug-in coils and the remaining holder for the valve. The terminals should be mounted on the small ebonite plates provided, and the various dials and indicating plates attached when the condensers are mounted. The indicators will, of course, be fitted outside the cabinet or over the panel should one be employed.

Using the Converter

Three coils are supplied with the kit, covering wavebands from 12 to 94 metres, divided into bands from 12 to 26, 22 to 47, and 41 to 94 metres. A small fixed condenser (.0005 mfd.) will be supplied with the kit and this should be attached to terminal No. 2 of the H.F. choke. The 'phone terminals should be bridged with a piece of bare wire, and the 4-pin plug which is fitted to the flex should be replaced by a 7-pin plug, with the three leads connected as follows:

Red lead to socket No. 4.
Black lead to socket No. 5.
Yellow lead to socket No. 7.

This plug should then be inserted into the H.F. valveholder and the valve replaced on top of the plug. The aerial should then be joined to the aerial terminal on the unit (not to the "Sprite" receiver) and the earth to the earth terminal on the unit, with an additional length of wire to connect together the earth terminal on the unit and the earth socket on the receiver. The remaining side of the .0005 mfd. fixed condenser should then be connected to the aerial socket on the Sprite receiver and the latter tuned to a point at the top of the long-wave band. You can then tune in signals on the short waves without any difficulty.



Wiring diagram of the converter unit.

Impressions on the Wax

H.M.V.

THIS month the Comedy Harmonists have two more of the clever vocal arrangements of well-known instrumental pieces, in "The Blue Danube" and "Perpetual Mobile," both by Johann Strauss, on *H.M.V. B* 8716. There is a bright vocal selection from "Me and My Girl" by the original artists of the show at the Victoria Palace, including Teddie St. Denis, Lupino Lane and Wallace Lupino, on *H.M.V. BD* 506; Elsie Carlisle sings "Little Drummer Boy" and "So Many Memories" on *H.M.V. BD* 499, and Revnell and West (the Two Cockney Kids) give a lively impression of what happens when they are "Going to the Pictures," on *H.M.V. BD* 510.

Films supply many of the new tunes. Allan Jones, who appears in "Firefly," sings the two principal songs from the film, "The Donkey Serenade" and "Giannina Mia," on *H.M.V. B* 8714. Kate Smith, who stars in the film "You're a Sweetheart," sings the theme song and the now very popular "Bei Mir Bist du Schoen" on *H.M.V. BD* 507, while Max Miller has two good numbers in "She Said She Wouldn't" and "I'm the Only Bit of Comfort That She's Got" on *H.M.V. BD* 505. Other songs of the moment are "You're a Sweetheart" and "The Pretty Little Patchwork Quilt," sung by Al Bowlly on *H.M.V. BD* 503, and "The Girl in the Alice Blue Gown" and "On Linger Longer Island" sung by Dan Donovan on *H.M.V. BD* 500.

The Three Musketeers give a study in the Hill-Billy manner of "The Last Hansom Cabby" and an attractive number in waltz time "On the Sunny Side of the Rockies"—*H.M.V. BD* 512. Finally, there is a splendid medley of Gershwin favourites sung by Elizabeth Welch and Robert Ashley with the New Mayfair Orchestra, *H.M.V. C* 2991, "Viewers" will doubtless remember the televising of the actual recording from the H.M.V. Studio.

Vocal

RICHARD CROOKS, the famous American tenor, follows up his series of songs by Stephen Foster with two that are not very well known here. They are "Beautiful Dreamer," and "Jeanie with the Light Brown Hair," *H.M.V. DA* 1599.

The first records from Gershwin's Negro Opera, "Porgy and Bess," were issued by the H.M.V. Company last month. Now there are some additions. Gershwin's tunes are good ones, and he skilfully preserves a real negro feeling in the rhythms he uses. Paul Robeson sings "It Ain't Necessary So," and "A Woman is a Sometime Thing," on *H.M.V. B* 8711. Peter Dawson also sings "I got Plenty of Nuttin'," from "Porgy and Bess," on *H.M.V. B* 8715.

Of quite another type is Ernest Lough's latest record. This one-time Temple Church chorister has now come out as a pleasing baritone, and this new record of "Abide with me" and "The Holy City," in which he has the assistance of chorus, organ, and orchestra, will be welcomed by a very large circle of those who like these favourite sacred songs—*H.M.V. B* 8712.

Dancing Time

THE New Mayfair Orchestra, with vocal refrain by Leslie Sarony, have recorded "Toot, Toot, Tootle on Your Flute" and "Follow the Band" on *H.M.V. BD* 5320, and also a medley for

the "Palais Glide," which is now very popular in all ballrooms, on *H.M.V. BD* 5325.

In the correct dance tempo series Henry Jacques has recorded "Remember Me" and "Everything You Said Came True" on *H.M.V. BD* 5317, also "Once in a While," coupled with "I Still Have to Kiss You Good Night" on *H.M.V. BD* 5318.

In the Swing Series Benny Goodman's Quartet have recorded "Vieni, Vieni" and "Handful of Keys" on *H.M.V. B* 8789, and the same orchestra play "Bob White," together with "When You and I Were Young, Maggie" on *H.M.V. B* 8691. "Hot Lips" and that old favourite "Ain't Misbehavin'" are the titles chosen by the Quintette of the Hot Club of France on *H.M.V. B* 8690.

Decca

FEATURED in the Decca Permanent Music series this month is Rossini's "Soirée Musicale" played by the Charles Brill Orchestra on *Decca K* 873-4. An English composer, Benjamin Britten, has transcribed some tit-bits of Rossini and presented a jolly suite for a small orchestra. This is the first recording by this orchestra for Decca.

A brand new recording of a very famous piano sonata is by Wilhelm Kempff playing the Beethoven Pathétique Sonata on *Decca X* 202-3.

"Snow White"

THIS film which is now running in London has a number of fascinating tunes and these have been recorded on three records—*Decca F* 6628-9-30, by Fred Rich and his Orchestra. A vocal gems selection by an orchestra and chorus, directed by Jay Wilbur, also appears on *Rex* 9257.

His Master's Voice have also made records from this film, and have recorded from the actual sound track of the film. The inclusion of dialogue and the "effects" noises makes each a perfect souvenir in sound of the sequence of the film from which it is taken. They are *H.M.V. BD* 514-5-6.

Peggy Cochrane, the popular radio star, sings a favourite number, "The Moon Got in My Eyes," from the film "Double or Nothing," coupled with "A Foggy Day," from the film "Damsel in Distress," on *Decca F* 6624. Vera Lynn, accompanied by Fred Hartley and his Sextet, also makes a vocal of "Rosalie," from the film of that name, and "With You" from the film "Brief Ecstasy," on *Decca F* 6617. On the male side we have Ord Hamilton singing "Just Remember" and "Outside an Old Stage Door," on *Decca F* 6627, Donald Thorne's "Hit Parade No. 5" on the organ of the Granada, Willesden, and a piano solo with rhythm accompaniment of a selection from the film "Rosalie" played by Frank Carle on *Decca K* 875.

"Rex" and "Panachord"

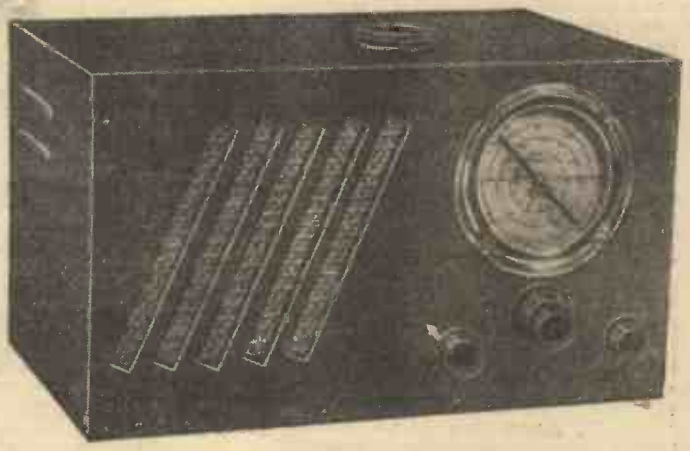
GRACIE FIELDS accompanied by Fred Hartley and his Orchestra has a new record of "Rosalie" and "London is Saying Good Night" on *Rex* 9255. This same orchestra also appear with Ralph Silvester in his vocal of "So Many Memories" and "Outside An Old Stage Door." Dancing fans will appreciate two records played in strict dance tempo by Maxwell Stewart's Ballroom Melody. The first, *Rex* 9253, features "Roses in December" (slow fox-trot) and "It's the Natural Thing to Do" (quick-step), and the other, *Rex* 9254, introduces "So Many Memories" (slow fox-trot) and "The Waltz Lives On" (waltz).

B.T.S. Trophy 3 S. W. Receiver

Details and Test Report of the Receiver which Won for the Designer the American Trophy for Station Logging

WE mentioned in these columns some time ago that a reader had succeeded in winning the American Trophy as the champion short-wave station logger over a given period. The feat was accomplished with a receiver of his own design, and in view of this feat arrangements have been completed for the manufacture and sale of receivers built to that design by the B.T.S. company. We illustrate herewith a three-valver employing the circuit, designed for battery use, and have had an opportunity of testing it in our own laboratories. The particular receiver is also available for A.C. mains use, and as a two-valve battery model.

The detector stage utilises a special U.S.W. type of valve which is resistance-capacity coupled to the first L.F. stage, an ordinary L.F. transformer serving to couple this to an output stage in which a high-slope pentode is used. A single tuned circuit is employed and the standard plug-in coil is used, with the holder so positioned that coils may easily be changed without opening the cabinet. The latter is of all-metal construction, and as may be seen from the illustration, the coil is inserted in the top of the cabinet. Coils are supplied to enable the receiver to be used to cover wavebands from 6 up to 550 metres—the cost of the coils being from 3s. to 3s. 9d. each.



This is the 3-valve Trophy receiver which is reviewed on this page.

Controls

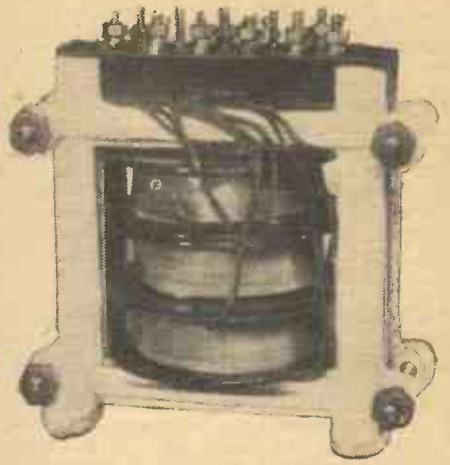
There are three controls, the centre being the main tuning, having slow and fast drives, and the remaining pair being for reaction and combined on/off and sensitivity. Variable aerial coupling is provided so that maximum results may be obtained with varying aerial systems. On a poor aerial it was found that the efficiency of the receiver was very good and gave low-background noise. The reaction was very smooth, but in the particular receiver which we tested the efficiency of reaction fell off slightly at the top end of the band. It was still adequate, however, for normal purposes, but it was apparent that it was not quite so sensitive at the top of the band on the 12/36 metre coil. The aerial sensitivity control affected reaction, as would be expected, and the position of this control was quite critical in relation to the reaction. The tuning was very smooth and free from back-lash and no dead spots were experienced. As the dial is calibrated in wavelengths it was a simple matter to identify various stations and to make quick searches for any required transmission. With a poor earth it was found that hand-capacity effects were rather prominent, and that if the operator placed his hand near the speaker opening a howl could be produced when tuning to a weak signal. It is important, therefore, to use a really sound earth connection, as a result of which trouble from hand-capacity will be avoided, and increased signal strength with freedom from interference background noises will be obtained. Provision is made for the use of headphones, which when plugged in automatically cut out the loudspeaker.

Economical Operation

The receiver is very economical to maintain, the measured H.T. current of the model under test being only 5 mA. This is an important point for the listener who is restricted to battery operation, whilst the mains-unit user will find that the receiver will give many hours of use at a minimum of cost. The overall size of the cabinet is 13½ins. by 8ins. by 8ins. high and is finished in black crystalline steel. It is entirely self-contained, and the price of the model illustrated (for battery use) is £5 15s. exclusive of batteries. The A.C. model costs £6 6s., and both models may be obtained on easy-payment terms, the former for 9s. 6d. deposit and 12 monthly payments of 9s. 11d., and the latter for 10s. deposit and 12 monthly payments of 10s. 9d. The two-valve model, for those who are more interested in headphone work and who require a low-priced outfit, costs £4 15s. or 7s. 6d. deposit and 12 monthly payments of 8s. 3d. In each case the price quoted is complete with valves and two coils covering the range from 12 to 52 metres.

Mains Transformer Pointers

A Simple Explanation of Some of the More Important Facts that Govern the Design and Choice of a Transformer. Some Useful Data are Also Given for Those Who Propose to Make One of These Components



A typical home-made mains transformer of massive construction.

READERS often ask why a mains transformer with given outputs can be obtained for, say, 18s., when another component with similar output costs, perhaps, 25s. If the two components could be placed side by side the question would be less likely to arise; if they were tested together, no further explanation would be required in the majority of instances. In general, the more expensive transformer is considerably more massive, besides being better finished. With many modern components size is no criterion of quality, but this ruling is not often applicable to mains transformers, which require to be accurately made for present-day valves.

Assuming that the iron-alloy used for the core is the same in both cases, and that wire of similar gauge is used on the two hypothetical transformers, the larger will have appreciably better "regulation." That means that the output voltage from the secondary windings will not vary to a very noticeable extent with variation in current. As an example, assume that a certain transformer has one secondary rated to provide 250-0-250 volts at 60 mA and another rated at 4 volts, 5-6 amp. If the regulation were poor (as it generally would be if the core were small and light) the H.T. voltage might rise to almost double the nominal value if the current load were reduced. That would not be a serious matter in some cases, since most readers are doubtless aware that the output voltage from any type of rectifier varies inversely as the current load. Nevertheless, a transformer with good regulation would give a much steadier voltage for any given variation in current.

It is the output from the 4-volt windings that is more important, because a voltage increase of 25 per cent. or so might be sufficient to damage the valve heaters. A sound, massively constructed transformer has such good regulation that, in most cases, a current of, say, 2 amp. could be taken from a winding rated at 5-6 amp. without any pronounced voltage rise.

Regulation and Voltage

A small transformer with light core has another serious fault, also related to the question of regulation; if the rated output current is exceeded, probably by only a small margin, the voltage will be reduced to a serious extent. Again, with 4-volt valve heater windings this would be a serious matter, because the heaters or filaments (with directly-heated valves) would be under-run, with the consequence that the valves might well suffer irreparable damage. The reason is not always apparent, especially to those who used to employ filament rheostats to control filament temperature of the old bright emitters. With those old valves it was generally found that slightly under-running the filament gave increased life. Such a position certainly does not exist where modern high-efficiency valves are concerned. The filament can be literally disintegrated by under-running due to the powerful "attractive" effect of the positively charged anode on the electron stream from the cathode.

Temperature Rise

A serious fault of transformers with poor regulation is that they are inclined to become very hot when worked at the full rated output; if the maximum output is slightly exceeded, conditions are far worse. There is one obvious reason for this, which is that the smaller volume and surface area of the core metal is less effective in carrying heat away from the windings and in transmitting it to the surrounding air. The temperature rise of a good transformer, worked at its full rated output, and mounted in such a way that air can easily circulate

A small home-made transformer intended for use in a trickle charger. An output of only about 9 volts, 1 amp. (9 watts) is required, and therefore the transformer can be quite small.

round it is very slight. The transformer never becomes so hot that the hand cannot be held against it without discomfort. If such a test were made with a small and cheap component, it would be found that it became unbearably hot.

Breakdown

Excessive heat is harmful in many ways. In the first place it causes expansion of the core and windings, this resulting in a risk of the windings being displaced and possibly fractured. It also often has a tendency to cause the winding spool to become loose on the core. If that happens it is almost sure to vibrate due to the A.C. current passing through the windings—and that, besides causing buzzing noises, tends to cause fracture of the finer windings. It has been found in many cases that a so-called burnt-out winding is nothing more than a winding that has been fractured due to vibration.

Another advantage of good regulation is that a voltage about 10 per cent. higher or lower than the nominal value can be applied to the primary winding without producing any other effect than a slight change in output voltage. For example, it might sometimes be found an advantage to connect a 240-volt A.C. supply to the 220-volt primary terminals in order to increase the H.T. output by about 25 volts. There would rarely be any serious objection to this when using a good-class transformer, provided that it were not quite fully loaded, but with a cheap article it might result in failure.

The reader might ask how these facts affect him. It is hoped that they might be helpful in assisting him to make a choice of a new transformer, but they should also be of some use to the constructor who makes his own. Many articles have previously been printed in these pages on the subject of transformer construction, and it is not proposed to repeat the information here, but a few helpful notes can well be given since they will reply in advance to many of those who have queries on the subject.

Gauge S.W.G.	Cross-sectional Area sq. in.	Length per pound (enamelled) yards.
16	.003217	26.8
17	.002463	—¶
18	.001810	46.9
20	.001018	83.3
22	.000615	137.0
24	.0003801	221.0
26	.0002545	311.0
28	.0001720	488.0
30	.0001208	694.0
32	.0000916	915.0
33	.0000785	—
34	.0000665	1,202.0
35	.0000554	—
36	.0000454	1,840.0
38	.0000283	2,810.0
40	.0000181	4,576.0

Choice of Core

The first concerns the choice of the core, which is most conveniently built up from a set of T and U stalloy stampings. A set of six dozen pairs is generally advised, this giving a core thickness of approximately 1⅛in. One of the most popular stamping sizes is that known as number 4. The centre limb of the T stampings in this size is ⅝in. wide, so that by using six dozen the cross section of the built-up limb is almost exactly one sq. in. For this area it is correct to use eight turns of wire per volt for all windings.

Current Density

If the total output wattage were not to exceed about 25 it would be permissible to go as low as six turns per volt, in which case it would be wise to choose the wire on a basis of 1,500 amp. per sq. in. As an example of the meaning of this, assume that the secondary winding had to carry 5 amp. The cross-sectional area of the wire required would therefore be 5/1,500 sq. in. or .0033 sq. in. From the table given on page 52 it can be seen that the nearest gauge is number 16. When using the full eight turns per volt it is normally perfectly safe to work on a current density of 2,000 amp. per sq. in. Thus, for 5 amp. the wire could have a cross-sectional area of 5/2,000, or .0025 sq. in.; this means that number 17-gauge would be adequately heavy. As, however, "odd-number" gauges are not usually easy to obtain we should still use 16-gauge.

A current density of about 2,000 amp. per sq. in. should be considered the maximum for efficient working and low-temperature running. We can take another example, this time in connection with an H.T. winding. Suppose, for instance, that the H.T. current required were 100 mA. If we were using six turns per volt we should allow 1,500 amp. per sq. in. and therefore the cross-sectional area of the wire should be 1/1,500, which is approximately .000066 sq. in. The correct gauge would therefore be number 34. If we could safely use a current density of 2,000 amp. per sq. in. the cross-sectional area need be only .00005 sq. in., or 35-gauge, whilst it would normally be safe to use 36 S.W.G., the area of which is not far short of the .00005 sq. in. required.

Maximum Safe Current

It will be seen from these examples that the cross-sectional area of wires is of far more importance than is generally realised. From it, the maximum safe current can easily be determined. At this juncture it should be mentioned that the maximum safe current density for "open" wires—that is, wires not enclosed by other windings—is usually taken by 4,000 amp. per sq. in. It is possible to work on this high figure with small transformers, but it is strongly deprecated, and done by manufacturers of very cheap components only.

Wire Covering

Another point that often gives rise to misunderstanding is in connection with the most suitable covering for the wire to be used. There is no definite rule on this, but it can be taken that it is quite good practice to use enamelled wire up to about 28-gauge, whilst for thicker wires (lower gauge numbers) it is better to use double-cotton-covering or, if winding space is at a premium, double or single-silk covering. The enamel insulation is inclined to crack on the heavier gauges when the wire is wound tightly on a former of fairly small diameter and especially when it has sharp corners, as with the usual square-section spool.

Insulation

Oiled-silk or waxed paper insulation should be used after every 50 volts of any winding, and care should be taken that later turns do not slip past it at the ends of the spool. A single turn slipping past the insulation might bring about breakdown due to a short circuit caused by the comparatively high voltage between two adjacent turns breaking down the insulation.

When fitting the core stampings into the winding spool the last few should be lightly—very lightly—tapped into place so that vibration cannot occur. If it is felt that there might still be a risk of vibration it is a good plan to pour a small amount of thin shellac varnish over the core and into the end of the spool; this will harden and so keep the assembly rigid.

Core-stamping Insulation

Some readers have been puzzled about a statement that has been given in some constructional articles to the effect that the stampings should be insulated from one another. They ask how this can be arranged. It does not call for any particular attention on the part of the constructor, because one side of each stamping has a thin insulated covering, which is white or grey. It is necessary simply to see that the insulated sides all face in the same direction.

Radio Clubs and Societies

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

BRENTWOOD AMATEUR RADIO SOCIETY

A MEETING of the society was held on February 25th, at "Old Basing," Alwyne Avenue, Shenfield, Essex—the QRA of G8KM. Activity at this meeting was directed mainly towards pre-arranged 56 mc. tests, carried out in co-operation with G2WG, our Vice-President, whose QRA is at Hutton. Signals from the latter's TX were heard on members' receivers, and gave good opportunity for testing, as the nearness of the TX resulted in strong signals being received. I think the general opinion of members it that more 56 mc. work is desirable in the Brentwood area, so any full C anticipating 5 metre transmitting will be welcomed with open arms.

Any readers desirous of obtaining information about the society should communicate with the Hon. Secretary, J. R. Deane Sainsbury, Esq., 2CYW, "Brunook," Crossways, Shenfield, Essex. Meetings are held twice a month, and all are welcome.

RADIO, PHYSICAL AND TELEVISION SOCIETY

ON Friday, March 11th, Mr. C. W. Edmans delivered the third in his series of lectures on Radio Fundamentals. This lecture, which was entitled "An Introduction to Radio Frequency Alternating Currents," was a general introduction to the properties of alternating currents and their behaviour under different conditions. The lecture dealt mainly with the theoretical aspect of radio-frequency alternating currents, no attempts being made to go into the design of alternating-current machinery or apparatus. The well-known three voltmeter method of measuring inductances was explained and details given of a useful and cheap arrangement consisting of a valve-voltmeter, a resistance of known value and a single-pole change-over switch by means of which inductances can be quickly and accurately measured. The lecture concluded with an explanation of why, under favourable conditions, the discharge of a condenser in the form of a spark is oscillatory. This was demonstrated in an interesting manner by means of a spark-coil and an oscillatory circuit through which the condenser was discharged.

Meetings of the society are held every Friday evening at 72a, North End Road, West Kensington, W.14. All lectures start at 8.15 p.m. New members will be very welcome and further particulars may be obtained by writing to the Hon. Secretary at the above address.

BRADFORD SHORT-WAVE CLUB

ON Friday, March 4th, a lecture on "The Design and Construction of Mains Transformers," was delivered to members of this club by Mr. A. C. Mallinson of The Trnechorde Radio Co., of Brighouse, Yorks. He dealt with the subject very thoroughly, from the theoretical and practical points of view, and the large membership present profited by his discussion. The membership of the club is steadily rising, but there is plenty of room in the large club-rooms for more, and inquiries are invited from all interested. Hon. Sec., S. Fischer, "Edenbank," 10, Highfield Avenue, Idle, Bradford, Yorks.

TONYREFAIL AND DISTRICT RADIO SOCIETY

AT the meetings on February 23rd and March 2nd, the Secretary gave a talk on "Oscillators" dealing with the Hartley, T.P.T.G. and Crystal Controlled circuits. On February 27th, members visited GW3CR, where they inspected the transmitter which uses a 362 R.F.P.15 in the final stage. Morse classes are held at every meeting with GW3CR at the key. Meetings are held every Wednesday evening at 81, Prichard Street, Tonyrefail, and all readers interested are invited to attend. Hon. Sec., Mr. E. Powell (2BPW), 44, Pritchard Street, Tonyrefail, Glam.

THE EXETER AND DISTRICT WIRELESS SOCIETY

AT the meeting of this society held on Monday, March 7th, Mr. V. C. Regan gave a talk on "Measurement in Radio." Mr. Regan stressed the need for accurate measurement if good results were to be obtained, and during the course of his lecture he ably compared the various types of meters, and showed the disadvantages of some types of meter for use in various ways.

Mr. Regan demonstrated a moving-coil meter used in conjunction with a metal rectifier, and warned the audience that readings were only true when the wave form is a perfect sine. Cathode rectifier tubes for the examination of wave forms, beat frequency oscillators, and capacity resistance bridges were also shown.

At the meeting, held at No. 3, Dix's Field, Exeter, on March 14th, a lecture was given by Mr. R. C. Lawes, A.M.I.E.E., A.M.I.Rad.E., of Exeter, entitled "The Electrical Conception of the Hammond Organ." A model of this organ was also demonstrated to a large and enthusiastic audience.

Mr. Lawes described in detail the construction of the instrument and explained very clearly the intricate electrical circuits used to produce sound. Some idea of the complication of wiring can be gathered from the fact that behind the 61 playing keys there are over 20 contacts to each key. This is only the second time the Hammond organ has been demonstrated in the south-west, and although its output is more than that of the average church organ, the cost is less than half. Mr. Lawes answered many technical questions concerning the electrical side.

Meetings are held each Monday at No. 3, Dix's Field, Exeter, and all those interested should get in touch with the secretary, Mr. W. Ching, 9, Sivell Place, Heavitree, Exeter.

LONDON TRANSMITTING SOCIETY

THE membership of this society has grown considerably of late. Anyone requiring Morse practice should come along, when they will be sure of a welcome. Membership of the society is free, but all members must possess an AA or full licence on joining. The object of the society is the mutual help on all transmitting subjects. We shall be pleased to hear from anyone with spare transmitting gear for sale, and our hon. sec. will be pleased to hear from any licence holder wishing to join. Hon. Sec., Mr. George Vale, 40, Raeburn Rd., Edgware.

THE "WALDRON RADIO SOCIETY"

ON Saturday evening, April 2nd, in conjunction with the local Men's Institute, the members of the above society are holding their Annual Exhibition at the Waldron Rd. Schools.

The exhibition is being opened by the Mayor of Wandsworth and L.C.C. members. We have the co-operation of several well-known manufacturers, and have a good show of amateur talent. If any readers are interested, they will find a good evening's entertainment in various parts of the building. Admission is free. Hon. Sec., Mr. W. E. Simmons, 33, Tranmere Road, Earlsfield, S.W.18.

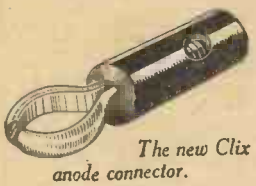
SLOUGH AND DISTRICT SHORT-WAVE CLUB

AT our meeting held on March 1st, Mr. K. Sly gave the next of his lectures on "Fundamentals," this instalment dealing with power supply from the mains, and an outline of the uses of the thermionic valve. The entries for section one of the club listening contest (Africa) were handed to the secretary and compared. Mr. Sly won this section by a narrow margin, using a mains-operated 0—v—1, and a speaker. The entry for this section was very poor, several of the entrants producing no logs at all, but we hope that the next section, N. America, will produce better results. After some discussion it was decided to draw lots for the task of building the club 0—v—0. This was done, and the job fell to the secretary! The RX will be on view for criticism at the next meeting, when Mr. Bramhill, 2BMI, will speak on his experiences with television. Particulars may be obtained from the secretary, J. H. White (2DAJ), 20, Chalvey Rd. East, Slough.

NOTES FROM THE TRADE

New Clix Connector

A VERY simple connector has been produced by Clix for use with modern valves having a plug top-cap connection. The accompanying illustration shows that this is in the form of a spring grip, the wire easily being attached in the insulated section, and the ends gripping the plug tightly. The illustration is larger than full size, and the price is only 1½d. It is supplied only with black insulated portion, unmarked.



The new Clix anode connector.

New G.E.C. Cell

THE General Electric Company announce the production of a new form of a secondary emission cell. This new cell, type CWS8, is similar to the CMG8 and CWG8 in size, and is designed to overcome the main objection to the first secondary emission cell, namely, its rather awkward size and shape. The potential difference between the primary cathode and target should be 85 per cent. of that between the primary cathode and collector, instead of 75 per cent. as in the case of the CWS24. The primary cathode is a silver surface deposited on the wall of the cylindrical bulb; the target, a silver tube which is coaxial with the bulb; and the collector, also coaxial with the bulb, consists of a molybdenum helix surrounding the target. With a total voltage of 300 a minimum sensitivity of 100 microamps. per lumen is guaranteed.

New Tucker Switches

MOST people with radio sets have noticed the "plopping" which is reproduced in a receiver when switches in the house are operated. The new switch produced by J. H. Tucker is designed to overcome this trouble, and is claimed to be the only switch which eliminates this source of annoyance. The mechanism is silenced by means of rubber buffers which cushion the movement and eliminate the usual harsh snap, and the electrical silencing is accomplished by making the off movement a slow one instead of the usual quick snap over. The "on" movement is effected in the usual quick manner. The switch is designed only for A.C. supplies and is known as the Tucker Short Slow Break A.C. switch. It may be obtained in 5 or 15 amp. models.

New Mazda Octal Valves

TWO new models are being added to the Mazda Octal range, and these are the VP113, a variable-mu screened pentode, and the HL133DD, a double-diode-triode. Both valves are intended for the A.C./D.C. type of receiver and have 13-volt heaters rated at .2 amps. The price of either model is 12s. 6d.

Cabinet Scratch Remover

A USEFUL scratch remover has been produced by Messrs. Holiday and Hemmerdinger. This is in the form of a tube with a small felt "wick" at one end, and this is used as a brush with which the liquid contained in the tube may be applied, and at the other end of the tube is a stain for application when the colouring of the cabinet has been removed. The price is 2s., and on test the apparatus works most effectively on cabinets of all types.

REPLIES IN BRIEF

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

T. C. (Erdington). We cannot supply a blueprint and we understand from the firm who sponsored this receiver that they also are now unable to supply details.

P. B. G. (Dunston-on-Tyne). The address is Angel Road, Islington, London, N.18.

C. H. (Wolverhampton). The diagram in the issue of January 22nd (the Triband receiver) shows switching which is identical to that you require.

W. P. (Neath). The Listener's 5-Watt Amplifier should be suitable, but we have also published details of a 12-watt amplifier if you need something more powerful.

W. S. (Warwick). The Beginner's Set should meet your requirements, but for a good all-round straight three on a baseboard we recommend the Centaur Three.

R. S. B. (Doncaster). We are afraid the details would not enable you to build a car radio. We have published several articles on the subject but have not given constructional details for an "all-mains" type of car receiver.

J. K. (Tuam, Co. Galway). We cannot supply blueprints of transmitting apparatus and are unable to suggest a source from which you could obtain them. Our present series of articles on the subject should interest you.

A. C. (Stornoway). The midgets could be used, but we prefer you to adhere rigidly to our specification to avoid disappointment.

J. P. W. (Co. Cork). The trouble may be due to the method in which you connected the two sets together. We should need a detailed sketch in order to solve the problem. The whistle may be due to a faulty set, and we do not recommend a filter in such a case. You should try to stabilise the circuit.

H. L. (S.W.9). It would appear that the existing valves will not function satisfactorily at the lower voltage or that the bias arrangements are such that excessive bias is applied at low H.T. values. Check the circuit and make quite certain that the valve is being operated at the correct values.

W. H. (Bristol). We regret that we have received no other reports of the station in question and are unable to identify it at the moment.

A. R. (Gainsborough). A faulty heater in one of the valves could give rise to the trouble and we therefore suggest that you have the valves tested before making any further tests in the wiring.

J. P. (Staines). The grid in question is the screening grid, but as the circuit was only a skeleton diagram the H.T. voltage leads were not indicated. The screen is, of course, joined to H.T. positive, the voltage applied being that recommended by the makers of the valve you intend to use.

H. B. M. (Gidea Park). All of the parts are obtainable from Messrs. Peto-Scott.

C. G. O. (Somerset). We regret that we cannot supply layouts and diagrams for individual receivers, and the set in question would not easily be modified on the lines you outline.

P. G. (Bristol). We do not advise you to tamper with the component. It would be preferable to return it to the makers for their test and report.

W. S. (Winsford). We cannot assist without further particulars. If the set is faulty it would be preferable to return it to the makers for their test and report. If only the trimmer has broken they may be able to supply a new one, or the condenser may have to be returned to the makers for repair.

R. H. H. (N.15). Further details are necessary before we can outline an idea. Do you mean that the required sounds must be superimposed on the radio programme, or that the apparatus shall work completely independently?

F. E. B. (Stepney, E.). You may be using the wrong valve types, or there may be a fault in the wiring which was made in the circuit. It would be preferable to try to find the makers of the chassis and get into touch with them concerning the right valves to be used.

E. F. (Leicester). The idea you outline should work satisfactorily, but you will not, of course, obtain half the output. The actual output will depend upon many factors.

J. H. (Salford, 5). The valves may be in need of replacement, the H.T. battery may not be up to the necessary standard, or you may be using the set with an inefficient aerial-earth system. All of these factors could account for the trouble.

C. H. (Emsworth). It is quite in order to use the Erie component in question, and this is supplied as a four-pole switch. The two tags are joined together to form one pole, exactly as in the Sprite receiver described in this issue. You will see from the illustrations and blueprint how this is done to convert the switch into a three-point component.

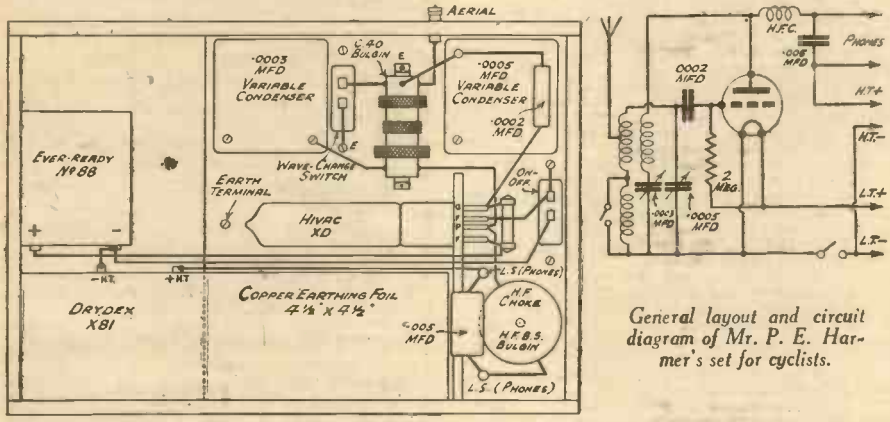
E. H. G. (Strood). It is not possible to make direct comparisons as you mention. You need a complete table of valve types and pin connections for this purpose.

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).

Radio Set for Cyclists

SIR,—Having seen your inquiry in the March 5th issue of PRACTICAL AND AMATEUR WIRELESS, I enclose a diagram of the midget one-valve set I have made from the circuit supplied with the Bulgin midget coil C.40. I suggest that either as it stands, or with the addition of a transformer and another valve, it might interest cyclists.



General layout and circuit diagram of Mr. P. E. Harmer's set for cyclists.

So far I have not been able to make a suitable aerial to fit around the set, but on the house aerial and earth I have heard London Regional and National and Lyons at good 'phone strength. The long wave is more difficult to hold, while Regional and National come in just as well without the earth.

Low tension current is supplied by a partly used torch battery, to get rid of the surplus 1½ volts. The condensers are paper dielectric ones purchased at the local "junk shop," and the switches, which are of the slide-across type, are only about ¼in. thick.

The condensers are earthed through the spindle to the copper foil. I think it might be better if the H.T. + was connected through the choke instead of the 'phones and .005 condenser and then choke. Anyway, as it is, it seems to operate fairly well.

You will see that except for the battery connections I have used no wire except that on the various components.—P. E. HARMER (Paddington).

Station VR6A—Pitcairn Island

SIR,—It might interest S.W.L. readers to know that I have just received a very unusual station on 14 megacycle 'phone band. The station in question is VR6A, situated on Pitcairn Island. The name of the operator is Young, and he has just been presented with a rig to work on the amateur 'phone bands. This transmitter is to replace a ten-year-old "spark" transmitter that served to keep Pitcairn Island in touch with the outer world. The power used at present seems to be about 60 watts, and the best time to listen for this rare catch is around 07.00 to 08.30.

I have received him for five mornings in succession, with the signal strength ranging from R6 down to around R3 with rather rapid fading at times.

QSL card hunters will probably have to wait about two years for a card from VR6A, as the mail boat only seems to call twice to three times a year, but even so, you might write to the operator and offer him good luck with his somewhat lonely and far off life.—D. C. CHAMBERLAIN (2CHD) Thornton Heath.

CUT THIS OUT EACH WEEK.

Do you know

—THAT distortion in the form of a "rattle" may often be traced to the separation of the layers of wood in a plywood cabinet.
—THAT an electron-coupled detector stage may give rise to serious interference from radiation.
—THAT an old H.T. battery should not be joined in series with a new one to give increased life to the old battery.
—THAT when extra capacity is needed two or more batteries or cells may be joined in parallel.
—THAT some forms of Q.M.B. switch are not suitable for switching H.F. circuits.
—THAT when baring the end of an insulated lead take care not to cut into the wire as the resistance will automatically be increased as the wire size is diminished.

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 of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor,* PRACTICAL AND AMATEUR WIRELESS, *George Newnes, Ltd., Tower House, Southampton Street Strand, W.C.2.*

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

A High-quality Amplifier

SIR,—I feel I must take exception to the article by Mr. Bonavia Hunt in your issue of March 12th, particularly his remark "no definite value of *coupling condenser* can be chosen to deal satisfactorily with all frequencies amplified, and as a result all frequencies above 4,000 cycles are extremely liable to amplitude distortion." This is a statement as regards "high audio-frequencies" which I am afraid he will find a difficulty in substantiating. Might I ask what authorities (other than his "ear") he can produce to reinforce this dictum?

Now as to some other features of his article. His design for a resistance-capacity amplifier (Fig. 1) will most certainly produce amplitude distortion. R1, i.e., anode resistance for V1, is given as 50,000 ohms, and R7 the following grid leak is quoted as .025 megohm or 25,000 ohms. This will result in the A.C. load on V1 being only .33 of the D.C. load and amplitude distortion will be very evident! Don't blame the coupling condenser! As for his completed "direct coupled" amplifier, with anode resistances of .25 *megohm*, and .001 *mfd* from the first anode to ground, it seems obvious why there is a "softness of quality" and "an absence of peakiness," together with "a surprisingly low level of surface noise" from gramophone records. Allowing only 15 micro-microfarads for each valve's interelectrode capacities, a few moments' calculation shows his amplifier to be more than 12 decibels down at 10,000 cycles. This does not bear out his statement that a "uniform response is maintained up to and even beyond 10,000 cycles." To me it does seem, however, that if this is high-quality reproduction, a new era is certainly with us.

Possibly some of your readers may try "shorting" the coupling condensers as mentioned in column 2, on page 699. Possibly they may do so *without* reducing anode voltage and increasing bias. They will then make a few remarks of an unprintable nature. Possibly other readers may have tried some of his previous quality amplifiers in which anode current was fed through the secondary of L.F. transformers (if they did not immediately burn out). In these previous "Quality" amplifiers two transformers were used with a *coupling condenser* between them. Why was a coupling condenser good then if not now?

I can most wholeheartedly agree with Mr. Bonavia Hunt on one point. I can picture the output valve at its work "functioning as a giant anode bend detector rather than as a mere amplifying valve? I can picture each valve in his amplifier functioning similarly—detecting or rectifying where no detector is required, i.e., at audio frequencies.—W. F. PIRIE (Aberdeen).

A 20 m. Log from Worthing

SIR,—I have not seen a 20 m. log from my part of the country, so I enclose mine. My set is a 1-valve converter to a 5-valve A.C. straight. Antenna is 45 ft. N—S.

This log is from February 6th to March 13th and all signals were received on the loud-speaker. EA3SI (Spain), SU1RD (Egypt), VU2CQ (Bombay), ES5D (Estonia), SP11FD (Poland), VE2LU, VE2HY, and VE2LP (Canada), SM5YU (Sweden), SV1NK (Greece), CO6Y, CO6OM, and CO8YB (Cuba), VU2EZ (Burma), LA5H (Norway), LZ5BW (Bulgaria), OZ5BW (Denmark).—E. W. PAULTON (Worthing).

Practical and Amateur Wireless
BLUEPRINT SERVICE

PRACTICAL WIRELESS	Date of Issue.	No. of Blueprint.
CRYSTAL SETS.		
Blueprint, 6d.		
1931 Crystal Receiver	9.1.37	PW71
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprints, 1s. each.		
All-wave Unipen (Pentode)	—	PW31A
Beginner's One-valver	19.2.38	PW85
Two-valve : Blueprints, 1s. each.		
Four-range Super Mag Two(D,Pen)	—	PW36B
The Signet Two (D & LF) ..	29.8.36	PW76
Three-valve : Blueprints, 1s. each.		
The Long-range Express Three (SG, D, Pen)	24.4.37	PW2
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2 LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow) ..	22.5.37	PW35
Summit Three (HF Pen, D, Pen)	—	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	20.5.37	PW39
Hall-Mark Three (SG, D, Pow) ..	12.6.37	PW41
Hall-Mark Cadet(D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans))	*June* '35	PM1
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	PW53
Battery All-Wave Three (D, 2 LF (RC))	—	PW55
The Monitor (HF Pen, D, Pen) ..	—	PW61
The Tutor Three(HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P) ..	14.8.37	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen) ..	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen) ..	31.10.36	PW69
The "Colt" All-Wave Three (D, 2LF (RC & Trans))	5.12.36	PW72
The "Rapide" Straight 3 (D, 2 LF (RC & Trans))	4.12.37	PW82
F. J. Camm's Oracle All-Wave Three (HF, Det, Pen)	25.8.37	PW78
1938 "Triband" All-Wave Three (HF Pen, D, Pen)	22.1.38	PW84
Four-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P) ..	1.5.37	PW46
Fury Four (2SG, D, Pen).. ..	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B)..	6.1.34	PW34B
Fury Four Super(SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P) ..	26.9.36	PW67
All-Wave "Corona" 4 (HF Pen, D, LF, Pow)	9.10.37	PW70
"Acme" All-Wave 4 (HF Pen, D (Pen), LF, Cl. B)	12.2.38	PW83
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen) ..	—	PW18
A.C.-D.C. Two (SG, Pow) ..	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow) ..	—	PW35C
D.C. Premier (HF Pen, D, Pen) ..	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen) ..	28.7.34	PW36A
Armada Mains Three (HF Pen, D Pen)	—	PW38
F. J. Camm's A.C.All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2 LF (RC))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
All-World Ace (HF Pen, D, Pen)	28.8.37	PW80
Four-valve : Blueprints, 1s. each		
A.C. Fury Four (SG, SG, D, Pen)..	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	24.7.37	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	9.2.35	PW47
A.C. All-Wave Corona Four ..	6.11.37	PW81
SUPERHETS.		
Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three-valve) ..	5.6.37	PW40
F. J. Camm's 2-valve Superhet ..	13.7.35	PW52
F. J. Camm's £4 Superhet ..	—	PW58
F. J. Camm's "Vitesse" All-Waver (5-valve)..	27.2.37	PW75
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valve) ..	—	PW43
D.C. £5 Superhet (Three-valve) ..	1.12.34	PW42
Universal £5 Superhet (Three-valve)	—	PW44
F. J. Camm's A.C. £4 Superhet 4 ..	31.7.37	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitone" Universal Four ..	16.1.37	PW73
SHORT-WAVE SETS.		
Two-valve : Blueprint, 1s.		
Midget Short-Wave Two (D, Pen)	—	PW38A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2LF (RC and Trans))	7.8.37	PW63
The Band-Spread S.W. Three (HF Pen, D (Pen), Pen) ..	29.8.36	PW68
PORTABLES.		
Three-valve : Blueprints, 1s. each.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen) ..	—	PW65
Parvo Flyweight Midget Portable (SG, D, Pen)	19.6.37	PW77
Four-valve : Blueprint, 1s.		
Featherweight Portable Four (SG, D, LF, Cl.B)	15.5.37	PW12
MISCELLANEOUS.		
S.W. Converter-Adapter (1 valve)	—	PW48A
AMATEUR WIRELESS AND WIRELESS MAGAZINE CRYSTAL SETS.		
Blueprints, 6d. each.		
Four-station Crystal Set	12.12.36	AW427
1934 Crystal Set	—	AW444
150-mile Crystal Set	—	AW450
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprints, 1s. each.		
B.B.C. Special One-valver ..	—	AW387
Twenty-station Loudspeaker One-valver (Class B)	—	AW449
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans)..	—	AW388
Full-volume Two (SG det., Pen)..	—	AW392
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans) ..	—	AW338A
Lucerne Minor (D, Pen)	—	AW426
A Modern Two-valver	—	WM409
Three-valve : Blueprints, 1s. each.		
Class B Three (D, Trans, Class B)	—	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	—	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans) ..	2.12.33	AW412
1934 Ether Searcher; Baseboard Model (SG, D, Pen)	—	AW417
1934 Ether Searcher: Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans) ..	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
Mullard Master Three with Lucerne Coils	—	AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All-Britain Three(HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM318
Simplo-tune Three (SG, D, Pen)..	*June* '33	WM327
Economy-Pentode Three (SG, D, Pen)	*Oct.* '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans) ..	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	—	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen) ..	*June* '35	WM380
Certainty Three (SG, D, Pen) ..	—	WM393
Minitube Three (SG, D, Trans) ..	*Oct.* '35	WM396

These Blueprints are drawn full size.

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

Issues of Practical Wireless	4d. Post Paid.
Amateur Wireless	4d. " "
Practical Mechanics	7½d. " "
Wireless Magazine	1/3 " "

The Index letters which precede the Blueprint Number indicate the periodical in which the description appears: thus P.W. refers to PRACTICAL WIRELESS, A.W. to *Amateur Wireless*, P.M. to *Practical Mechanics*, W.M. to *Wireless Magazine*.

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

QUERIES and ENQUIRIES

Spanish War News

"I recently picked up a station about 200 metres giving out news of the war in Spain in English. I was interested in this, but it faded out and I could not get it again. Is there any regular broadcast of this feature and could you give me the exact wavelength?"—R. T. (Highbury).

THERE are several stations now broadcasting the news in question, and you may have picked up one of the smaller relay stations. On the other hand, a local listener may have been using his set in an oscillating condition and you may have received the programme by re-radiation. On 200 metres there is the Melilla station, using 190 watts, and this relays the R. National programme from 10.45 p.m. to 11.30 p.m. The most powerful of the stations is Tenerife, on the short-waves, but on 238.5 metres you should find Radio Nacional, using 20 kW., and broadcasting from 9 a.m. to 10 a.m., 1.30 p.m. to 3.30 p.m., 6 p.m. to 9.30 p.m. and from 10 p.m. to 1 a.m. This station is situated at Salamanca.

Switch Faults

"I have built an all-wave set as on the diagram enclosed, but find a peculiarity which I cannot quite solve. When switched to either the lower short or medium wave-bands I sometimes cannot get signals, but when I twist the switch signals come through. I have searched in vain for the trouble and wonder if you can see anything wrong."—G. E. (York.)

THE switching in question is accomplished through ordinary on/off push-pull switches and it is noticed that the plunger is utilised as a third contact. This returns to earth through the mounting bracket and chassis. You are therefore relying in this circuit upon a frictional contact as part of the actual tuned circuit and unless the contact is sound you are bound to experience trouble. The switch is not intended by the makers to be used in this manner and therefore the plunger is not designed to carry H.F. You should, therefore, solder a flexible lead to the plunger end and connect this firmly to an earthed point. This should then overcome the difficulty.

Long-range Receiver

"I am anxious to build a really powerful receiver which will give me maximum range of reception with high quality. I have plenty of spare parts and valves and prefer a straight receiver as I can wind my own coils easily. What type of T.R.F. receiver would you think is necessary for really reliable and satisfactory long-distance work at high quality?"—J. E. (Perth).

AS we have already pointed out in these pages, a two H.F. receiver with band-pass tuning will provide ample range and selectivity, provided that it can be made up in a stable form. You may find it possible to use three H.F. pentodes with transformer coupling and still obtain stability, but some care will be necessary to find a lay-out and working values which will give a performance better than two such stages. It is often found that as successive H.F. stages are added the gain has to be reduced in the interests of stability and thus eventually valves are being "wasted" except so far as the additional selectivity of the tuned circuits are concerned. Thus, for all practical purposes you will probably find, as we have already pointed out, that two good H.F. stages with a band-pass circuit incorporated will provide the best performance.

Wiring a Receiver

"I am a new-comer to radio construction and wonder if there are any rules or special points which I could note regarding the wiring of a set. For instance, what wires should be insulated and where can bare wires be used? Also, when is it necessary to use stranded or flex wire and when single? Perhaps you could help me in this particular field."—H. E. DeT. (Scarborough).

RULES

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

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

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

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

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

THERE are actually no rules regarding wiring, and provided that the purpose of the connected wire is borne in mind any wire may be used. For instance, as you will have seen by the article in last week's issue, the filament positive lead in a battery set could be insulated to prevent short-circuits, but there is still bare metal exposed in that circuit, and thus insulation does not greatly help. On the other hand, in a mains set, insulation of the high-voltage leads will prevent you from obtaining shocks or prevent damage to valuable components in the event of an accidental short-circuit. If the wiring is properly carried out, soldered joints being used wherever possible, bare wire may be used, but for safety you can always slip lengths of insulated sleeving over all wires. Flex is only needed for heater leads in an A.C. set where it would be inconvenient to use a heavy solid wire, and for battery leads in the simpler types of set.

Valve Life

"I believe that some of my valves are in need of replacement, as I have had them in constant use now for two years. How can I tell if I ought to replace them, and what is the average life of a valve in modern sets? The receiver is battery operated."—F. J. A. (Stourbridge).

THE life of the valve depends to a great extent upon the way it is used, and if run at the valve-maker's figures it will obviously last much longer than one which is over-run. Reports have been received of valves which have been in use for five years and are still performing as well as when new, whilst in other cases a valve may fail after six months' use. The best plan in your case is to take the valves to a good local dealer who is provided with one of the latest valve-testing devices and he will simply plug the valve into a socket and an indicator will show both the dealer and you the condition of the valve. Gradual deterioration of a valve may take place and will not be noticed, but if the valve is replaced by a good component a remarkable improvement may be noticed.

Triode-pentode Connections

"I note the circuit in your issue dated March 12th, entitled "A Single-valve Pre-selector," but would point out that the modern triode-pentode has the triode grid internally joined to the suppressor grid of the pentode section. Consequently the circuit as shown by you would not work with a triode-pentode valve."—J. M. L. (Glasgow, C4).

YOU are wrong in your statement that a modern triode pentode has the combined connections. Some valves are made in this way, it is true, but it is possible to obtain both battery and mains triode-pentodes with the separate connections, and in the Mazda range, for instance, these are types TP.22 and AC/TP. The circuit is therefore quite in order, but of course you should make certain that you obtain the triode-pentode with the separate connections.

Meter Conversion

"I wish to convert a meter I have to read higher currents and am not quite clear of the formula for this. I believe you have published the details but I have been through all my back numbers and cannot find it."—G. P. (Birkenhead).

THE meter has to be shunted to read a higher current and therefore the value of the shunt will be equal to the resistance of the meter divided by the mutiplication factor less one. Expressed mathematically, this equals—

$$\text{Value of shunt} = \frac{\text{Resistance of meter}}{N-1}$$

where N is the multiplication factor or number of times the full scale has to be increased.

The coupon on page iii of cover must be attached to every query.

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Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," Tower House, Southampton Street, Strand, London, W.C.2.

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GARRARD A.C. Radiogram Units, with pick-up and all accessories, in sealed cartons; 42/-.

TELSEN (1937-38) Components, iron-core coils W.349 (Midget size), 3/6. W.477 (triple ganged, for band-pass or straight circuits), 14/6; W.476 (triple-ganged superhet), 14/6. W.478 (twin ganged), 9/-; all ganged coils complete on bases, with switch; I.F. transformer coils, 4/6; dual range coils, 2/9; with aerial series condenser, W.76, 3/9.

TELSEN A.C./D.C. Multimeters, 5-range (tests anything radio or electrical), 8/6; loudspeaker units, 2/6; Ace (P.O.) microphones, complete with transformer ready for use with any receiver, 4/6; headphones, 4,000 ohms, 3/- pair.

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MORSE Tappers, complete radio-telegraph set (flasher, buzzer and tappers), with batteries, bulb, code, 3/-.

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VAUXHALL. T.C.C. electrolytic condensers, 8 mfd. and 4 mfd. 500 volt, 2s. 6d. 50 mfd. 50 volt, 1s. 6d.

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VAUXHALL. Magnavox and Rola P.M. speakers. 7in. cone, 16s. 6d.; 10in. cone, 22s. Energised models, 2,500 field coils, 7in., 12s. 6d.; 10in., 17s. 6d.

VAUXHALL UTILITIES, 163a, Strand, W.C.2. Temple Bar 9338. Send postcard for free list. Post paid 2s. 6d. and over, or C.O.D.

---

25 ONLY FOR SALE.—3-valve kits with valves and diagram, 12/6; 3-valve S/G kits with valves and diagram, 20/-. Orders executed in rotation. —Universal Radio Co., 221, City Road, London, E.C.1.

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