TESTING SHORT-WAVE COILS—See page 63.

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EVERY WEDNESDAY

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RADIO CAREERS

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EVERY WEDNESDAY
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EDITED BY F. J. CAMM
Staff: W. J. DELANEY, FRANK PRESTON, H. J. BARTON CHAPPLE, B.Sc.

ROUND THE WORLD OF WIRELESS

Adding Range

WHEN considering the question of increasing the range of a short-wave receiver the usual procedure is to add an H.F. stage. But there is a better scheme which not only increases range but at the same time increases the efficiency of a receiver out of all proportion to the small addition which is made. We refer to the inclusion of a short-wave converter. The only drawback to this type of unit is that the receiver with which it is employed must include H.F. amplification. A further drawback to the addition of another stage when considering mains apparatus is that the additional current is not readily obtainable, and if the supplies in the receiver are tapped off it may result in inefficiency in the receiver. In this issue we describe an efficient converter which may be used with either A.C. or D.C. receivers, and this includes its own mains section which, by making use of the A.C./D.C. type of circuit which does not include a mains transformer, cuts down expense and at the same time removes all difficulties associated with the provision of the additional L.T. and H.T. supplies. We must emphasise once again that this type of unit is only useful with receivers having H.F. amplification (and this includes superhets) whilst for the simpler type of receiver without H.F. an ordinary adapter must be employed.

Novachord Recitals

"VOX NOVACHORD," a programme featuring the unique musical instrument which simulates dozens of others, may be heard over WLW on Tuesdays at 7.15 p.m., E.S.T. Gene Perazzo (staff organist at WLW) will be the novachord artist, and will be accompanied by a string ensemble.

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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.

Grand National

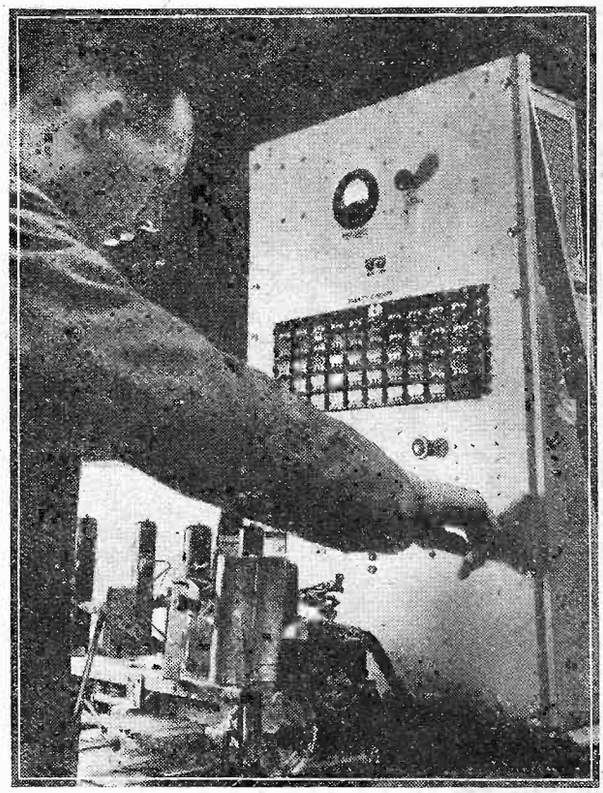
ONE of the biggest racing events of the year will again be brought right into the homes of listeners when a running commentary is given on the Grand National at Aintree on April 5th. This commentary, which has one of the biggest audiences of any programme in the year, is also to be broadcast to the Forces in France. R. C. Lyle will be responsible for the preliminaries, and the commentaries on the actual race will be by Richard North and Raymond Glendenning. The points from which the commentaries will be made are the Starting Post, the Grand Stand, and the Canal Turn.

Breathless Last Minutes in Sport

AN edition of "Fan Fare," the Scottish sports radio magazine, will be presented once again by R. F. Dunnett in the Forces programme on April 5th. This time it will be a slightly revised edition of the first war-time "Fan Fare" which was heard in the Home Service on January 16th. He has recreated in dramatised form at the microphone exciting last minutes of famous sporting encounters in Scotland—Association and Rugby Football matches won with the last kick before the whistle, and boxing matches, such as Benny Lynch's victory over Peter Kane.

"Composer Cavalcade"

THE next programme in the popular "Composer Cavalcade" series will again be devoted to that prolific melodist, Irving Berlin. There are few composers of modern popular music who could stand the strain of more than one programme of this nature. Irving Berlin is certainly one of them, and most of his 700 compositions can bear constant repetition. Some of his songs have been for some years classics in their own field. Among those which are to be broadcast on April 3rd are "Easter Parade," written for "Stop Press" in 1933; and "A Pretty Girl is Like a Melody," which was composed in 1919 but was revived for that monumental musical film "The Great Ziegfeld" in 1936. More recent is "Now it can be Told" which was the only new number in "Alexander's Ragtime Band"—based on Berlin's successes and shown in 1938; and "Back to Back" from the Sonja Henie-Tyrone Power film, "Second Fiddle." Phil Cardew, who will be remembered for his work in the recent Ray Noble programme, will again be responsible for the arrangements.



The increase in interest in radio as a career lends point to this illustration of a novel service tester of the analyser type used in the G.E.C. laboratories.

The Vale of Evesham

IN peace-time Charles Gardiner and Robin Whitworth collaborated in a programme about the Vale of Evesham and the life of the fruit and vegetable growers on its rich soil. This programme has been brought up to date, and will be revived on April 13th with local speakers. Mr. Gardiner is Clerk to the Evesham Rural District Council.

Radio Careers

There are Specialised Branches of Research Available to Experts in Certain Fields

A specialist testing insulation in an elaborate air-conditioned cabinet. This is used for special tests in conjunction with tropical apparatus.

IN previous issues we have dealt with the subject of radio as a career, and although the industry has been subdivided into various sections some of these have naturally had to be dealt with rather briefly. Radio production does not embrace merely electrical processes, but when the individual components and apparatus used in radio are examined it will be found that there are several sciences introduced in their production. Take, for example, the ordinary valve. Apart from the various mechanical details, there is also the question of the chemical composition of the filament or cathode, and in this direction trained chemists are employed on research. Metallurgists also play their part in the production of special materials for grids and anodes. Many modern radio components, and even cabinets, are now made from bakelite, and again this is a chemical production which was not special to radio in the first instance. It will thus be realised that trained physicists, chemists, etc., can also find an outlet for their abilities in modern radio, and these professions require specialised training at the end of which some academic degree would be taken.

These specialised trainings are, of course, more suited to the young man who is just finishing his education, and who is thus more easily able to transfer to one of the universities or a branch thereof.

Postal Training

There are, further, specialised training centres which cater for tuition by post to reach certain high standards such as those mentioned, but in general it is not a simple matter to obtain the necessary degrees without attending a centre where the necessary practical experience may also be obtained. A perusal of some of the "Situations Vacant" columns published in certain quarters recently will show that there are still many vacancies for specialists such as those mentioned. It is also often possible to obtain junior posts as assistants to such experts, where practical experience may be gained, although again a really sound general education is one of the most important features. As an idea of the salary to be expected, the Air Ministry recently advertised for laboratory assistants having good general education with theoretical training in electricity, practical experience of receivers or electrical testing, and at the age of nineteen the salary offered was 40s. to 70s. per week, according to the qualifications and experience of the applicant. Next week we shall deal more completely with this subject, and an important announcement will be made. Order your copy now.

Impressions on the Wax

Orchestral Recordings

PROMINENT among the record releases for this month is a number of interesting orchestral recordings. First, there is the famous "Nutcracker Suite," played by The Little Symphony Orchestra, conducted by Alexander Smallens, on three 10-in. records, complete in album with leaflet, costing 8s. 6d.—*Decca F* 7360-2. Equally well known is Offenbach's "Tales of Hoffmann" a selection from which is played by The Regent Concert Orchestra on *Decca F* 7228. In the "Permanent Music" series is a recording by The Boyd Neel String Orchestra of "Concertino in F Minor" and "Largo" (Concerto in F) on *Decca X* 148-9. Two more old favourites make their appearance—"The Whistler and his Dog" and "Teddy Bears Picnic," played by the Belgrave Salon Orchestra on *Rex* 9643.

New Record Album

ALSO amongst this month's new record releases is an album which admirably illustrates a popular song development that is probably unique. Sung by Bing Crosby, Brunswick sponsors a set of twelve cowboy songs. "Boots and Saddle" and "I'm an old Cowhand," are two examples, both of which are included in the album.

The original cowboy songs were not folk songs in the strict sense of the term. The ranch boys used any old tunes there were around for borrowing and fitted words expressive of their thoughts and actions to old tunes. The tune of "My Bonnie Lies over the Ocean" was better known as "The Cowboys' Dream." But although there were many such adaptations, it finally resulted in a great number of modern songs in cowboy vein.

Twelve of the best of these are sung by Bing Crosby in this new album, which includes, as well as the two previously mentioned titles, such evergreen favourites as "Silver on the Sage," "A Gold Mine in the Sky," and "My Little Buckeroo," *Brunswick O* 2923-8.

Gershwin's Concerto in F

A LONG overdue recording featured in the Brunswick lists this month is that of Gershwin's "Concerto in F." Most people think Gershwin's large scale works begin and end with the famous "Rhapsody in Blue." The concerto is a much more broadly planned work. Although originally written for symphony orchestra, this special version now recorded by Paul Whiteman serves, perhaps, to further emphasise the essentially jazz style of the composition. The slow movement in particular is very beautiful. Paul Whiteman shows that he is still the leader of one of the greatest dance bands ever, while his pianist, Roy Bargy, gives a fine performance of the difficult solo part. *Brunswick* 0145-6. Funny how the old tunes won't lie down. Most recent of song re-incarnation is "Oh! Johnny, Oh! Johnny, Oh!" which dates back to 1917 and which has now been introduced into the new edition of "Black Velvet." The most intriguing record of it is by Arthur Young and the Hatchett Swingtette. This unusual little band, which is built around the Novachord and uses the unique fiddle playing of Stephane Grappelly, records on *Decca F* 7045. Elsie Carlisle also sings this tune on *Rex* 9734, and couples it with "Mr. Jones (Are You Coming to Bed)."

An even older melody than the "Johnny" song is "Tristesse," which is a modern dress version of one of Chopin's loveliest tunes. Ambrose has recorded it on *Decca F* 7400, while there is an alternative version by the Inglese Tango Orchestra on *Decca F* 7395.

TESTING SHORT-WAVE COILS

A Simple Method which the Experimenter will Find Particularly Useful

TO the short-wave enthusiast, the construction of coils affords endless scope for interesting experiments. But the average home-constructed S.W. coil, though made with certain basic principles of coil construction in mind, is very often a "hit or miss" affair, which requires testing under working conditions before being incorporated in an experimental circuit. This "testing under working conditions" presents a problem, unless certain equipment is available.

Many constructors prefer the "plug-in" method of incorporating their coils, mounting them on old 4-pin or 7-pin valve bases. But, even assuming a plentiful supply of valve bases, it is annoying to complete a masterpiece of soldering only to find the coil unsatisfactory or inefficient in operation.

To obviate this difficulty, the following method was devised, and has been completely satisfactory, having the additional advantage of testing both 2-circuit and 3-circuit coils with equal facility, simply by throwing a switch. The necessary apparatus consists merely of a strip of ebonite about an inch wide and six terminals, preferably of the "telephone" type.

Ebonite Terminal Strip

The ebonite is first drilled to take a row of six terminals, spaced approximately one inch. Lacking any other suitable strip of ebonite, it may be noted that the ebonite holder of the slotted type used for supporting the old "basket" coils can be profitably employed. No drilling is necessary when this type of holder is used, since the terminals can be firmly fixed at equal intervals along the slot. Further, the slot helps to reduce surface leakage between adjacent terminals.

The ebonite strip is then fixed in an upright position by means of small angle brackets, or even pushed firmly into a slotted cork screwed to the baseboard. The terminals should be numbered 1 to 6 from top to bottom, and then the panel permanently incorporated in your favourite circuit. Fig. 1 shows, semi-pictorially, how this is done in the case of a typical frequency-changer as employed in short-wave converters. Fig. 2 gives the connections for a simple two-valver. The scheme may also be adapted for use in various other circuits.

The switch in the aerial circuit needs some explanation, as its function is important. This must be a good anti-capacity S.P.C.O. switch, since any capacity across its terminals will defeat its object, which is to enable 2-circuit (grid and reaction) coils and 3-circuit (aerial, grid and reaction) coils to be tested on the same panel. When the aerial lead is switched to terminal 2, the aerial coil is brought into circuit. Where no aerial winding is used, the change-over switch connects the aerial directly to terminal 3; that is, in the grid line.

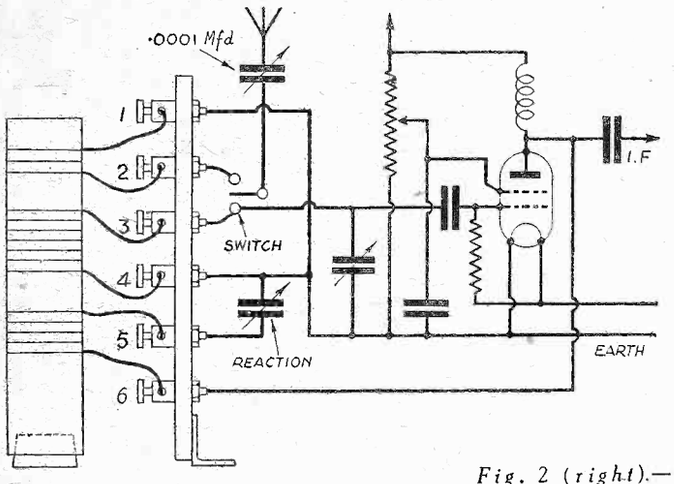


Fig. 1 (left).—Circuit diagram showing the simple coil - testing method applied to a frequency-changer circuit.

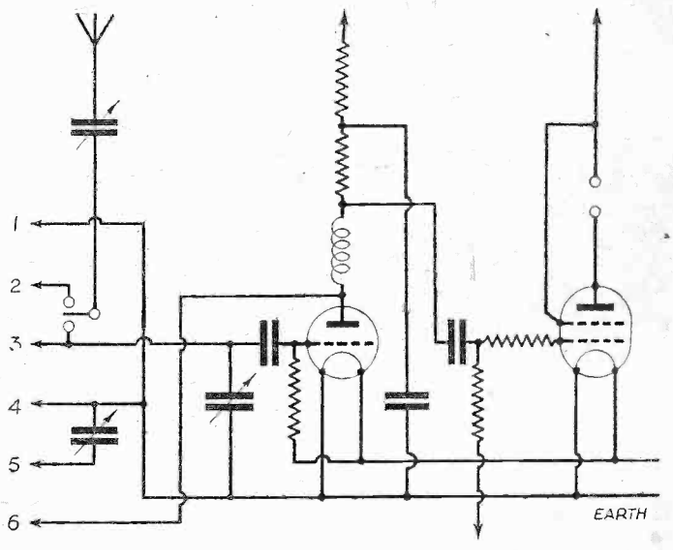


Fig. 2 (right).—Circuit diagram showing connections for a simple two-valver.

Coil Construction

When constructing coils for use with this apparatus, it must be remembered that all the windings are made in the same direction round the former, otherwise the correct "sense" will not be obtained, and the circuit will not operate efficiently, if at all.

There should be no difficulty about connecting the coils to the panel. With 3-circuit coils, beginning at the aerial end, the first lead goes to the first terminal, the second to the second terminal, and so on, down to the bottom of the reaction coil. With 2-circuit coils, terminals 1 and 2 are not used, and the aerial lead is switched to terminal 3.

To support the coil firmly in position when all connections are made, a large tapered cork or piece of wood is screwed to the baseboard, close to the terminal panel. The coil former is pushed over this, preventing any movement and consequent variations in inductance. Changing coils is a matter of seconds and has the advantage that no soldering is necessary.

The .0001 mfd. aerial series condenser, which is pre-set or fully variable, will require different settings for different coils (and these may be easily found after a little experimenting) to remove "dead-spots."

Finally, a few hints that may make a great deal of difference.

(a) Choose a piece of good quality ebonite; leakage losses can be considerable when inferior ebonite is used. To bring these losses to a minimum, try roughening the surface with a piece of emery cloth.

(b) When wiring the terminal panel in the circuit, do not forget that most important law of S.W. construction: keep all leads as short and direct as possible.—G. W. B.

Using Television Relay Stations

BEFORE the war the use of a number of small relay stations was put forward as an alternative suggestion to the employment of a cable link for the purpose of transferring the television programme signals generated at Alexandra Palace to one or more stations in the provinces where the programme would be rediffused for the benefit of inhabitants within the local service area. The authorities went so far as to state that tests were being conducted to ascertain the merits and demerits of each system with a view to accepting one of them for inaugurating the plan of provincial television. In the United States steps have already been taken to put the relay method on trial, with the idea that subsequently this can link up a network of television stations and so furnish a television service over a very wide area. The American experiment was undertaken with a main television broadcasting station, the signals from which were received at the relay station many miles distant. A special aerial array beamed in the proper direction and supported on 400ft. masts ensured that the received signal was satisfactory in every respect. From this point the vision and sound were fed to the local broadcast transmitter, so that all receivers within the service range of the latter were provided with ample signal strength to operate the sets, although in normal circumstances the sets were well beyond the service range of the main radio transmitter.

EXTERNAL AIDS

Simple Additions which May Be Made to Any Receiver for Improvement Purposes

By W. J. DELANEY

MANY constructors have a receiver which they have built or purchased and which, whilst it is more or less quite satisfactory, would lend itself to some slight improvement in one direction or another. At the same time they hesitate to make any modification to the actual wiring or components in view of the fact that they may spoil the results they are already obtaining. It should be realised, however, that it is still possible to effect improvements outside a receiver without, in some cases, actually interfering with the wiring or components in any way. Such improvements are, by the very nature of things, limited in their scope, but it is quite possible to effect considerable improvements to the working of a receiver by such means in certain cases. For instance, a receiver may be built without an output filter. If the receiver is self-contained such a filter is not essential. But as soon as an extension speaker is needed with the set, then some form of output filter is essential to avoid the passage of the H.T. supply through long leads with a consequent loss of voltage and inefficient working of the output stage. A mains unit may be purchased for the purpose of operating a battery set from the mains, and this may result in instability. Decoupling will, therefore, have to be added, and this also may be included outside the receiver. Selectivity may not be quite good enough. A wave-trap may be added to sharpen up the tuning. These are only a few of the directions in which external aid may be included and the exact lines of inclusion will now be detailed, so that the scheme may be followed in individual cases.

Output Filter

Taking the case of the inclusion of an output filter first. This consists only of an L.F. choke and a fixed condenser, and thus may very easily be added. In commercial receivers the choke is replaced by the speaker transformer which is fitted to the receiver, and sometimes the addition of an extension speaker does not silence the built-in speaker. In other cases a special silencing switch is fitted, but this is on the secondary side so that the speaker transformer is still in circuit. However, if you wish to use a single speaker and so avoid the expense of an additional model, then when it is removed from the set and taken to another room the transformer primary must be replaced in the receiver, and this is where the iron-core L.F. choke is used. Obviously, the output arrangement would be modified so that the speaker, whether used direct against the set or in another room, is filter-fed and the new arrangement is shown in Fig. 1. The choke and condenser could be screwed on the side of the cabinet, and a pair of terminals added. One of these is joined to earth and the other to the condenser, and then the speaker may be joined to the two terminals, or the single lead from the extension point joined to the "live" terminal. The choke should be of the ordinary type, having a rating of about 20 to 30 henries and capable of carrying, say, 30 mA. The fixed condenser should be of the 2 or 4 mfd. type and capable of standing the H.T. voltage used with the set.

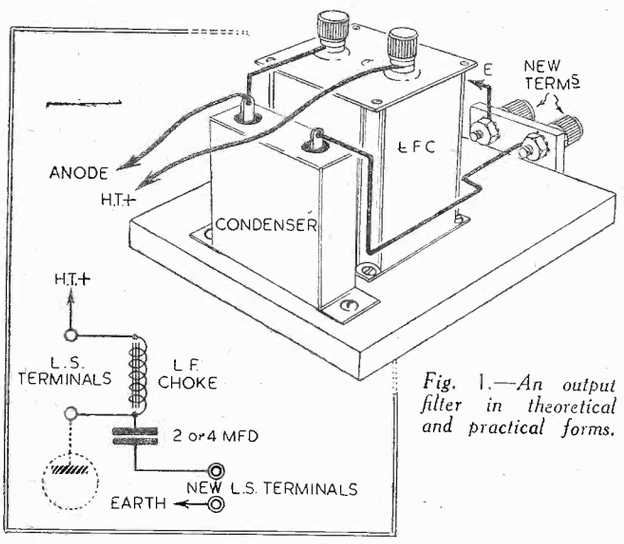


Fig. 1.—An output filter in theoretical and practical forms.

Decoupling

The problem of adding decoupling components is not quite so simple and depends to a great extent upon the type of receiver, that is, number of H.T. leads, and the type of mains unit being employed. It is often found when the S.G. or detector plugs on a simple mains unit are used for the supply of a battery set used with multi-battery cords, that instability sets in due to common coupling in the mains unit. In such a case the battery leads should be connected through decoupling circuits to a single maximum H.T. terminal on the mains unit. It may be possible to do this with only one of the battery leads, say, the detector feed, or the screen-grid feed, and therefore it may be desirable only to make up one such unit first and connect this. If it does not effect a cure, transfer it to the other lead, and if still ineffective you will have to use another circuit in the other lead. The decoupling unit itself consists merely of a fixed resistance and by-pass condenser, the latter preferably being of the 2 mfd. type and the resistance being selected according to the amount of H.T. which can be dropped in the circuit. Thus, if the detector stage is normally fed with 66 volts and the H.T. is of the 120 volt type, there is approximately 60 volts to dispose of, and the detector current will only be about 1 milliamp. This means that the resistance would be 60,000 ohms. If you wish to work out values for yourself divide the voltage to be dropped by the current in milliamps and multiply the answer by 1,000. The two components may be mounted on the cabinet or on a small piece of wood, and the H.T. battery lead joined to the junction of resistance and condenser, and the other side of the resistance is taken to the H.T. maximum socket or terminal on the mains unit. The free side of the condenser is, of course, joined to earth. If more than one unit is required it may be mounted on the same small base to preserve a compact arrangement.

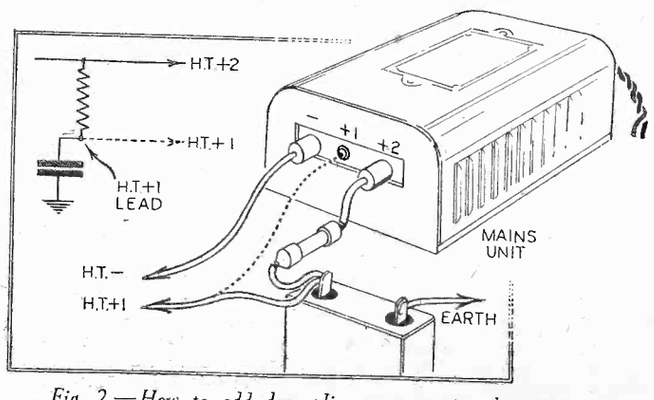


Fig. 2.—How to add decoupling components when using a mains unit.

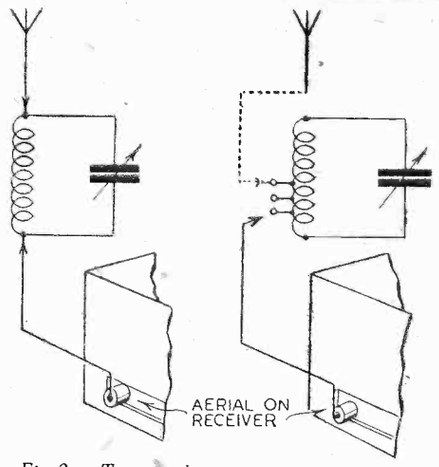


Fig. 3.—Two simple wave-trap arrangements.

Wave-trap

Where the problem is one which concerns selectivity the necessary addition of a wave-trap may be effected in an exactly similar manner. The condenser needed in a wave-trap need not be of the large, air-spaced type, but one of the small solid-dielectric variety generally employed for reaction control purposes. This may be mounted on the side of the cabinet, and the coil may also be mounted inside the cabinet near the condenser. The aerial will have to be joined to one side of the wave-trap

(Continued on page 80.)

ON YOUR WAVELENGTH

By Thermion

Definition of a Lowbrow

IN a case recently heard at Tottenham Police Court in which a lady was involved in a dispute with her husband she said: "My husband has no ear for real music. He listens to B.B.C. concerts, operas, and such-like, but when a dance band comes on he turns the wireless off."

Now we know what a lowbrow really is.

Death of Professor Edouard Branly

THE names of Marconi, Fleming and DeForest have become so fixed in the public mind in connection with radio that few remember the pioneer work of Professor Edouard Branly who was one of the earliest pioneers of wireless. He died on March 24th at the age of 96. He invented the first practicable appliance for the detection of certain electro-magnetic waves, using as a detector a glass tube of iron filings—the primitive form of coherer. This is the device which was later used by Marconi, who in 1899 radiated his first wireless telegram from England to France. The message ran: "M. Marconi sends M. Branly his respectful compliments by wireless telegraphy across the British Channel, this splendid achievement being due to the remarkable work of M. Branly."

Future of Component Makers

THE members of the Radio Component Manufacturers Federation recently met to discuss their future prospects. I was not present at the meeting, but I have some decided views on the subject. Radio component manufacturers originally founded their businesses on the demand for components required by constructors. When set manufacturers began to overtake the constructor, the component manufacturers tried to keep a foot in both camps by supplying components at special cut prices to set manufacturers, whilst in some cases charging high prices to the constructor. The inevitable result was that in many cases it was cheaper to buy a set than to make one. I know the reasons why it is not possible to sell one component at the same discount as a gross, but this would not account for the great disparity in price.

There will always be a good market for constructor components, and I can assure the R.C.M.F. that this journal survives because of the continued interest of those thousands of constructors who still prefer to build and experiment and learn, rather than buy and listen and be bored. I suggest that whilst they are troubled about lack of orders they should revive the interest in the market which not only provided them with their businesses but also with their skilled personnel.

I am certain that there is a large and as yet untapped market for components marketed at a price more in keeping with the times, and not so reminiscent of the hey-day of home construction when constructors in their ignorance and enthusiasm would pay fantastic prices for a hank of wire in a tin box and marketed under some fancy name. Do you remember the crystal racket? People paid as much as a guinea for a piece of bornite carefully wrapped in tissue paper with a cat's whisker and some trifling device for searching the crystal. I remember one device for connecting to the aerial which was claimed to give better reception. The device was carefully sealed up, but I smashed one open only to find that the aerial was connected to a strip of copper foil and was thus merely a connection between the aerial and the aerial terminal. They wanted 12s. 6d. for it, but after my letter and threat to expose, it was withdrawn from the market; and do you remember the old hedgehog transformers—a bundle of soft-iron wires with copper wire wound round in any old form? And the fancy coil winders, and the tripe which was written by alleged experts? Where are they now? Back to the obscurity and the obloquy from which they should never have been permitted to emerge. Their fancy talk of their laboratories used to make me sick. I knew a number of these tadpole-brained experts. Their laboratory consisted of a 5s. meter, a fretsaw, and a corner of the kitchen table. Many of them were merely schoolboys who, in order to impress, would walk about with a slide rule sticking from their pocket. They could not even read it.

Look back at some of your old wireless journals and see the nonsense which has masqueraded as powerful articles from leading experts. Some component manufacturers were merely racketeers, and they have deservedly gone to the wall, although I cannot altogether blame them. They knew nothing of radio, were merely in it to make as much as they possibly could, and retained some expert who knew even less to design their apparatus. The expert, of course, took his rake-off. Members of the public were not sufficiently knowledgeable in those days, and so the racket succeeded.

The specification of the average set looked like a combination of all the manufacturers' catalogues, and thus our solus policy was welcomed, as it gave the intending constructor a clear-cut idea of the parts actually used in our designs. Some, indeed, of the combination of parts specified in designs not sponsored by this journal would require a baseboard 6ft. square.

Now that the Augean stables have been cleansed, I suggest that the component manufacturers anxious as to their future should take stock of the past when considering the present, in order to ensure a future built on a more solid foundation than the sandy soil from which sprouted the now happily defunct mushroom racketeer wireless firms—and dealers.

Whilst I am dealing with this matter I must complete my exordium by stating that most of the racketeer dealers have gone also. Thus the manufacturers are left with ground from which the weeds and the stones have been harrowed, and in which it should be possible to plant the seeds of a successful and enduring industry.

B.B.C. Announcers

IT has been announced that not only will the B.B.C. augment the existing staff of announcers, but will broaden the scope of their duties. In future, announcing will take three specialised forms; there will be a team of news readers and another for general programme announcements, while a third will be chiefly concerned with presenting the Forces programme.

The new arrangement will involve the introduction of about ten new voices in one or other of the three categories. The method of presentation of the Forces programme will be considerably more informal than hitherto and there is a possibility of the introduction of a new woman's voice, together with representatives from the Dominions; the London team will include Lionel Gamlin. There will be four regular news readers in London, selected from Frank Phillips, Alan Howland, Joseph MacLeod, Alvar Lidell and Patric Curwen; the latter, though a new recruit as an announcer, is familiar to listeners as an actor. Stuart Hibberd will shortly be going to Bristol, where for the time being he will be heard once more announcing a wide variety of programmes, ranging from symphony concerts to light variety. Newcomers to the announcing staff will also be heard from Bristol and other Regions.

Wave Mechanics

A LECTURE by Professor D. R. Hartree, M.A., F.R.S. (Manchester University), on "Wave Mechanics" will be given on Friday, April 5th, before a meeting of the Institution of Electronics. The meeting will be held at 6 p.m. at the Royal Society of Arts, John Street, Adelphi, W.C.2, and readers of PRACTICAL WIRELESS are cordially invited to attend. Tickets can be obtained from the Secretary of the Institution of Electronics, A. H. Hayes, 27, Fetter Lane, E.C.4.

Comment, Chat and Criticism

Studying Music—1

In This Article Our Music Critic, Maurice Reeve, Appeals to Those Who Have Postponed or Abandoned Their Musical Studies

THE study of music was gravely affected by the outbreak of war. In the large centres of population the paralysis that overtook it was comparable to the cessation of scholastic education. Thanks to the leniency of the mighty Field-Marshal Goering in having so far spared us the horrors endured by the Poles and the Finns, it has revived a little; but only a little. People, and more especially parents, no longer feel terrified at the prospect of going a journey for their music lesson, as they did last September, and consequently many of those remaining in the big towns have resumed something approaching their normal routine and mode of life. But the profession is still very hard hit by the evacuations, and more especially the exodus of the big public schools, and many hundreds of teachers have been left high and dry. And a large number of adult students have either left town with their firms or joined the Services.

I would like this article to appeal to those left behind who, for one reason or another, have stopped their musical studies; and to those who have abandoned, through the war, any ideas they may have formed of commencing taking lessons. My urgent advice is—reconsider your decision at once. To those of you who stopped learning, I would say "resume your lessons as soon as possible"; whilst to the others who gave up the idea of studying, I say, "commence straight away." I will deal with each of these groups separately.

Existing Students

At the outset I would emphasise that my remarks are not addressed to any particular class of student or musician, and certainly not the so-called "high-brows." I appeal to anybody who studies an instrument for no matter what purpose.

Although success in the playing of an instrument can only be finally achieved through interpretative qualities, and the ability to "say" something original and appealing on that particular instrument, the goal can only be reached through mechanical means. What we have to say must finally depend on *how* we say it. I am not trying to put the cart before the horse, but just as the very finest motor-car or *de luxe* train would be impossible and unrealisable without certain essential prerequisites of permanent way or road surface, signalling or traffic control and other details, so is a concert artist impossible unless the mechanical apparatus through which alone he can convey his message to us and interpret his music is always in perfect condition. When appearing before us as an artist he naturally makes of his technical equipment a means to an end—the end being the interpretation of the music. But this mustn't hide from us the fact that his technique *must* be acquired first and constantly maintained at "concert pitch" just as the modern metalled highway was brought to its present state of perfection the moment the potentialities of the motor-car were realised.

Now, one of the chief objects when taking a course of lessons is to acquire a technique, with which we can later on interpret music and play it generally and, within our individual limits, so to gain a comprehension of the mechanical side and manipulation of a given instrument that, when pronounced ready, we can, to continue in a metaphor already employed, "become our own chauffeur," and "drive our own car." Side by side with the lessons, and the one acting as the complement of the other, comes the daily practice. It is this constant and unfailing seeing to the mechanism, plus the correction and further instruction at the weekly lesson, that is so essential. For, like all things mechanical, it *must* be maintained in all its parts, and its "running efficiency" regularly proved. Just as an engine cannot be parked indefinitely without a steady deterioration taking place in it, so a student cannot suddenly cease his studies without losing his technical efficiency. Only in music the decline is infinitely more rapid. What has been laboriously built up after months of careful and earnest cultivation disappears as snow before the sun.

The muscles become hardened very quickly, with a consequent loss of responsiveness in the fingers. Several months are often required to recover one's former status, and to merely restore the *status quo*. For this reason alone I would earnestly appeal to all those who, with the best reasons in the world, have decided to "park" their lessons for the duration to reconsider things, and if they had the slightest pretensions to being serious over it, to recommence them with as little delay as possible.

Resuming Studies

The remainder of this article will consist of a reasoned appeal to those who have decided to postpone their study of an instrument until after the war to reconsider that decision, always provided that no insuperable barrier to their doing so, such as a serious diminution of their income, has arisen.

Few, if any, of us will ever become Paderewskis no matter how long we study. For the vast majority of us it may not even be possible to reach what I may call an ordinary concert standard. For this we ought to be profoundly grateful; there is absolutely no pleasure in such a livelihood, whilst the toil and sacrifice demanded have been testified to by the most renowned artists.

But the pleasures, and profit to many, that are open as the reward of four or five years of careful and diligent study are many and varied. Take accompanying to start with. I should say without hesitation that to be able to play a good accompaniment is easily the biggest reward one can have for their labour, and that justifies up to the hilt any expenditure of time or money that may have been made.

First, a good accompanist *must* be a good, intelligent and musical player. It is always possible for a soloist pure and simple to be out of action at any time, and for any reason. During such periods the decline in mechanical efficiency will place him *hors de combat*, for the reasons entered into above. But the accompanist can always go into action, and show his mettle and prowess.

Secondly, as a social asset, his value is enormous. He is in the proud position of knowing that, without his co-operation, all vocalists, violinists, etc., are utterly immobilised; they can do nothing until he is found. If he is at all good at the job, he is going to be absolutely *persona grata* in any house whose circle of visitors needs his services.

Thirdly, he constantly acquaints himself with one of the most important and beautiful portions of musical literature—a big enough reward in itself.

Fourthly, there is many a useful guinea to be picked up by a good accompanist; guineas that are utterly beyond the reach of soloists, whilst a really excellent master of the craft can possess a splendid career. Although the soloist takes the credit for any success achieved, much of it belongs to the accompanist, which can at least be a source of secret satisfaction to him.

Fifthly, there is the ability to read all the operatic scores in the form of piano reductions; the key to a treasure house indeed.

Reading Music

All this can go on in spite of wars and black-outs; in fact, its value is enhanced thereby. Without any question whatever, your studies will amply repay you if you can gain the art of reading music efficiently and profitably.

Whilst on the question of reading music, I must not refrain from emphasising the enormous pleasure gained from reading the piano reductions of the famous symphonies. Also that one must attain a reasonable degree of proficiency as a player in order to cull the full satisfaction from this most delightful pastime.

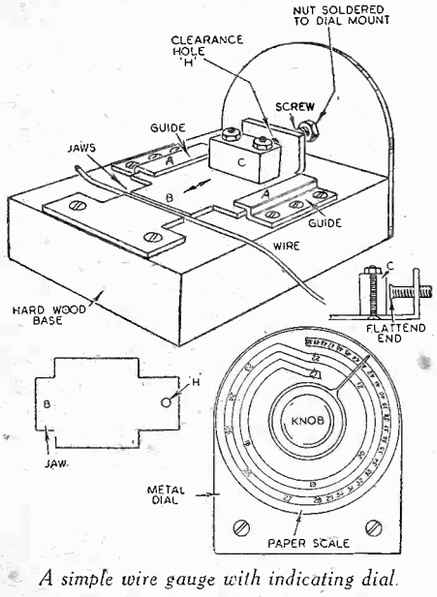
To the jazz fiend I would say that you must acquire a considerable degree of finger agility, enabling you to maintain the rhythmic urge of your numbers, even though you will not have to call into play the subtleties of tone colour and interpretation. A good rhythm player must have a period of orthodox study in order to gain this facility before branching out into it with hopes of success.

As a form of spending it cannot conflict in any way with the nation's needs for economy, and with any of the advice tendered to us by those in authority. And as a form of mental and physical relaxation in these strained and taut times it can have few rivals. I strongly advise you to study some branch of music even though the war may prevent your freedom to decide for some time exactly what you will do with its result.

Practical Hints

A Simple Wire Gauge

THE accompanying sketches give details of a simple but accurate wire gauge. The jaws are constructed from heavy gauge aluminium, or other suitable material, and the base is a piece of hardwood. The moving jaw is kept in position by two shaped pieces of metal (A), as indicated.



A simple wire gauge with indicating dial.

The dial, which is of the same metal as the jaws, is screwed on to the wooden base, and a nut is soldered to the centre to hold the threaded rod to which the pointer is attached. On one end of the moving jaw is a projection which is bent at right angles to the jaw. Through the centre of this a hole (H) is bored and the rod is passed through, the end of it being flattened slightly to prevent it from coming out again. Next a piece of metal (C) is screwed on to the jaw near the raised projection so that the threaded rod is fixed to the jaw, and can push it along.

The pointer is a piece of stiff wire, and is soldered to the knob. Other details are clearly shown in the illustrations.

The dial consists of a piece of paper stuck to the metal front.

If the threaded rod has a pitch of 1/36in. then one turn of the pointer will be sufficient for gauges 50-22, and a second turn for gauges 22-17. The gauge can also be used for sheet metal.—F. R. FREDERICKS (Finchley).

A Jack and Plug Adaptation

WHEN modifying my short-wave receiver recently I decided to make provision for using the 'phones by tapping the first L.F. stage in the manner shown inset in the accompanying sketch.

Experimenting with different forms of switching so that the simplest operation could effect change over from 'phones to speaker, at the same time interrupting the filament circuit to cut out the final tetrode valve, I hit upon the scheme illustrated.

This arrangement required a little extra care in modifying the plug shank to act as a combined insulating and contact operating cam. On dismantling the plug by removing the sleeve and terminal screw plate inside (tip contact fitment), I then pulled the tip contact centre shank free with the aid of a vice and pliers. This left me with a "shell" (sleeve) and ebonite insulating medium. I then inserted the plug in the jack and scribed off the limits of the jack (determined by the raised ebonite portions separating the contacts).

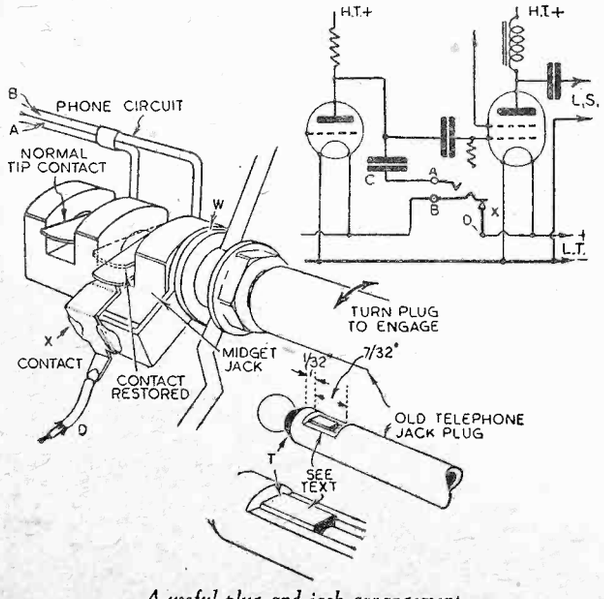
After this, it was necessary to file down the brass sleeve within the limits shown in the illustration, but the ebonite tip insulator "T" was removed first of all by gently tapping this out. The sleeve had to be filed down below the level taken by the slightly-filed ebonite piece "T," this providing the insulated cam action, whilst the depth should be sufficient to provide a suitable contact movement.

After checking carefully by a trial assembly, the plug was again dismantled and thoroughly cleaned of the brass filings which worked into the sleeve.

The inset circuit clearly shows how the by-pass capacity "C" is returned to positive L.F. to permit the combined function of switching and by-passing.

When the plug is turned to engage the extra contact "X" it will be apparent that it becomes locked in the jack, but this serves no intended purpose.

The extra contact comprises a brass washer, with an extension piece, fitted between the jack and the back of panel washer "W," the contact proper being of thin resilient copper soldered to the shank.—W. E. WELLS (Brentwood).



A useful plug and jack arrangement.

THAT DODGE OF YOURS!

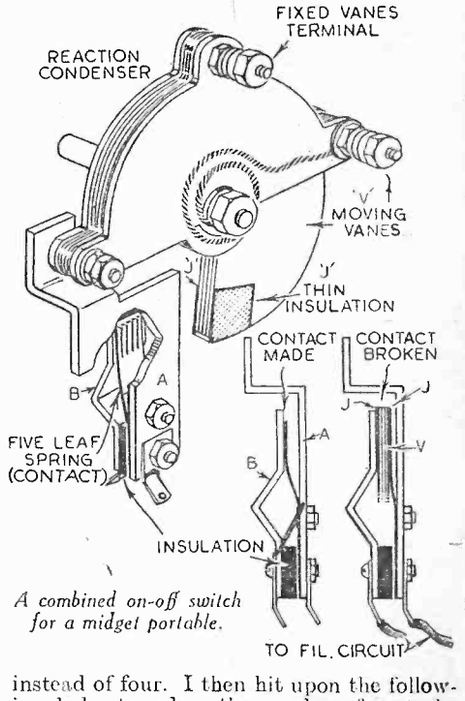
Every Reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best hint submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending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

SPECIAL NOTICE

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

A Combined On-off Switch

WHILE building a midget portable, I found that I wanted, for convenience and appearance, three knobs on the front instead of four. I then hit upon the following dodge to reduce the number of controls. On to the reaction condenser I fixed a metal strip (A), as shown. Fixed to the top of this, but insulated from it, I fixed another strip on the other side of the moving vanes. When the moving vanes are wide open they separate the spring from the strip (B) and, as they are insulated, the contact between (A) and (B) is broken. When the volume control is open the set is off, and to switch it on the vanes are closed a little, enough to release the spring, and then the required volume can be had by shutting the vanes more.—D. ATKINS (Hounslow).



A combined on-off switch for a midget portable.

Checking Your Accumulator's Charge

A Novel Device which Automatically Checks Up on Your Charging Station - - - By DEREK ARCHER

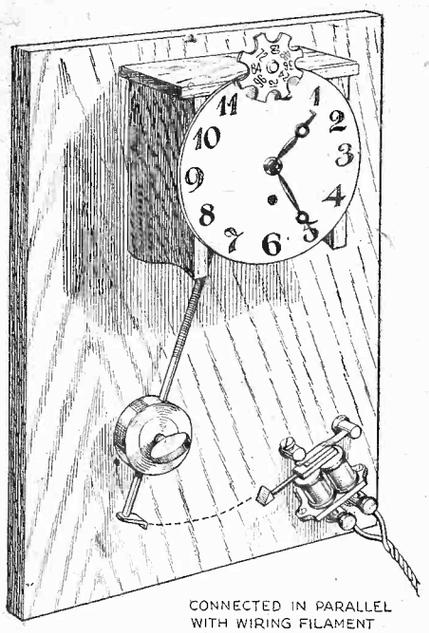


Fig. 3.—A general view of the finished clock.

SOME accumulator charging stations are not exactly what they should be, and possibly due to carelessness or too many accumulators to charge on an inadequate plant, it is found that one's accumulators last for different periods each time of charging. Whereas sometimes the accumulator lasts a week, other times it lasts a fortnight. The writer has had much experience of this, and much argument with the charging station, and for some time kept a log. Although this was satisfactory up to a point, one cannot expect other users of the same receiver to have the same interest, and, therefore, the log was not an accurate one. To remedy matters the writer rigged up the following device, which has given some satisfactory service, but has opened up interest from many points of view. The device counts up the actual time the receiver is in use, and gives a true account of the life of the accumulator charge. It also indicates the hours the receiver is used by others than the writer, and indicates over longer periods the life of an H.T. battery—not by so many months, but by the actual hours.

Mounting the Clock Movement

Obtain an eight-day clock movement, one with a pendulum, or an ordinary one-day clock will do, providing the winding is

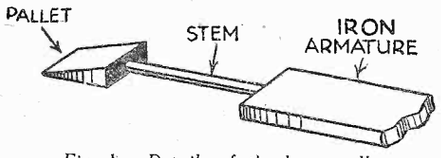


Fig. 1.—Details of the brass pallet and armature.

not forgotten. A clock with a rotating flywheel is not recommended, as it is nearly impossible with simple mechanism to make it start by itself once it is stopped. Also obtain an electric bell movement in good condition. Mount the clock movement on a piece of stout board towards the left-hand side. The principle of the idea is fully explained, and the details can be decided as the mechanism is put together. Remove the brass ball at the end of the stem of the bell movement and solder in its place a brass pallet-shaped, as shown in Fig. 1. The faces of the pallet should be smooth and free of solder. Then solder to the end of the pendulum rod another pallet made from thin brass strip. This should be made fairly light so that the timing of the clock is not affected more than can be corrected by the usual adjusting screw. Now set up the clock movement to work in its proper position, and offer up the bell movement so that the pallet on the pendulum just misses the pallet on the end of the bell arm when the armature of the bell is pressed up against the pole pieces. Secure the bell movement in this position. The movement can be secured to a piece of wood provided with slots so that adjustments can be made after it is mounted. Then adjust the usual contact screw, which will now be used electrically to push the armature towards the pole pieces so that the two pallets just engage in one another when the armature is released. Sufficient engagement should be allowed to hold the pendulum back just at the top of its swing.

The Wiring

Disconnect the two wires of the bell movement and take the two wires from the coils to two conveniently placed terminals on the clock board. These two terminals are then connected up by flexible wire to the receiver. The wires are connected direct to the two filament terminals of one of the valve-holders, so that current is only applied to them when the receiver is switched on. The circuit and the complete arrangement is shown in Fig. 3. It is important to note that the two wires must not be connected across the accumulator terminals or across the filament switch. Some tests should now be made to see that the device is working correctly. Catch the pendulum up on to the bell pallet and switch on the receiver. The current should then traverse the windings of the coils and magnetise the cores. The armatures should then be drawn up to the pole pieces and the pendulum released and the clock started working in the usual way. The receiver should next be switched off when the armature returns to its normal position against the adjustment screw. The pendulum on its next swing will thus catch up on the pallet and the clock will be stopped. There are one or two points which require attention. It may be found that the armature refuses to "come unstuck" when the receiver is switched off. This is due to the residual magnetism in the cores and the armature, but this may be overcome by securing a piece of paper to the ends of the cores or on the back of the armature so that the armature and the ends of the cores do not come into contact with each other. Another method is to run a small blob of solder on the top of each core—anything to prevent the armature and the hole pieces touching, and so sticking together when the current is switched off. Another point which may require attention is the fact that the armature may not release when the set is switched on owing to the weight of the pendulum pressing too hard against the pallets. The faces of the two pallets should be filed so that they slide over each other easily, and, if necessary, they can be polished. Another point which requires attention is the two coils of the bell movement. Usually, these coils are of a very low resistance, the pair used by the writer being 4 ohms, and therefore, pass a fairly large current. In fact, the coils can use up as much current as the valves in the receiver. This must, of course, be cut down considerably. The insertion of a 400-ohm resistance in one of the leads to the coils cuts the current down to about 5 m/A, which is quite small compared with the current taken by the receiver. However, it may be found that the ampere turns on the coil have been cut so low that the armature will not operate with so small a current. The bobbins can be rewound with No. 40 enamelled wire, and the resistance will then come up to several hundred ohms.

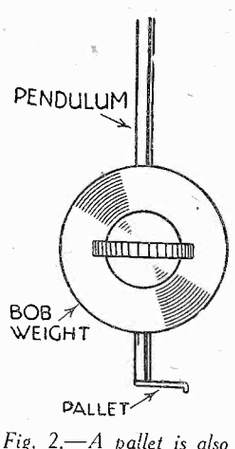
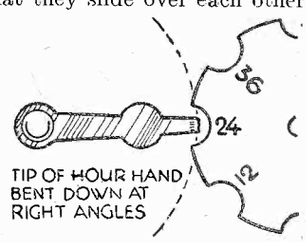


Fig. 2.—A pallet is also fitted to the end of the pendulum.

Fig. 4.—Showing how additional hours may be recorded.



Radio in the Services

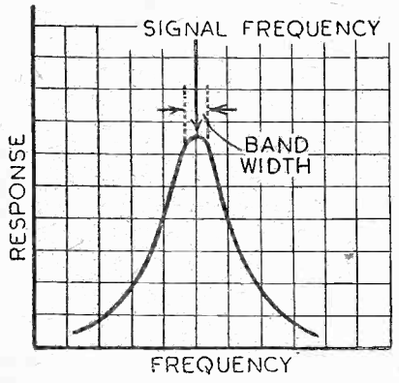
A Refresher Course for the Radio Mechanic—4

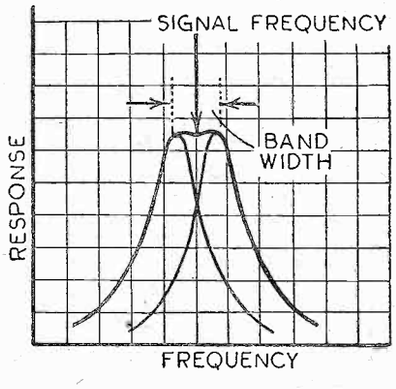
By Frank Preston

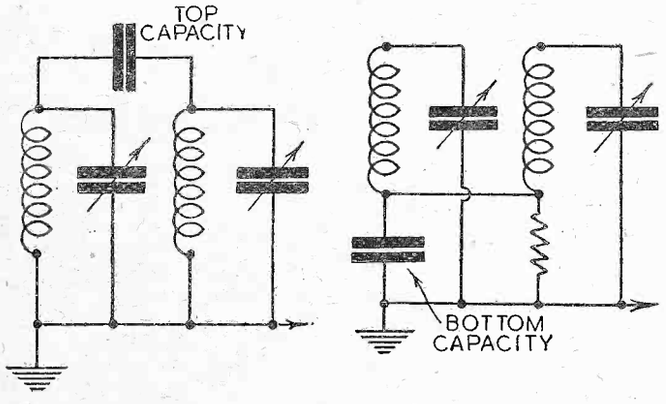
A Further Series of Questions Such as May Be Asked of Applicants for Enrolment as R.A.F. Radio Mechanics, Along with Appropriate Brief Replies

EXPLAIN as simply as possible the difference between trimming and tracking, as applied to tuning circuits.

Trimming consists of balancing the tuning circuits—generally by adjusting the pre-set condensers associated with the different sections of a gang condenser—to compensate for stray capacities. In other words, the object is to ensure that each tuning circuit shall resonate at precisely the same frequency for any setting of the tuning condenser. If this were not done, one circuit may be tuned to a slightly different frequency or wavelength from the rest, with the result that tuning would be broadened and sensitivity reduced.







(Above) Two simple graphs to show a "peaked" tuning curve for a single-circuit tuning and the flattened curve obtained with a band-pass tuner by combining two tuning peaks. (Left) Two simple band-pass circuits.

Tracking consists essentially of balancing the tuning circuits of a superhet to ensure that the difference in frequency between the signal-input circuit and the oscillator circuit remains constant irrespective of the position of the tuning control. The important point is that the rate of change of frequency for any given movement of the tuning control is different for the two circuits if the frequency difference (intermediate frequency) is to remain constant. A pre-set condenser, or more than one such condenser, is used for tracking, but this is not in parallel with one section of the tuning condenser, but is more usually in series with either the oscillator section of the condenser or with the oscillator coil.

What purpose is served by a band-pass tuner? Give a diagrammatic band-pass circuit to illustrate your answer.

The object of a band-pass filter is to provide the utmost useful selectivity combined with a sufficiently wide tuning channel to avoid the cutting of high audio frequencies, or high notes. It is well known that if a single-circuit tuner is made highly selective the tuning "peaks"; in other words, the required signal can be heard over only a very narrow band on the tuning scale. This means that all the higher audio frequencies are lost, or not passed on to the circuit following the tuner.

To obtain satisfactorily good reproduction from a modern broadcast transmission it is necessary that the receiver should respond evenly to a frequency band of at least 8,000 cycles. This means, in effect, that the tuning circuit should give even response to frequencies between 4,000 cycles below and 4,000 cycles above the fundamental or signal frequency.

This is achieved by combining two sharply tuned circuits, one "peaking" at a slightly higher frequency than the other. Thus, the two together give a flat-top-peak tuning curve. The adjustment of the two circuits is generally made so that the top of the "peak" extends over about 9,000 cycles or 9 kilocycles.

Two different forms of band-pass filter are shown in the accompanying circuits. In one case the coupling is by means of top-capacity (a very low-capacity condenser joining the high-potential ends of the two coils), and in the other case by bottom capacity. In the former case tuning is sharpened, or the band width reduced, by reducing the capacity of the condenser; in the latter, the band width may be reduced by increasing the capacity of the condenser.

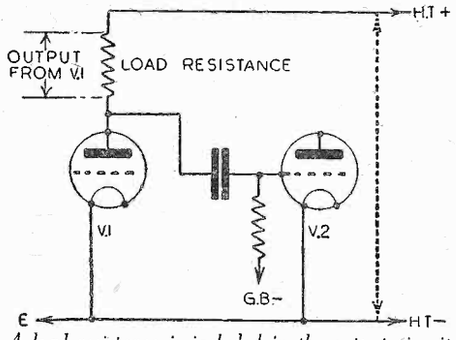
How could you tell whether or not an H.F. or detector valve was oscillating?

In the case of a detector valve the simplest method is to touch the grid terminal with a moistened finger tip. Oscillation is generally indicated by a "plop" in the 'phones or speaker. Another method is to include a milliammeter in the anode circuit of the valve and notice any change in reading as the grid terminal is touched. This test can generally be applied to either an H.F. or detector valve.

Should the current rise as the grid terminal is touched the valve is in a state of oscillation—or at least it was until the grid terminal was touched. Touching the terminal stops oscillation, and thereby causes the anode current to rise.

What is a load resistance?

It is a resistance used in the output circuit of a valve or rectifier. The output from the stage (it may be a valve, H.F. metal rectifier or crystal detector) is built up across this load resistor, so that there is a potential difference between the two ends; it is this which is used to operate 'phones, a speaker or a following valve.



A load resistance is included in the output circuit of an amplifying stage, and it is across it that the output is developed. This is applied to the following stage. A broken line is used to show the completion of the circuit through the H.T. supply.

It is not necessary for the resistance to be a normal resistor, but it may be an H.F. choke (in an H.F. circuit), an L.F. choke or the primary of a transformer. When not a resistor, the output-coupling device would be referred to simply as the output load or anode load.

Draw an outline circuit showing the connections for a parallel-feed transformer, and explain the chief advantages of this method of coupling.

A diagram is shown on page 71, and from this it may be seen that the anode current for the valve preceding the transformer is carried entirely by the fixed anode (or

(Continued on page 71.)

New Detector Circuits

Detector Valves which Give Fidelity with Some Degree of Amplification are Described in this Article

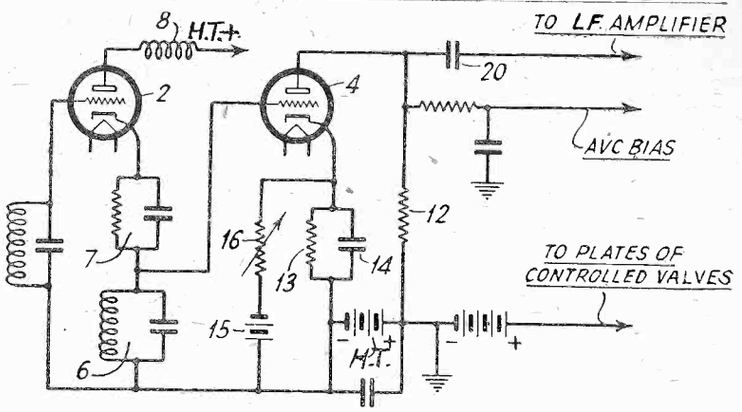


Fig. 2.—Another detector arrangement applicable to a superhet.

ALTHOUGH linear detectors, such as the diode type and the triode type with cathode feedback, are now well known, these detectors both suffer from lack of amplification, and other detectors giving comparable fidelity with some degree of amplification are of interest.

A modified form of anode bend detector with some interesting properties will now be described. Referring to Fig. 1, the secondary winding of the I.F. transformer 5 of a superheterodyne receiver feeds the signals to the valve 2 which in turn feeds the detector valve 4. In order to provide the amplifier stage with a low internal impedance, the circuit 6 is disposed in the earthed cathode lead of valve 2. The usual bias resistor-condenser network 7 is disposed between cathode and the circuit 6 for providing a normal bias on the amplifier grid. Appropriate positive potential may be applied to the anode of amplifier 2 through a radio-frequency choke coil 8.

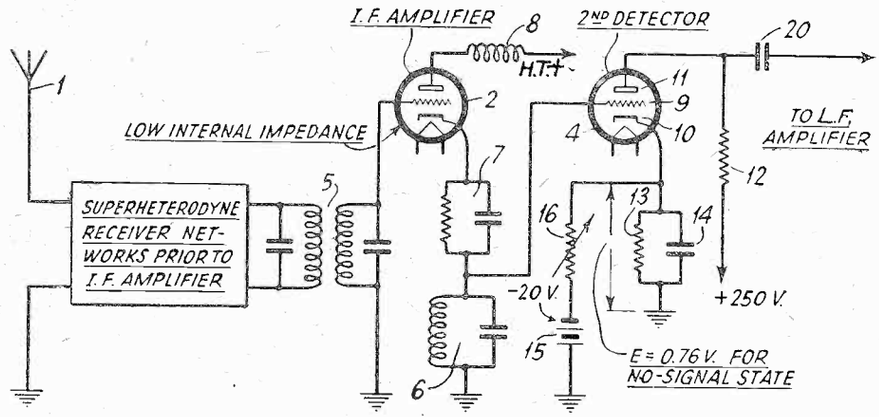


Fig. 1.—Detector stage, showing the cathode circuit improvement.

Circuit 6 is resonated to the operating I.F. value, and is effectively connected between the control grid 9 and cathode 10 of the detector valve 4. The valve 4 can be a triode of the 6F5 type, and the anode 11 thereof is connected to a current source, through an anode load resistor 12. The resistor may have a magnitude of approximately 100,000 ohms, and a potential of about 250 volts is applied to the anode 11. The cathode 10 is connected to earth by a resistor 13 of about 700 ohms; the resistor is by-passed for I.F. currents by condenser 14 having a magnitude of 0.2 mf. There is provided in shunt with the self-bias resistor 13 an auxiliary 20-volts current source 15, the negative terminal of which is connected through adjustable resistor 16 to the cathode end of the bias resistor. The resistor 16 is preferably adjusted so that the effective potential E across resistor 13, in the no-signal state, is 0.76 volts.

Distortionless Rectification

The relation between RMS volts input and the magnitude of E is illustrated in Fig. 3. It will be observed that there exists a wide region of distortionless rectification, as shown by the area between the vertical dotted lines. The curve demonstrates that the grid bias of the detector valve is influenced by the signal input and by the current from auxiliary current source 15. The latter may be, if desired, a bleeder resistor in the common voltage supply source of the receiver. With no signal input to detector 4, the bias on grid 9 is determined by the normal flow of current of the triode, and by the current from 15. In this case, since the source 15 opposes the space current flow through resistor 13, the normal self-bias of the valve has its value reduced, as is shown by the initial portion of the curve. Between the region of 0.3 volts and 2.0 volts (RMS input) is the region of operation which produces no distortion in the output of the triode. The constants of the detector circuit are so selected that the necessary bias E is developed to produce distortionless operation with any input between the limits quoted.

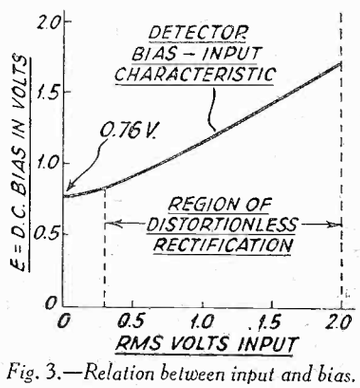


Fig. 3.—Relation between input and bias.

The audio voltage is tapped off across the load resistor 12, and the voltage is transmitted to the audio utilisation network through condenser 20. Since the grid bias of the detector valve is close to zero, the signal source coupled to the detector input circuit 6 is of low internal impedance. The amplifier 2 has circuit 6 in its cathode lead to provide such a low-impedance source. Of course, any other type of signal network which has a low internal impedance may be used in place of the cathode loaded amplifier valve 2. For example, a power triode could be used.

A.V.C. Bias

This detector circuit has substantial gain; high R.F. amplification is not needed. It can readily feed the usual audio amplifier network. Further, it provides carrier amplification, and hence delivers sufficient direct current voltage for A.V.C. bias purposes. This is secured by a rearrangement of earthing points to permit the D.C. voltage across resistor 12 to be applied to the grids of controlled valves. One connection, shown in Fig. 2, which provides this is to earth H.T.+ of the detector valve, and replace the present earth by the negative terminal of the H.T. source, which is by-passed to earth for low R.F. impedance. The control valves have a higher H.T. voltage above earth for their anode supply. In this respect the detector is of advantage over a diode rectifier or a degenerative plate circuit detector (also termed an infinite impedance diode detector). The latter have no gain, and hence need substantial radio-frequency amplification prior to detection.

Again, the present type of detector circuit is of advantage over the so-called linear power detector circuit, wherein the linear portion of the biased detector characteristic is utilised. In the latter type of detector circuit it is required to utilise sufficient radio-frequency amplification prior to the detector input circuit in order to operate along the linear part of the characteristic. Again, it is necessary to utilise a high negative grid-bias in such a circuit. In the present detector circuit the range of signal input voltage is relatively wide, although the magnitudes of the signal voltages themselves are small. A gain of 30 can be expected from this type of detector. With 1 volt RMS input on the grid, as high as 40 volts D.C. can be secured.

Harmonic Distortion

Distortionless detection is secured by virtue of a distortion balancing action. While it is believed unnecessary to enter into a discussion of the theoretical aspects of the functioning of the detector circuit, yet it is pointed out that, in general,

(Continued on facing page)

NEW DETECTOR CIRCUITS

(Continued from previous page)

harmonic distortion created by curvature in the square lower detection characteristic is balanced out by complementary distortion introduced by proper choice of the detector circuit constants. In other words, the resulting detector characteristic is not necessarily a linear one; it is more accurate to describe the detector circuit as being distortionless in operation over a predetermined wide range of signal input voltages. Hence, it will be seen that the present detector circuit not only provides freedom from harmonic distortion but at the same time produces sufficient audio voltage and carrier voltage gain to render the network desirable for use in the standard type of broadcast receiver.

In Fig. 4 there is illustrated a circuit arrangement wherein the detector circuit performs an additional function. The numeral 30 designates a valve of the 6E5 type. Briefly, this type of valve comprises a triode section which includes cathode 31, control grid 32 and anode 33. The valve also includes a fluorescent target 34, and an electron ray control element 35. The control element 35 is disposed between the target 34 and a second cathode 36, both cathodes 31 and 36 being at a common potential. The observer views the interior face of the target which is coated with a fluorescent material, and the target is usually cone-shaped. The control electrode 35 projects from the anode 33, and both electrodes are connected through the load resistor 12 to a source of positive potential H.T. The target 34 is connected to the positive end of load resistor 12.

Biasing Network

In this arrangement the triode section 31-32-33 functions as the biased detector section, and the biasing network connected in the cathode circuit is the same as in the case of Fig. 1. The audio voltage is taken off from the negative end of load resistor 12. Normally the positive target 34 receives electrons from the cathode 36. These electrons cause the fluorescent coating on the inner face of the target to glow, and the target has the appearance of a ring of light. When the potential of electrode 35 is less positive than the target, electrons flowing to the target are repelled by the electrostatic field of the control electrode, and, therefore, the electrons do not reach that portion of the target directly behind electrode 35. The control electrode 35 is said to cause shadow on the glowing target. Since the potential of electrode 35 varies in response to the potential drop across load resistor 12, it will be clear that the shadow on target 34 is of variable width. Therefore, it will be seen that the electron indicator is able to indicate the signal carrier amplitude by virtue of the direct current voltage drop in the detector plate circuit. H.T. supply may be 250 volts, and the load resistor 12 can be 500 ohms.

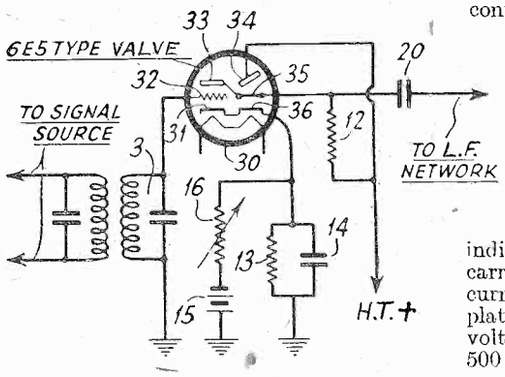


Fig. 4.—In this arrangement the detector performs an additional function.

These circuits were developed in the R.C.A. Laboratories.

RADIO IN THE SERVICES

(Continued from page 69)

load) resistor. Only the audio-frequency currents are passed to the transformer, these being applied through the .01-mfd. coupling condenser. In consequence of this method of coupling, the transformer primary winding is relieved of the need for carrying D.C. as well as A.F., and therefore it can be wound with finer wire. A more important point is that the effective inductance of the primary, for any given number of turns and core size, is appreciably greater than if a heavy D.C. current had to be carried. Conversely, the required inductance can be secured by employing a smaller transformer; this has the practical advantages of cheapness and compactness.

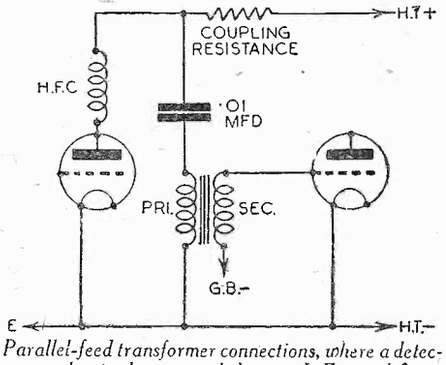
There is another less-important advantage of parallel-feed, which is that a number of different coupling ratios can be obtained by varying the connections to any one transformer. Thus, a ratio of unity would be obtained by connecting primary and secondary windings in series and joining both the grid of the following valve and the anode-coupling condenser of the preceding valve to the upper end of the windings. The highest ratio is obtained by connecting the windings in series, joining one end of the secondary to the grid, one end of the primary to the G.B.— and the series junction to the coupling condenser. By this means an effective ratio of 1 : 4 would be obtained when using a 1 : 3 transformer.

What is the object in screening components and sections of a receiver?

The screen is primarily intended to prevent the magnetic fields of two components from linking; if they did link there would be inductive coupling between the components. And if, for example, the grid coil and anode-circuit H.F. choke of an H.F. amplifier were coupled together, the valve would be thrown into a state of oscillation. By placing an earthed screen between the two, the components would be isolated as far as their magnetic fields are concerned.

Precisely the same conditions apply when a whole portion or stage is screened, or even when a connecting lead is screened. For H.F. circuits the screen must be non-ferrous if losses due to eddy currents are to be avoided. Copper is probably the best metal for screening in an H.F. circuit, but aluminium, which is a good deal cheaper, is completely satisfactory in nearly every case.

For screening in low-frequency circuits or in A.C. mains power-supply circuits, soft iron is the most effective material. It should be of fairly heavy gauge.



Parallel-feed transformer connections, where a detector valve is shown coupled to an L.F. amplifier.

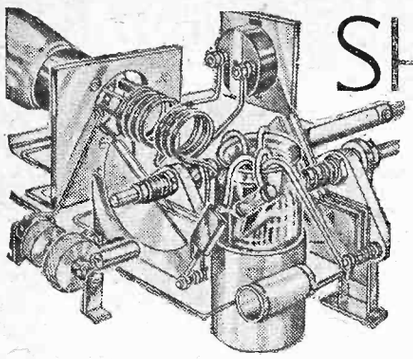
What is (a) mutual conductance, and (b) conversion conductance?

Mutual conductance is a measure of the "goodness" or efficiency of a valve, and is stated in milliamps per volt. It is the ratio of the small change in anode current of a valve brought about by a small change in grid voltage, when all other voltages remain unaltered. The term is often described as the "slope" of a valve, since mutual conductance is indicated by the anode current-grid volts curve; the steeper the slope of the curve, the higher the mutual conductance.

Conversion conductance is a term used in connection with a frequency-changer, and is expressed as microamps per volt. It is the ratio between the I.F. current in the output circuit to the corresponding input signal voltage applied to the grid of the valve. Conversion conductance is really the counterpart of mutual conductance of an amplifier valve.

Frequency Modulation and Television

ALTHOUGH it was known that a few months ago the question of frequency modulation as a means of radiating television signals was being investigated in this country, the advent of war completely upset the plans for conducting practical tests on a really large scale. This has not been the case in America, however, where the development of a public service on financially self-supporting lines is being tackled in a determined fashion by co-operation with advertisers. It is, of course, known in that continent that the use of frequency modulation would make an enormous difference to the signal-to-noise ratio, but unfortunately there is the corresponding disdavantage that the channel width would have to be increased. Consideration is therefore being given to the possibility of a compromise whereby the theoretical essential increase in band width can be omitted, and a practical use made of a figure below this. By this means the full advantage of noise reduction would not be forthcoming, but there would be an important compensating factor introduced. That is to say, the peak power of the transmitter could then be made to coincide with the carrier power instead of having to be four times this figure, as in the case of the more orthodox amplitude modulation. This would straightway increase the range of the broadcasting station, as well as showing a marked improvement in the results observed in sets already within the accepted service area. Within the service area alone, therefore, there would be a substantial increase in the number of people able to enjoy noise-free television pictures, and for this reason the new system merits a very close investigation. This should be done before the number of viewers reaches a high figure, as complications arising from compensation for replacements or modifications could then be kept within reasonable limits.



SHORT-WAVE SECTION

AN A.C.-D.C. SHORT-WAVE CONVERTER

An Efficient Three Wave-band Unit, which is Simple and Cheap to Construct — By THE TECHNICAL STAFF

CORRESPONDENCE indicates that there is now a far greater demand for a converter unit than the early type of adapter. Although the latter is quite satisfactory, when used in conjunction with a reasonable design of the detector and L.F. type of broadcast receiver, it would appear that superhet and H.F.-Det.-L.F. circuits are now more widely used, therefore, it is a far better proposition to use a S.W. converter and make use of all the stages in the receiver.

For the benefit of those not too familiar with the two forms of S.W. units under discussion, it should be noted that an adapter, as its name implies, allows only the detector stage of the receiver to be adapted to tune over the short-wave bands, but with a converter, the receiver circuit, provided it incorporates one or more stages of H.F. amplification, is actually converted into a very efficient short-wave set operating on the superhet principle. This arrangement gives greater sensitivity and selectivity, and once the operator has got the touch of the controls, some very satisfactory and surprising results, bearing in mind the simplicity of the apparatus, can be obtained.

The early form of S.W. converter made use of a single triode valve acting as an autodyne arrangement, which virtually allows the valve to act as a detector and oscillator. Owing to the operating characteristics of this type of circuit, there are one or two defects which can prove rather annoying; therefore, with the introduction of the modern frequency-changing valves considerable progress has been made in the design of S.W. units, and all the early snags and inefficiencies eliminated.

The unit described in this article is a typical example of what can be done with a single modern multi-electrode valve, plus well-designed coils. As a matter of fact, the circuit itself is built round the commercial coils specified and differs in one or two respects from the original bench test model. The circuit can, of course, be used with suitable plug-in coils, as in the case of the initial design, but when the several advantages offered by the three-range coils specified are appreciated, it will be realised that the change in circuit design is well worth while. The objection to multi-range coils, or should we say, the objection which used to be raised, namely, losses due to complicated switch wiring and switches with high H.F. losses, no longer exist, if one takes the trouble to examine the details of the suitable modern components now available. A proof of this will be found in the examination of many of the finest communication type of receivers.

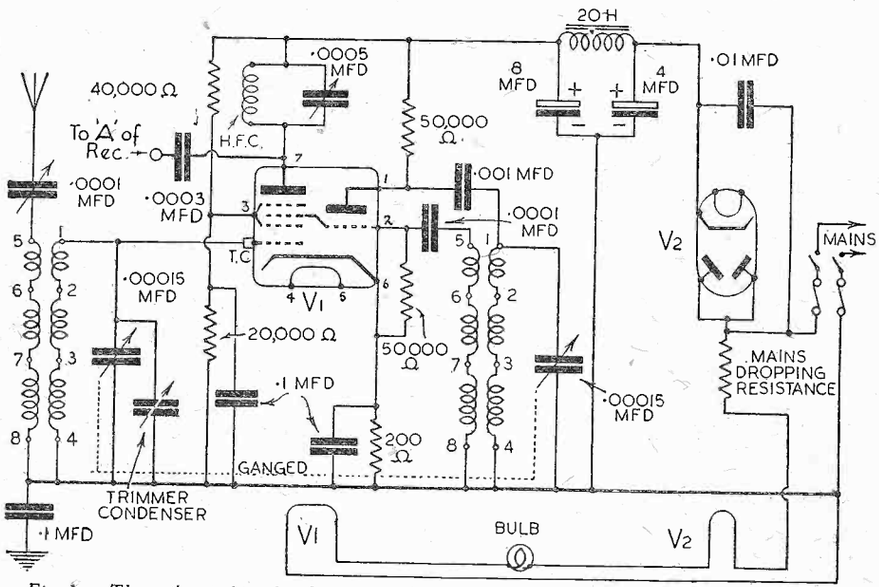


Fig. 1.—The coil switching has been omitted from this circuit for the sake of clearness. Note valve pin connection numbers.

The Circuit

An examination of Fig. 1 will show that the circuit is a straightforward frequency-changing arrangement making use of a triode-hexode. This type of valve is ideal for short-wave work as it is invariably better on the higher frequencies than, say, a heptode. The valve used was an Osram X31 for universal operation, but an X41 is recommended if the unit is to be used on A.C. supplies only.

On the mains side, a U30 is employed for rectification of the A.C., and as the circuit is equally suitable for A.C. or D.C. supplies, it is connected as a half-wave rectifier. No mains transformer is, of course, necessary, but it is essential to incorporate a suitable resistance in series with one side of the supply and the heater circuits to provide the necessary voltage drop. The component for this purpose is the Bulgin mains-dropping resistance type No. N.R.45. For visual indication purposes, to show when the unit is switched on, a pilot light is connected in series with the heaters. Smoothing is provided by any good make of L.F. choke, having an inductance of, say, 25 Henries at 30 mA., in conjunction with a 4-mfd. and an 8-mfd. fixed condenser.

Coils

Two coils are required, namely, types S.W.65 and S.W.66, both being produced by Bulgin. The former is for the aerial circuit and the latter for the oscillator. It should be noted that it is not necessary to employ padding condensers with the 66 as it is quite sufficient for accurate tuning over the three bands if a small parallel variable condenser is connected across the aerial tuner. Both tuning condensers have a capacity of .00015 mfd. each, and

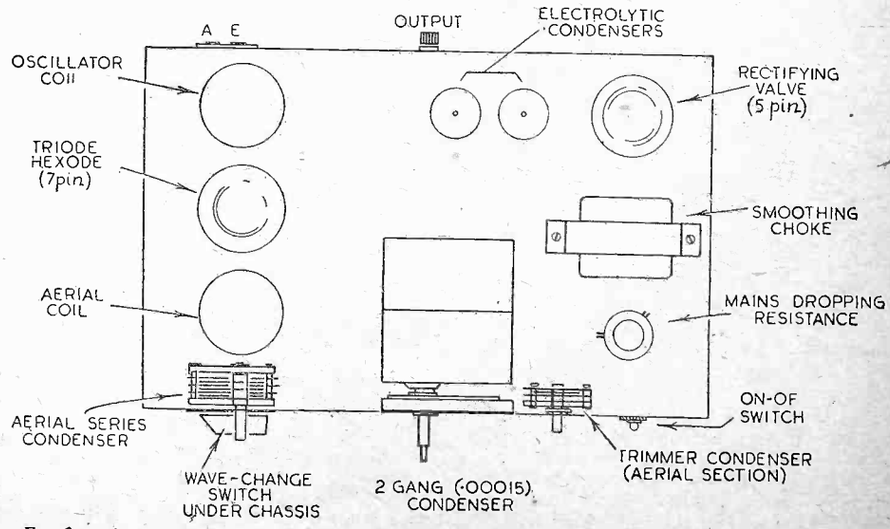


Fig. 2.—A suggested layout for the unit. Slight modifications can be made providing attention is given to coil location.

the small trimming component should be in the neighbourhood of .00005 mfd.

With the tuning condenser mentioned, the actual wave-ranges of the coils will be 11 to 25 metres, 22.5 to 50 metres, and 45 to 95 metres, thus covering all the important frequencies.

The inductance of the oscillator section is such that an I.F. of, approximately, 250 kc/s, or, in other words, a wavelength of 1,200 metres, is produced, thus allowing the L.W. section of the broadcast receiver to be tuned to that frequency for the I.F. amplification.

The two tuning condensers can be ganged if so desired, although if two separate condensers of the correct capacity are to hand, then they can be used without complicating the tuning to any appreciable degree. With a circuit of this type, there is a lot to be said for two separate controls, as once their relative settings have been noted, it is often possible to obtain just that little bit extra adjustment which sometimes makes all the difference between a good and a passably good signal. However, that is a matter of personal taste and the gear available.

Construction

A suggested layout is shown in Fig. 2. We would advise metal chassis construction as this allows a neat assembly, good location of the components, and short wiring, but if reasonable care is taken a baseboard arrangement can be used.

The wave-band switching is not so complicated as it might appear from the theoretical diagram as one switch unit, Bulgin type No. S. 122, does all that is necessary. It will be seen that the unit is really connected to form four simple short-circuiting switches.

With any apparatus of this type, it is advisable to pay particular attention to all connections made to the metal chassis or the common negative line; see that perfect contact is made and that the wires are as short and as stout as possible. It is also vitally important to remember that with an A.C./D.C. circuit, a direct electrical connection *must not exist* between the earth and the common negative line, which, in this instance, is the chassis. The reason for this should be obvious, when it is remembered that one side of the mains supply is also connected to the chassis. The correct thing to do is to make the earth connection to the metal work via a fixed condenser having a capacity of, say, .1 mfd. The actual capacity is not critical, but the condenser must have a working voltage higher than that of the mains.

The other components, i.e., fixed condensers and resistances, etc., can be perfectly standard parts, but the variable condensers should be of reliable S.W. types if the maximum efficiency is expected.

The number connections for the valve-holder of the triode-hexode follow normal practice, and by making reference to pages 7, 8 and 9 of the "Radio Engineer's Handbook" (our issue of February 10th last) no difficulty should be experienced in making the correct connections to the 7-pin holder. The rectifier valve requires a standard 5-pin holder.

Operation

Before making any connection to the supply mains, go over all wiring and make quite sure that everything is connected according to the diagram. At this stage, a word of *warning* is necessary. With an A.C./D.C. circuit and *especially* when a metal chassis is in use, remember that the chassis (the common negative earth line) can be at a much *higher potential than the actual earth*.

One side of the supply mains is always earthed. Supposing in your district it happens to be the positive side, well, that means that you would feel the full supply voltage if you made contact with the chassis and the ground, so *be careful*. To be on the safe side, see that you are standing on a dry carpet, or board if you are likely to touch the chassis, or, better still, switch off the mains before making any adjustments.

With the aerial connected to the *converter* aerial terminal, join the aerial terminal of the set to the output terminal of the unit, and after seeing that the earth connection is on, plug in the mains making quite sure in the case of D.C. supplies that the polarity is correct. The broadcast set must be switched over to the long waves and tuned to about 1,200 metres, and the volume control set to about mid-on. When all valves have warmed up, it should then be possible to tune in the S.W transmissions by adjusting the tuning controls of the unit only. The aerial series condenser must be adjusted to allow maximum efficiency to be obtained on all the wave-bands.

The same remarks apply to the operation of this unit as to all other S.W. apparatus, have a little patience, spend some time getting the hang of the adjustments, and remember that S.W. transmissions are not always consistently good. Don't condemn the unit because of a bad evening or lack of tuning skill.

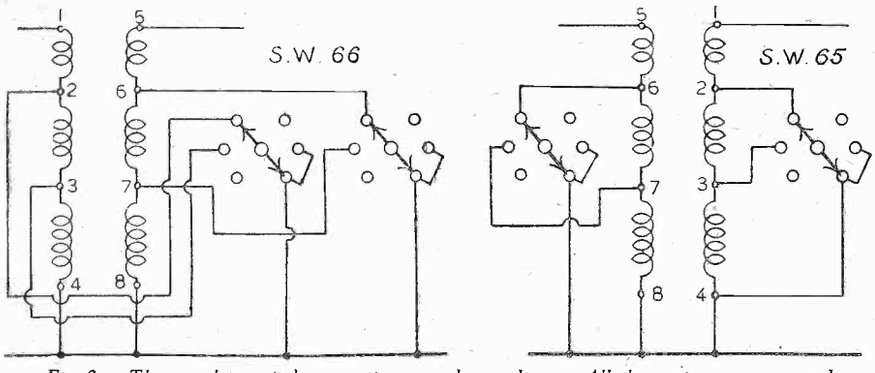


Fig. 3.—The complete switch connections are shown above. All the sections are operated by one control.

PRACTICAL TELEVISION

April 6th, 1940. Vol. 4. No. 197.

Compact Packs

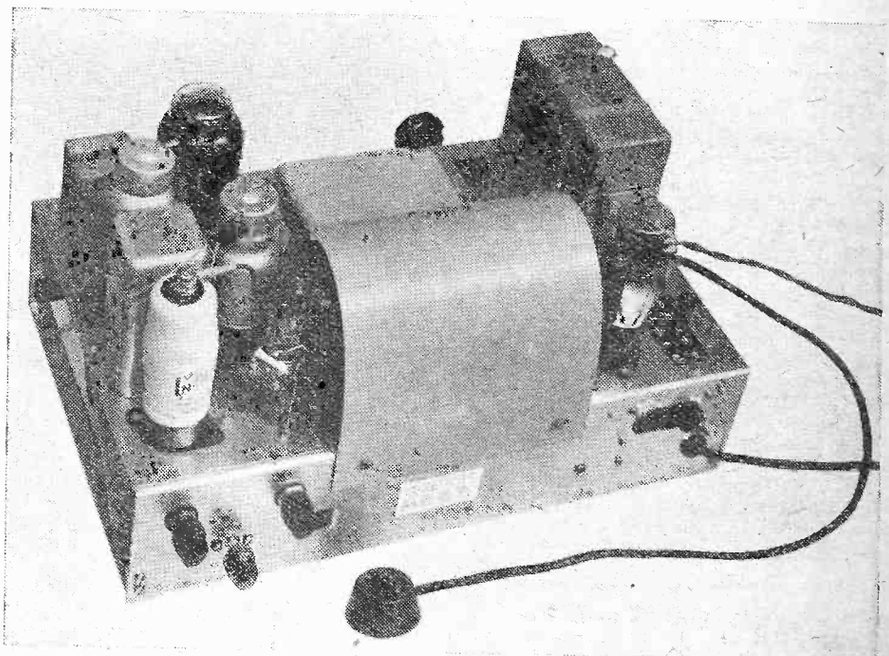
THE problem of providing a satisfactory and efficient form of power supply for the television receiving-set has been solved in a variety of ways by different designers. With the original high-definition sets, the development of the appropriate voltage for the cathode-ray tube anode supply was undertaken by a fairly bulky separate unit, while the cathode and anode supplies to the sound and vision receivers was developed in another comparatively large unit. To provide accommodation for these two units meant that the cabinet itself had to be correspondingly large, and although in the initial phase of a new and novel entertainment service public reaction was not against a bulky set, as soon as the novelty began to wear off the size of sets became an important feature. It was felt that television sets should not be very much larger than the household radio set, and every section of the complete television receiver was therefore examined carefully to ascertain where space could be saved. The dimensions of the glass bulb of the cathode-ray tube were reduced in a very drastic manner, while the newer vision chassis seemed to bear no relation to the earlier prototypes in so far as bulk was concerned. The final designs both in this country and abroad tended towards the separation of the set into two units. The first of these accommodated the time-base generator, deflector equipment, cathode-ray tube and vision receiver, while the second housed the sound receiver together with the anode and power supplies. A very interesting example of the compact form taken by the latter is furnished by the accompanying illustration. On the left-hand side is the sound receiver, in this case a three-valve set without any provision for a main tuning control, since the television sound is radiated on a single carrier frequency and there is, therefore, no question of searching the ether for ultra-shorts. Since the high-voltage feed for the anode of the cathode-ray tube was of a much lower value than the early sets, the rectifier and associated parts were located behind the semi-cylindrical insulating shield and gave a voltage of the order of 4,500. The balance of the power supply units are mounted above and below the chassis, and can be seen on the right, while in the foreground is the high voltage cap for clipping on to the terminal brought out for that purpose on the truncated glass wall of the cathode-ray tube. This neat and compact chassis as a rule was accommodated in the base of the cabinet and gave first-class results, being indicative of the advances made in this particular branch of the apparatus.

Allowing for Development

IN a recent paragraph of these columns the attention of readers was drawn to the suggestions put forward in America in relation to the television service in so far as it affects development. Is it better to make provision for a preliminary period while improvements in the apparatus at both the transmitting and receiving ends are being undertaken, or would it be preferable to standardise the pictures now, and maintain that standard for a period of years before any changes are made? Both suggestions have their adherents, but no decision has as yet been arrived at, and until this is done the industry is not likely to make the progress essential for placing it on a sound economic basis. It is for this reason that a good deal of attention has been directed towards the Dumont method of television transmission and reception, for it is claimed that this is so flexible that it will automatically take cognisance of improvements in picture definition without any changes having to be made in the receiver, with the result that each set purchaser is protected against early obsolescence. For this to happen, the complete control of the television chain is transferred to the transmitting end. In the more common form of television service the cathode-ray tube receiving set is built so that the scanning action of the tube's beam of electrons is furnished by impulses built up in the time-base generator. The speed with which these pulses function is dependent on the electrical constants of the line and frame circuits, and the synchronising pulses injected into the radiated vision signal merely serve to maintain a check on the triggering action at the receiving end. If there is a change in picture definition, therefore, the electrical constants of every receiver in use have to be altered, and the more drastic the change the higher becomes the cost involved to each individual purchaser of the television set.

Special Advantages

TO carry this special scheme into effect the movement of the cathode-ray beam across the screen of the tube in the line and frame directions is undertaken by what is perhaps best termed automatic sweep circuits. This is quite distinct from the self-oscillating circuit, and is only brought into action by the application of a synchronising pulse. The range of speed is such that the circuit will work over very wide limits, and can be regarded as an amplifier. That is to say, the line and frame sweep pulses are in effect included in the radiated sound wave, and when received at the set are filtered out. These pulses at line and frame frequency are then amplified by the automatic sweep circuits, and applied to the cathode-ray tube to move the beam at exactly the same speed as that originally generated at the transmitting end of the chain. It is clear, therefore, that both the number of lines in the received picture as well as the number of frames and complete pictures per second are under the absolute control of the transmitting end, and can be increased or decreased at will according to the dictates of the service. This really simplifies the controls at the receiving end, and also ensures that none of the annoying difficulties arising from lack of synchronisation in the set arise in practice. The form of synchronising signal necessary to put this scheme into effect differs from the waveform employed with present-day practice, but the prime advantage of flexibility to suit any standard of picture is one which merits a very close investigation by the American authorities, who are now in the throes of attempting to find satisfactory solutions to all the television difficulties with which they are confronted.



A good example of a neat and compact unit which includes the sound receiver, power pack, and anode supply for a television receiver.

LATEST PATENT NEWS

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Abstracts Published.

TWO-PART COUPLINGS.—Yoshida, K. No. 502421.

A connection board for wireless receiving sets has a number of layers, each consisting of a pair of insulating boards with connecting strips between them, placed one upon another with a metallic plate interposed between adjacent layers. The boards and

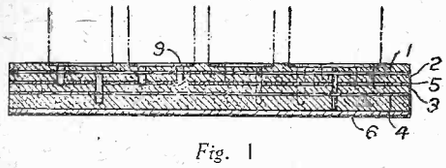

Fig. 1

plates are provided with sockets to receive plugs on the bases of the components, these sockets being appropriately joined by the connecting strips between the boards. The upper layer, consisting of boards 1, 2 (Fig. 1), is separated from the lower layer i.e., boards 3, 4, by a metal sheet 5, and may have a metallic plate covering its upper surface. Sockets 9 serve to connect the plugs on the components with the connecting strips, some between boards 1, 2 and others between boards 3, 4. A further metal plate 6 is placed on the bottom of the complete baseboard and the whole is held together by screws. The object of separating the wiring into layers is to reduce coupling and for this purpose several layers may be used. The whole may be enclosed in a metallic casing to provide complete screening of the wiring (not shown).

CONDENSERS; WIRELESS RECEIVING-APPARATUS.—Standard Telephones and Cables, Ltd., Leno, J. A., Edwards, J. C. No. 507604.

A condenser casing 1 (Fig. 2) is cylindrical with sides cut away from the top to form two shelves as at 3 by means of which it can be secured either to screws 5 to a base as shown or direct to a panel, etc. Leads from the condenser may pass downwards and out through the sides of the base as at 22, 23, 24, or laterally from the flattened sides of the casing 1. The under side of the casing 1 may be constituted by a plate which can carry fuses in clips, connection to terminal posts mounted in the base being effected by spring clips. The cylindrical form enables it to be combined with a coil—for example to form an interference suppressor—by mounting within the coil former.

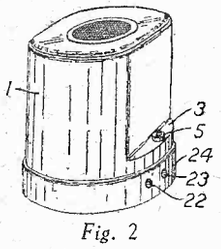

Fig. 2

ADJUSTING WIRELESS APPARATUS; INDICATING APPARATUS.—Murphy Radio, Ltd., and Fisher, L. No. 507948.

In order to open the scale of the short-wave band of a radio receiver, the short-wave tuning scale 8 (Fig. 3) is combined with a vernier 9 comprising a part moving with the tuning means, such as the drum 1, and marked with a number of evenly spaced transparent lines, and a fixed part comprising a number of evenly spaced transparent lines on the transparent fixed plate 7, the spacings differing in known manner for vernier scales. The plate 7 carries an index mark 4 and each station in the long and medium wave bands 3, 2 is indicated by a registering mark 6. The scale arrangement and illumination is such that a mark on the moving scale is only illuminated against a dark background when it coincides with a mark on the plate 7. Alternatively, the vernier may be constituted by a circle of translucent dots containing numerals and co-operating with a series of spiral dots on the rotating drum 1. Greater subdivision may be obtained by mutually inclining the two sets of gradations and extending their length.

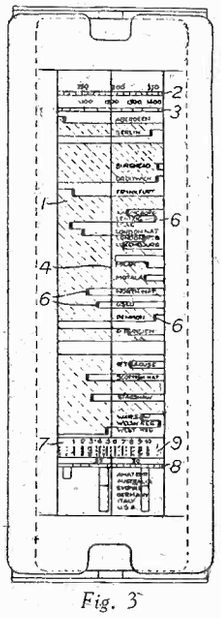

Fig. 3

NEW PATENTS

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Latest Patent Applications.

4237.—Loewe Radio Co., Ltd.—Television transmitters. March 5th.

4238.—Loewe Radio Co., Ltd. (Schlesinger).—Electronic systems for television, etc. March 6th.

4239.—Loewe Radio Co., Ltd. (Schlesinger).—Means for selecting electrical signals or impulses for television. March 6th.

Specifications Published.

518480.—Jones, J. E. Rhys.—, Barrett, J. O. G., and Plessey Co., Ltd.—Electrical frequency-dependent control means, primarily for radio apparatus.

518491.—Eichhorn, C. E.—Vibration-translating devices, such as loudspeakers or phonographic pick-ups.

518574.—Marconi's Wireless Telegraph Co., Ltd.—Cathode-ray tubes.

518615.—Kolster-Brandes, Ltd., Smyth, C. N., and Tiller, P. A.—Television receivers.

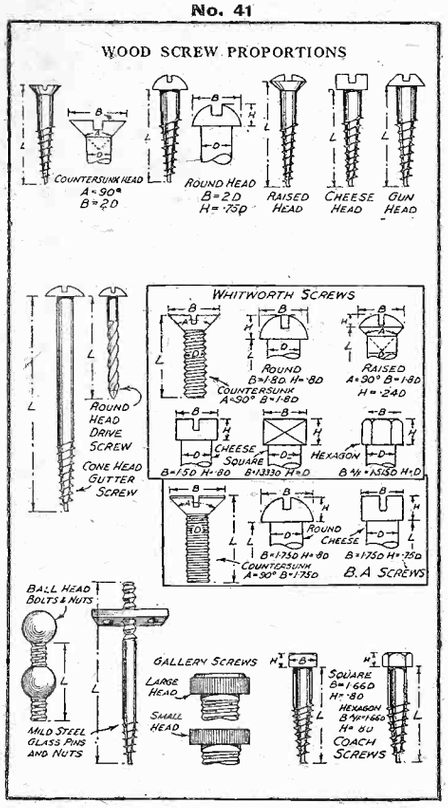
518616.—Kolster-Brandes, Ltd., and Smyth, C. N.—Television receivers.

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

NEW SERIES

RADIO ENGINEER'S POCKET-BOOK

No. 41



No. 42

Equivalents of Imperial and Metric Weights and Measures

IMPERIAL — METRIC

Linear Measure

1 Inch	=	25.400 Millimetres.	1 Millimetre (mm.) (1/1000 m.) = 0.03937 Inch.
1 Foot	=	0.30480 Metre.	1 Centimetre (1/100 m.) = 0.3937 ,,
1 Yard	=	**0.914399 Metre.**	1 Decimetre (1/10 m.) = 3.937 Inches.
1 Fathom	=	1.8288 Metres.	**1 Metre (m.) . = 39.370113 Inches.**
1 Pole	=	5.0292 ,,	**= 3.280843 Feet.**
1 Chain	=	20.1168 ,,	**= 1.0936143 Yards.**
1 Furlong	=	201.168 ,,	1 Decametre (10 m.) = 10.936 Yards
1 Mile	=	1.6093 Kilometres.	1 Kilometre (1000 m.) = 0.62137 Mile

Square Measure

1 Square Inch	=	6.4516 Square Centimetres.	1 Square Centimetre = 0.15500 Square Inch.
1 Square Foot	=	9.2903 Square Decimetres.	1 Square Decimetre = 15.500 Square Inches.
1 Square Yard	=	0.836120 Square Metre	= 10.7639 Square Feet.
1 Rood	=	10.117 Ares.	1 Square Metre . = 1.1960 Square Yards.
1 Acre	=	0.40468 Hectare.	1 Are . . = 119.60 Square Yards.
1 Square Mile	=	259.00 Hectares.	1 Hectare . = 2.4711 Acres.

No. 43

Equivalents of Imperial and Metric Weights and Measures—continued

IMPERIAL — METRIC

Cubic Measure

1 Cubic Inch	=	16.387 Cubic Centimetres.	1 Cubic Centimetre . = 0.0610 Cubic Ins.
			1 Cubic Decimetre (c.d.) . = 61.024 Cubic Ins.
1 Cubic Foot	=	0.028317 Cubic Metre.	= 35.3148 Cubic Feet.
1 Cubic Yard	=	0.764555 ,, ,,	1 Cubic Metre . = 1.307954 Cubic Yards.

Measure of Capacity

1 Pint	=	0.568 Litre.	1 Centilitre (1/100 litre) = 0.070 Gill.
1 Quart	=	1.136 Litres.	1 Decilitre (1/10 litre) = 0.176 Pint.
1 Gallon	=	**4.5459631 Litres.**	**1 Litre . . = 1.75980 Pints.**

Avoirdupois Weight

1 Grain	=	0.0648 Gramme.	1 Milligramme (1/1000 grm.) = 0.015 Grain.
1 Dram	=	1.772 Grammes.	1 Centigramme (1/100 grm.) = 0.154 ,,
1 Ounce	=	28.350 ,,	1 Gramme (1 grm.) = 15.432 ,,
1 Pound (7,000 Grains)	=	**0.45359243 Kilogramme.**	**1 Kilogramme (1,000 grm.) = 2.2046223 Lb. or 15.432.3564 Grains.**
1 Hundredweight	=	50.80 Kilogrammes. 0.5080 Quintal	1 Quintal (100 kilog.) = 1.968 cwt.
1 Ton	=	1.0160 Tonnes or 1.016 Kilogrammes.	1 Tonne (1,000 kilog.) = 0.9842 Ton.
1 Grain (Troy)	=	0.0648 Gramme.	1 Gramme (1 grm.) = 0.03215 Oz. Troy. 15.432 Grains.
1 Troy Ounce	=	31.1035 Grammes.	

No. 44

LOGARITHMS

	0	1	2	3	4	5	6	7	8	9	1½ 2 3	4 5 6	7 8 9
10	0000	0043	0086	0128	0170	0212	0253	0294	0334	0374	4 8 12	17 21 25	29 33 37
11	0414	0453	0492	0531	0569	0607	0645	0682	0719	0755	4 7 11	15 19 23	26 30 34
12	0792	0828	0864	0899	0934	0969	1004	1038	1072	1106	3 7 10	14 17 21	24 28 31
13	1139	1173	1206	1239	1271	1303	1335	1367	1399	1430	3 6 10	13 16 19	23 26 29
14	1461	1492	1523	1553	1584	1614	1644	1673	1703	1732	3 6 9	12 15 18	21 24 27
15	1761	1790	1818	1847	1875	1903	1931	1959	1987	2014	3 6 8	11 14 17	20 22 25
16	2041	2068	2095	2122	2148	2175	2201	2227	2253	2279	3 5 8	11 13 16	18 21 24
17	2304	2330	2355	2380	2405	2430	2455	2480	2504	2529	2 5 7	10 12 15	17 20 22
18	2553	2577	2601	2625	2648	2672	2695	2718	2742	2765	2 5 7	9 12 14	16 19 21
19	2781	2810	2833	2856	2878	2900	2923	2945	2967	2989	2 4 7	9 11 13	16 18 20
20	3010	3032	3054	3075	3096	3118	3139	3160	3181	3201	2 4 6	8 11 13	15 17 19
21	3222	3243	3263	3284	3304	3324	3345	3365	3385	3404	2 4 6	8 10 12	14 16 18
22	3424	3444	3464	3483	3502	3522	3541	3560	3579	3598	2 4 6	8 10 12	14 15 17
23	3617	3636	3655	3674	3692	3711	3729	3747	3766	3784	2 4 6	7 9 11	13 15 17
24	3802	3820	3838	3856	3874	3892	3909	3927	3945	3962	2 4 6	7 9 11	12 14 16
25	3979	3997	4014	4031	4048	4065	4082	4099	4116	4133	2 3 5	7 9 10	12 14 15
26	4150	4166	4183	4200	4216	4232	4249	4265	4281	4298	2 3 5	7 8 10	11 13 15
27	4314	4330	4346	4362	4378	4393	4409	4425	4440	4456	2 3 5	6 8 9	11 13 14
28	4472	4487	4502	4518	4533	4548	4564	4579	4594	4609	2 3 5	6 8 9	11 12 14
29	4624	4639	4654	4669	4683	4698	4713	4728	4742	4757	1 3 4	6 7 9	10 12 13

No. 45

LOGARITHMS—(continued)

	0	1	2	3	4	5	6	7	8	9	1 2 3	4 5 6	7 8 9
30	4771	4786	4800	4814	4829	4843	4857	4871	4886	4900	1 3 4	6 7 9	10 11 13
31	4914	4928	4942	4955	4969	4983	4997	5011	5024	5038	1 3 4	6 7 8	10 11 12
32	5051	5065	5079	5092	5105	5119	5132	5145	5159	5172	1 3 4	5 7 8	9 11 12
33	5185	5198	5211	5224	5237	5250	5263	5276	5289	5302	1 3 4	5 6 8	9 10 12
34	5315	5328	5340	5353	5366	5378	5391	5403	5416	5428	1 3 4	5 6 8	9 10 11
35	5441	5453	5465	5478	5490	5502	5514	5527	5539	5551	1 2 4	5 6 7	9 10 11
36	5563	5575	5587	5599	5611	5623	5635	5647	5658	5670	1 2 4	5 6 7	8 10 11
37	5682	5694	5705	5717	5729	5740	5752	5763	5775	5786	1 2 3	5 6 7	8 9 10
38	5798	5809	5821	5832	5843	5855	5866	5877	5888	5899	1 2 3	5 6 7	8 9 10
39	5911	5922	5933	5944	5955	5966	5977	5988	5999	6010	1 2 3	4 5 7	8 9 10
40	6021	6031	6042	6053	6064	6075	6085	6096	6107	6117	1 2 3	4 5 6	8 9 10
41	6128	6138	6149	6160	6170	6180	6191	6201	6212	6222	1 2 3	4 5 6	7 8 9
42	6232	6243	6253	6263	6274	6284	6294	6304	6314	6325	1 2 3	4 5 6	7 8 9
43	6335	6345	6355	6365	6375	6385	6395	6405	6415	6425	1 2 3	4 5 6	7 8 9
44	6435	6444	6454	6464	6474	6484	6493	6503	6513	6522	1 2 3	4 5 6	7 8 9
45	6532	6542	6551	6561	6571	6580	6590	6599	6609	6618	1 2 3	4 5 6	7 8 9
46	6628	6637	6646	6656	6665	6675	6684	6693	6702	6712	1 2 3	4 5 5	7 8 9
47	6721	6730	6739	6749	6758	6767	6776	6785	6794	6803	1 2 3	4 4 5	6 7 8
48	6812	6821	6830	6839	6848	6857	6866	6875	6884	6893	1 2 3	4 4 5	6 7 8
49	6902	6911	6920	6928	6937	6946	6955	6964	6972	6981	1 2 3	4 4 5	6 7 8
50	6990	6998	7007	7016	7024	7033	7042	7050	7059	7067	1 2 3	3 4 5	6 7 8
51	7076	7084	7093	7101	7110	7118	7126	7135	7143	7152	1 2 2	3 4 5	6 7 8
52	7160	7168	7177	7185	7193	7202	7210	7218	7226	7235	1 2 2	3 4 5	6 6 7
53	7243	7251	7259	7267	7275	7284	7292	7300	7308	7316	1 2 2	3 4 5	6 6 7
54	7324	7332	7340	7348	7356	7364	7372	7380	7388	7396	1 2 2	3 4 5	6 6 7

No. 46

LOGARITHMS—(continued)

	0	1	2	3	4	5	6	7	8	9	1 2 3	4 5 6	7 8 9
55	7404	7412	7419	7427	7435	7443	7451	7459	7466	7474	1 1 2	3 4 4	5 6 7
56	7482	7490	7497	7505	7513	7520	7528	7536	7543	7551	1 1 2	3 4 4	5 6 7
57	7559	7566	7574	7582	7589	7597	7604	7612	7619	7627	1 1 2	3 4 4	5 6 7
58	7634	7642	7649	7657	7664	7672	7679	7686	7694	7701	1 1 2	3 4 4	5 6 7
59	7709	7716	7723	7731	7738	7745	7752	7760	7767	7774	1 1 2	3 4 4	5 6 7
60	7782	7789	7796	7803	7810	7818	7825	7832	7839	7846	1 1 2	3 4 4	5 6 6
61	7853	7860	7868	7875	7882	7889	7896	7903	7910	7917	1 1 2	3 4 4	5 6 6
62	7924	7931	7938	7945	7952	7959	7966	7973	7980	7987	1 1 2	3 4 4	5 6 6
63	7993	8000	8007	8014	8021	8028	8035	8041	8048	8055	1 1 2	3 4 4	5 5 6
64	8062	8069	8075	8082	8089	8096	8102	8109	8116	8122	1 1 2	3 4 4	5 5 6
65	8129	8136	8142	8149	8156	8162	8169	8176	8182	8189	1 1 2	3 3 4	5 5 6
66	8195	8202	8209	8215	8222	8228	8235	8241	8248	8254	1 1 2	3 3 4	5 5 6
67	8261	8267	8274	8280	8287	8293	8299	8306	8312	8319	1 1 2	3 3 4	5 5 6
68	8325	8331	8338	8344	8351	8357	8363	8370	8376	8382	1 1 2	3 3 4	5 5 6
69	8388	8395	8401	8407	8414	8420	8426	8432	8439	8445	1 1 2	3 3 4	4 5 6
70	8451	8457	8463	8470	8476	8482	8488	8494	8500	8506	1 1 2	3 3 4	4 5 6
71	8513	8519	8525	8531	8537	8543	8549	8555	8561	8567	1 1 2	2 3 4	4 5 5
72	8573	8579	8585	8591	8597	8603	8609	8615	8621	8627	1 1 2	2 3 4	4 5 5
73	8633	8639	8645	8651	8657	8663	8669	8675	8681	8686	1 1 2	2 3 4	4 5 5
74	8692	8698	8704	8710	8716	8722	8727	8733	8739	8745	1 1 2	2 3 4	4 5 5

Open to Discussion

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

A Clacton Reader's Den

SIR,—I have been a reader of PRACTICAL WIRELESS for the past year, and have found it very helpful in numerous cases, and I wish it every success in the future. I enclose a photograph of my den, together with a log from February 1st, 1940, to March 10th, 1940, hoping these will interest other readers.

My RX is a home-constructed A.C. mains straight three with coils, and the following stations were heard on 14 mc/s: W1JFG, W1DIC, W1AEP, W1FVO, W1KIU, W1BLO; W2FYO, W2KZG, W2IXY, W2GMQ, W2JT; W3GPM, W3FRE, W3EOZ, W3FJU, W3EMM; W4DSY, W4BMR, W4AHH; W8CFA, W8BUO. W8LUQ, W8QKS, W8CUO, W8MHC; I1JKV, I1RE; ES5C, ES5D; ES4G, XUIB, LY1J, K4FKC, HA6T, HA7P. HA9Q, YV1AQ, EA7BA and UK8AH.—A. HAZELTON (Clacton-on-Sea).

The Kestrel S.W. Four

SIR,—You may be interested to hear about my experiences with the Kestrel S.W.4.

I constructed it as near the original as my very meagre supply of pocket-money would allow. I obtained a piece of sheet steel the required size for the panel, whilst the sides of the chassis are made of ¼in. oak. The top is of plywood, the whole being lined with sheet tin obtained from motor oil tins. I also screened the H.F. coil and tuning condenser with a screen made from the same material. The tuning condensers are "Premier," and Eddystone coils, 4-pin H.F., are used together with Utility microdials, with electric bandspreading. In the H.F. stage I am using a Tungsram HP210 valve with a 50,000 ohms potentiometer for grid bias to the grid. A Cossor SPT210 is used as detector, Mullard PM2HL as first L.F. and a Triotron P225 in the output stage. The L.F. transformer is a R.I. Parafeed. I might add that it is the best S.W. set I have constructed so far.

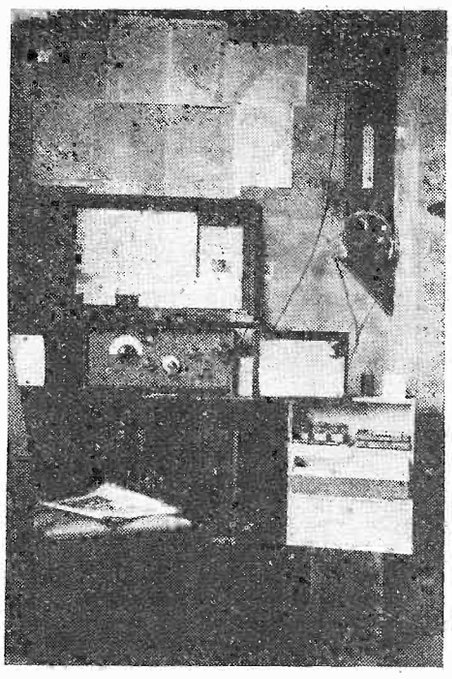
As to results, I can get practically all the European stations, Athlone, TAP (Ankara), VUD2 (Delhi), CXA2 (Montevideo), VLQ (Sydney), XGOY (Chungking), WGEO, WRUL, WCBX, WPIT and WNBI.

I heard a station the other evening between 10 p.m. and 10.30 p.m. on 49 metres which announced itself as KBRM, Manila, Philippine Islands. I cannot find Manila in any tabulated list of stations on 49 metres.

Try as I will, I have never been able to hear any station in Canada or S. Africa on this or any other set. I am somewhat puzzled about this, as the American stations come in loud enough to burst the speaker when conditions are favourable, but I cannot obtain even a very weak headphone signal from Canada.—J. KIDD (Melton Mowbray).

SIR,—Herewith is a further log of stations received on the Kestrel S.W.4 at various times from February 18th to date. Aerial, 30ft. inverted-L facing N.S. All stations heard on speaker: 20-metre Amateurs: W1MF, BLO, KIU, IGL, JEL, FOV, AEP, BES, JFG, JQM; W2GIZ, IXY, DMJ, IJD, FOY; W3IGL, DOK, SMY, CGF, EOZ, FJU; W4CK, DSY, BMR; W7GBY, W8RHP, OBP, GFF, HLK, BF, QSK, PYA, ACY, JOE, DBC; W9BEU, K4FKC, ES4G.

31-metre band: Athlone testing, VLQ. On 20 metres I heard PSE at R7. The



A corner of Mr. A. Hazelton's den.

programme was destined for Germany. Motala comes in very well on 19 metres. Readers will note from the above that this set has proved itself capable of picking up Sydney, Australia. I have heard this station three times so far at signal strengths varying from R4 to R7.

In closing I should like to make a few suggestions which I feel would have an appeal to many readers.

1. Why not have some S.W. superhet circuits? I suggest simple circuits to start with, using valve combinations such as an FC2A, VP210, TDD2A, PM22A, then go on to something more ambitious at later dates.

2. I, like many other readers, would like to see the return of "Leaves from the Short-wave Log," or similar articles.—E. ANDREWS (Brighton).

A Survey of S.W. Reception Conditions!

SIR,—I would like to second the suggestion of your correspondent, Mr. Horrocks, in a recent issue, that you should publish a survey on reception conditions.

For instance, readers could send in their logs of short-wave broadcast stations monthly; the logs should contain the time at which the stations were logged, and the signal strength of the station and its frequency. They should also state the type of receiver used. The best log or logs received each month could be published.

I realise that space in your paper si valuable nowadays, but would it not be possible once a month to publish a reception log on the lines mentioned? Such a log would surely stimulate interest in the short-waves among the non-short-wavers and promote friendly rivalry among DX-ers.

I would like to get in touch with two or three readers of PRACTICAL WIRELESS, residing anywhere outside of Great Britain, with a view to corresponding regularly. I will reply to every letter received.

I have been a short-wave fan for about a year and have received QSLs from VLR3, XGOY, Burgos, WPIT, WRUL, WNBI, WGEA, WGEO, and I am waiting for veries from CR7BE, K2RH, TAP, WCBX.—J. PARKIN, JUNR., 18, Rowley Grove, Cottingham Road, Hull, Yorks.

A DX Log from Wallington

SIR,—Looking at the different logs printed in your fine magazine from time to time, I think that perhaps my DX log may prove interesting to other readers. Here it is: The numbers in brackets are approximately how many stations I have received:

CO (4), CX (2), PY (22), YV (4), LU (2), HC (2), YP3, VP5, all W. States and all VE districts. PK (3), KA (5), VK (7), J, VU, U3-4-5-9, CR6, CR7, OQ5, ZS1-3-4-5-6 (13), HP, K4 (4), K5 (2) and K6 (1), and the following broadcast stations:

COBX, COCM, COCQ, CORJ, TGWA, TGWB, PRA8, CXA2, CXA4, MTCY, FZR, KGEI, XEXA, LSI, LRX, HJ4ABE, HC1GO, KZRM, KZRF, XGOY, JZI, JZJ and JNJ.

The receiver is a home-built 0-v-1, and the aerial is an inverted-L type 36ft. long and 12ft high, running N.E.-S.W.—S. GARNER (Wallington).

Prize Problems

PROBLEM No. 394.

BARLOW decided to use an extension speaker with his three-valve battery set and accordingly purchased a coil of bell-wire, which he laid round his skirting board from one room to another. He laid the wire double and connected the speaker to one end, joining the other two ends to the speaker terminals on his receiver. When he switched on he found that volume was very poor and although the speaker was the same one as he used originally with the receiver, and was in order, he could not obtain satisfactory results with it in use as an extension model. Why was this? Three books will be awarded for the first three correct solutions opened. Entries must be addressed to The Editor, PRACTICAL WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 394 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, April 8th, 1940.

Solution to Problem No. 393.

When Marshall connected the resistance from anode to earth he short-circuited the supply, and he should have connected a fixed condenser in series, not only to avoid the short-circuit but also to complete the tone-control circuit.

Only one reader successfully solved Problem No. 392, and a book has accordingly been sent to G. Barrow, 9, Meadow Lane, Long Eaton, Nr. Notts.

Practical Wireless

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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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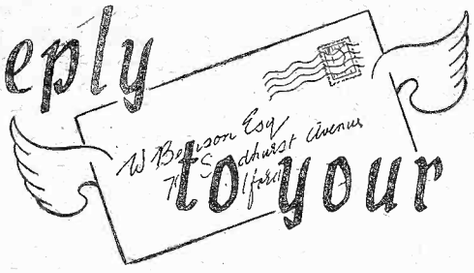
Amateur Wireless ... ... 4d. „ „
Wireless Magazine ... ... 1/3 „ „

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

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

PRACTICAL WIRELESS	Date of Issue.	No. of Blueprint
CRYSTAL SETS		
Blueprints 6d. each.		
1937 Crystal Receiver	—	PW71
The "Junior" Crystal Set	27.8.38	PW94
STRAIGHT SETS. Battery Operated.		
One-valve: Blueprints, 1s. each.		
All-Wave Unipen (Pentode)	—	PW31A
Beginners' One-valver	19.2.38	PW85
The "Pyramid" One-valver (HF Pen)	27.8.38	PW93
Two-valve : Blueprint, 1s.		
The Signet Two (D & LF)	24.9.38	PW76
Three-valve : Blueprints, 1s. each.		
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2 LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow)	22.5.37	PW35
Summit Three (HF Pen, D, Pen)	—	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW39
Hall-Mark Three (SG, D, Pow)	—	PW41
Hall-Mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-Wave Three)	13.4.35	PW49
Cameo Midget Three (D, 2 LF (Trans))	—	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	—	PW53
Battery All-Wave Three (D, 2 LF (RC))	—	PW55
The Monitor (HF Pen, D, Pen)	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P)	14.8.37	PW64
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	PW69
The "Colt" All-Wave Three (D, 2 LF (RC & Trans))	18.2.39	PW72
The "Rapide" Straight 3 (D, 2 LF (RC & Trans))	4.12.37	PW82
F. J. Camm's Oracle All-Wave Three (HF, Det., Pen)	28.8.37	PW78
1938 "Triband" All-Wave Three (HF Pen, D, Pen)	22.1.38	PW84
F. J. Camm's "Sprite" Three (HF Pen, D, Tet)	26.3.38	PW87
The "Hurricane" All-Wave Three ((SG, D, Pen), Pen)	30.4.38	PW89
F. J. Camm's "Push-Button" Three (HF Pen, D (Pen), Tet)	3.9.38	PW92
Four-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P)	1.5.37	PW4
Fury Four (2 SG, D, Pen)	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B)	—	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P)	26.9.36	PW67
"Acme" All-Wave 4 (HF Pen, D (Pen), LF, Cl. B)	12.2.38	PW83
The "Admiral" Four (HF Pen, HF Pen, D, Pen (RC))	3.9.38	PW90
Mains Operated		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen)	—	PW18
A.C.-D.C. Two (SG, Pow)	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow)	7.1.39	PW35C
D.C. Premier (HF Pen, D, Pen)	—	PW35B
Unique (HF Pen, D (Pen), Pen)	—	PW36A
Armada Mains Three (HF Pen, D, Pen)	—	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	—	PW50
"All-Wave" A.C. Three (D, 2 LF (RC))	—	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	—	PW70
Four-valve : Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	—	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	—	PW47
SUPERHETS.		
Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three-Valve)	5.6.37	PW40
F. J. Camm's 2-valve Superhet	—	PW52
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valve)	—	PW43
D.C. £5 Superhet (Three-valve)	—	PW42
Universal £5 Superhet (Three-valve)	—	PW44
F. J. Camm's A.C. Superhet 4	31.7.37	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitone" Universal Four	16.1.37	PW73
Four-valve : Double-sided Blueprint, 1s. 6d.		
Push Button 4, Battery Model / Push Button 4, A.C. Mains Model	22.10.38	PW95
SHORT-WAVE SETS. Battery Operated.		
One-valve : Blueprint, 1s.		
Simple S.W. One-valver	23.12.39	PW88
Two-valve : Blueprints, 1s. each.		
Midget Short-wave Two (D, Pen)	—	PW38A
The "Fleet" Short-wave Two (D (HF Pen), Pen)	27.8.38	PW91
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2 LF (RC and Trans))	—	PW63
The Band-Spread S.W. Three (HF Pen, D (Pen), Pen)	1.10.38	PW68
PORTABLES.		
Three-valve : Blueprints, 1s. each.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)	—	PW65
Parvo Flyweight Midget Portable (SG, D, Pen)	3.6.39	PW77
Four-valve : Blueprint, 1s.		
"Imp" Portable 4 (D, LF, LF (Pen))	—	PW86
MISCELLANEOUS		
Blueprint, 1s.		
S.W. Converter-Adapter (1 valve)	—	PW48A
AMATEUR WIRELESS AND WIRELESS MAGAZINE CRYSTAL SETS.		
Blueprints, 6d. each.		
Four-station Crystal Set	23.7.38	AW427
1934 Crystal Set	—	AW444
150-mile Crystal Set	—	AW450
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprint, 1s.		
B.B.C. Special One-valver	—	AW387
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans)	—	AW388
Full-volume Two (SG det, Pen)	—	AW392
Lucerne Minor (D, Pen)	—	AW426
A Modern Two-valver	—	WM409
Three-valve : Blueprints, 1s. each.		
£5 5s. S.G.3 (SG, D, Trans)	—	AW412
Lucerne Ranger (SG, D, Trans)	—	AW422
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
Transportable Three (SG, D, Pen)	—	WM271
Simple-Tune Three (SG, D, Pen)	*June* '33	WM327
Economy-Pentode Three (SG, D, Pen)	*Oct.* '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	*Mar.* '34	WM354
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen)	—	WM389
Certainty Three (SG, D, Pen)	—	WM393
Minitube Three (SG, D, Trans)	*Oct.* '35	WM396
All-Wave Winning Three (SG, D, Pen)	—	WM400
Four-valve : Blueprints, 1s. 6d. each.		
65s. Four (SG, D, RC, Trans)	—	AW370
2HF Four (2 SG, D, Pen)	—	AW421
Self-contained Four (SG, D, LF, Class B)	*Aug.* '33	WM331
Lucerne Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2 LF)	*Feb.* '35	WM381
The H.K. Four (SG, SG, D, Pen)	—	WM384
The Auto Straight Four (HF Pen, HF, Pen, DDT, Pen)	*Apr.* '36	WM404
Five-valve : Blueprints, 1s. 6d. each.		
Super-quality Five (2 HF, D, RC, Trans)	—	WM320
Class B Quadradyne (2 SG, D, LF, Class B)	—	WM344
New Class B Five (2 SG, D, LF, Class B)	—	WM340
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C.	—	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C.-D.C. Two (D, Pen)	—	WM394
Three-valve : Blueprints, 1s. each.		
Home Lover's New All-Electric Three (SG, D, Trans) A.C.	—	AW388
Mantovani A.C. Three (HF Pen, D, Pen)	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	*Jan.* '36	WM401
Four-valve : Blueprints, 1s. 6d. each.		
All Metal Four (2 SG, D, Pen)	*July* '33	WM329
Harris' Jubilee Radiogram (HF Pen, D, LF, P)	*May* '35	WM386
SUPERHETS.		
Battery Sets : Blueprints, 1s. 6d. each.		
Modern Super Senior	—	WM375
'Varsity Four	*Oct.* '35	WM395
The Request All-Waver	*June* '36	WM407
1935 Super-Five Battery (Superhet)	—	WM379
Mains Sets : Blueprints, 1s. 6d. each.		
Heptode Super Three A.C.	*May* '34	WM359
"W.M." Radiogram Super A.C.	—	WM366
PORTABLES.		
Four-valve : Blueprints, 1s. 6d. each.		
Holiday Portable (SG, D, LF, Class B)	—	AW393
Family Portable (HF, D, RC, Trans)	—	AW447
Two H.F. Portable (2 SG, D, QP21)	—	WM363
Tyers Portable (SG, D, 2 Trans)	—	WM367
SHORT-WAVE SETS. Battery Operated.		
One-valve : Blueprints, 1s. each.		
S.W. One-valver for America	15.10.38	AW429
Rome Short-Waver	—	AW452
Two-valve : Blueprints, 1s. each.		
Ultra-Short Battery Two (SG, det, Pen)	*Feb.* '36	WM402
Home-made Coil Two (D, Pen)	—	AW440
Three-valve : Blueprints, 1s. each.		
World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
The Carrier Short-waver (SG, D, P)	*July* '35	WM390
Four-valve : Blueprints, 1s. 6d. each.		
A.W. Short-wave World-beater (HF Pen, D, RC, Trans)	—	AW436
Empire Short-waver (SG, D, RC, Trans)	—	WM313
Standard Four-valve Short-waver (SG, D, LF, P)	22.7.39	WM383
Superhet : Blueprint, 1s. 6d.		
Simplified Short-wave Super	*Nov.* '35	WM397
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Two-valve Mains Short-waver (D, Pen) A.C.	13.1.40	AW453
"W.M." Long-wave Converter	—	WM380
Three-valve : Blueprint, 1s.		
Emigrator (SG, D, Pen) A.C.	—	WM352
Four-valve : Blueprint, 1s. 6d.		
Standard Four-valve A.C. Short-waver (SG, D, RC, Trans)	—	WM391
MISCELLANEOUS.		
S.W. One-valve Converter (Price 6d.)	—	AW329
Enthusiast's Power Amplifier (1/6)	—	WM387
Listener's 5-watt A.C. Amplifier (1/6)	—	WM392
Radio Unit (2v.) for WM392 (1/-)	*Nov.* '35	WM398
Harris Electrogram battery amplifier (1/-)	—	WM399
De Luxe Concert A.C. Electrogram (1/-)	*Mar.* '36	WM403
New style Short-wave Adapter (1/-)	—	WM388
Trickle Charger (6d.)	—	AW462
Short-wave Adapter (1/-)	—	AW456
Superhet Converter (1/-)	—	AW457
B.L.D.L.C. Short-wave Converter (1/-)	*May* '36	WM405
Wilson Tone Master (1/-)	*June* '36	WM406
The W.M., A.C. Short-wave Converter (1/-)	—	WM403

In reply to your letter



Degenerative Feedback

"Could you please tell me what degenerative feedback is and how I could connect the arrangement to my set? I am told it gives better quality."—C. B. (Torquay).

THE term is merely another expression for "negative feedback." This consists of an arrangement whereby a proportion of the output voltage is fed back to the grid circuit, and is mainly used with pentodes and tetrodes. It is, in effect, a resistance-capacity feedback scheme, and it was dealt with in our recent series of articles on the valve as an amplifier. We cannot tell you how to add it to your set without a diagram, and if you are using good triodes it should be unnecessary to use it.

Smoothing

"I have a small A.C. set, but the smoothing does not appear adequate. I have another choke but am not sure whether I should include this in series with the existing choke or put it in the H.T. negative line. I believe I once read in your paper that it was not advisable to do the latter, but I should like you to confirm this."—W. N. U. (Amersham).

THEORETICALLY, it would be desirable to add the choke in series with the existing circuit, including another condenser, of course, on the receiver side to complete the smoothing circuit. If you put it in the H.T. — line the only point to watch is that the choke is so placed that there is no coupling between it and the other choke, as this would aggravate the hum trouble. This was the point which was raised in these pages some time ago.

Condenser Reactance

"I am interested in working out the various smoothing effects of condensers in mains and other apparatus carrying A.C. —such as would be encountered in an A.C. quality receiver. I should like you to give me again the formula for the reactance of the condenser, as I have mislaid a data sheet containing this which you gave away some time ago."—L. I. (Swanage).

THE reactance of a condenser on A.C. increases as the frequency decreases, and the formula for reactance is:

$$\text{Frequency} = \frac{1}{2\pi fC} \text{ ohms.}$$

where f is the frequency of the supply, C is the capacity in farads, and π is, of course, the standard 3.14.

Link Coupling

"I enclose a cutting of a circuit which I have just found and which looks as though it might offer possibilities for short-wave reception. There is one arrangement about which I am not clear and I should be glad if you would explain just what is intended in the area enclosed in the blue pencil. This does not appear to have been used in any circuits in your pages since the time I have been taking your paper."—R. W. T. (Taunton).

THE circuit is of a two-stage transmitter, consisting of crystal oscillator (tritet) and a push-pull P.A. stage. You could not use this circuit for reception, and it is, of course, illegal to make up transmitting equipment now. The part you have ringed round is the output circuit of the oscillator and the input of the P.A. stage, and we presume that your difficulty lies in the peculiar wavy lines with the two loops. This indicates what is known as link coupling, and illustrates a single loop coil, coupled to each of the two tuned circuits mentioned, and the loops then joined by a link of ordinary twisted flex.

RULES

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

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

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

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

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

D.C. Charging

"I have been told that I can charge my accumulators straight from the mains if they are D.C. with the aid of a lamp? Could you send me details of the connections from a heat plug and size of lamp? The voltage of the mains is 230. Also, does the lamp use any current?"—T. S. (E.12).

THERE is just one point to watch and that is that the heat plug is not rated at double the lighting circuit, namely 460 volts. Otherwise, it is quite in order to use the mains for charging, with a lamp in series. You should make up a small charging board so that no live wires or contacts are available on the high voltage side, and the size of the lamp is dependent upon the charging rate you require. Using ordinary electric lamps the following rates would be obtained—approximately:

Wattage of lamp	Charging current rate
40 at 200 v.	.2 amps
60 ,,	.3 ,,
75 ,,	.35 ,,
100 ,,	.5 ,,

You should include fuses in the interests of safety. The lamp as well as the complete accumulator circuit consumes current at the rate given above.

H.T. Potentiometer

"I am thinking of making up a simple converter from the circuit and details given in your article on the Frequency-Changer in the issue dated February 24th last. There appears, however, to be a misprint in the circuit Fig. 1, on page 479. As I see it there is a short-circuit across the H.T. through the potentiometer which is used for the screen of the valve. Perhaps you could give me the correct arrangement for this."—T. G. (Bury St. Edmunds).

THERE is no mistake in the circuit in question, as the potentiometer must have a current flowing through it in order to carry out its function of applying a varying H.T. voltage to the screen. This is quite a standard arrangement and you are apparently confused with a series resistance method of control. This is not advised for H.F. screen control purposes. The only point to watch is that an on/off switch is included somewhere in the H.T. supply so that the H.T. will not drain away through the potentiometer when the set is switched off. Usually, this is carried out by including a three-point switch for the purpose, one pair of points being used for L.T. and the other point being joined between the lower end of the potentiometer and the H.T.—line.

Reaction Control

"I find that when I have my reaction control at zero, there is still some form of distortion, which I can clear by disconnecting the condenser leads from the anode. When I disconnect the condenser from the coil it does not make any difference. I should be glad if you could explain this and tell me how to overcome the distortion."—D. C. E. (Barnes, S.W.13).

THE trouble may be due to the fact that you are using a by-pass condenser across the anode circuit, and that this is large and, in parallel with the residual capacity of your reaction condenser, acts as a tone control. We suggest that you try the effect of bending up a corner of one of the end vanes of the moving portion of the condenser so that when in the zero setting the condenser is short-circuited. To avoid short-circuiting the H.T. supply a small capacity fixed condenser may be included in series with the condenser and the anode. Perhaps the tone-control circuit shown on page 325 of our issue dated December 30th last may interest you.

Choice of Circuit

"I wish to build myself a receiver for general purpose working, that is, on all wavelengths. I am not anxious to obtain the highest quality, but I want a set I can play about with, without undue restriction as to scope. I wonder if you can recommend anything from your list of Blueprints."—N. R. W. (Sheffield).

THE best type of set in a case such as that outlined would be one employing plug-in coils. This would enable you to tune to any desired wavelength and with a suitable type of circuit the quality should be quite satisfactory. We would suggest a three-valve circuit, detector and two L.F. stages, band-spread tuning for simplicity on the short waves and good quality components throughout.

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

RADIO CLUBS & 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.

BRISTOL EXPERIMENTAL RADIO CLUB

Headquarters : 21, King's Corridor, Old Market Street, Bristol, 2.

Publicity Manager : D. J. James, 40, Robertson Road, Eastville, Bristol, 5.

THE meeting of this club, held on Tuesday, March 12th, was chiefly devoted to the official business of the club. Mr. C. R. Davis, the secretary, having volunteered for the radio operator section of the R.A.F., Mr. P. R. Dinham was elected to be his deputy until the end of the present financial year. D. James was elected to deputise for the chairman, Mr. A. A. Uppington, whenever his National Service duties prevent him from attending meetings.

It was decided that now evenings are lighter again, meetings should commence at 8 p.m. Mr. L. Toghill was requested to be responsible for the half-hour period of morse tuition at each meeting. Members' ideas for future agendas were discussed, and it was decided to adopt at least one of them.

THE CROYDON RADIO SOCIETY

Hon. Pub. Sec. : E. L. Cumbers, 14, Campden Road, South Croydon.

MR. NIXON, of the General Electric Co., Ltd., lectured to the Croydon Radio Society in St. Peter's Hut, Ledbury Road, S. Croydon, on Thursday, March 7th. His topic was "Valve Development," and he recalled the carbon lamp being the valve's forerunner, having its filament as one electrode.

It was not long, however, before objections to carrying accumulators to be charged were voiced, and so mains valves, firstly as a four-volt range, appeared. Then the triode led to the pentode, tetrode and screened grid, which meant that more tuned stages was better tuning. Finally Mr. Nixon's film of G.E.C. valve manufacture proved most interesting, containing as it did full explanations of every stage from glass blowing, exhausting and gettering, and elaborate testing before dispatch. The next monthly meeting is on Thursday, April 4th, with the annual general meeting at 7.30 p.m. The balance sheet will be presented and officers for 1940-41 will be elected. At 8 p.m. the popular ex-chairman, Mr. G. A. Hoskins, will give a musical programme on records with his new high quality apparatus. He has a selection of 200 records from which to choose, and PRACTICAL WIRELESS readers are invited to a most interesting evening's entertainment.

EXTERNAL AIDS

(Continued from page 64.)

and thus an additional socket or terminal will have to be mounted on the cabinet. The aerial is transferred to this new socket when the trap is required, and a lead then joined from the trap to the original aerial socket or terminal. By connecting a short, flexible lead to the trap and bringing this outside the cabinet the change, when desired, may be effected in a few seconds. The wave-trap consists merely of a condenser as already mentioned, having a maximum capacity not exceeding .0005 mfd.—preferably .0002 mfd. and a coil which will cover the medium-wave band. The trap is not generally needed on the long waves and therefore construction is simplified. If you make use of an old dual-wave broadcast coil the long-wave section may be short-circuited with a length of bare wire to avoid the complication of a switch, whilst if you wish to make up a coil you can use a former about 2½in. in diameter and wind on 45 or 50 turns of wire of about 22 to 26 d.c.c. A home-made coil lends itself more readily to experimental work, and by making tappings from the lower end at every 5 turns you can connect the trap in a number of different combinations, each of which will offer varying degrees of selectivity. The circuits are shown in Fig. 3.

No doubt other additional schemes will suggest themselves to keen constructors, such as an extra L.F. stage—preferably resistance-capacity coupled, or a small aperiodic H.F. stage, but as these will take up a fair amount of room, it may not be possible to add them conveniently to a receiver which is of the small table or self-contained type, and, accordingly, they are not described here.

RECEIVERS AND COMPONENTS

(*Continued from page 80, col. 3*).

24 MFD. can type, electrolytics, 450v. working, **1/-** each.

B.I. wire-end type bias electrolytics. 50 mfd., 12v, **1/6** each; 50 mfd., 50v, **2/-** each.

TUBULAR wire-end non-inductive paper condensers. All sizes up to 0.1, **5d.** each, **4/9** dozen.

ENERGISED speakers, Plessey 6" cone, 1,500 ohms field. **5/11** each.

BATTERY output pentode valves. Well-known make. **3/11** each.

BATTERY double diode triode. Well-known make. **3/6** each.

ROTARY converters, 6v. and 12v., D.C. input, output 240v. 40 m.a. Complete with smoothing and suppression. State voltage when ordering. To clear **15/-** each.

RAYTHEON first-grade valves. Largest stockists, all types in stock, including glass series, glass octal series, metal series, bantom series, single-ended series, and resistance tubes, all at most competitive prices: send for valve lists. All orders must include sufficient postage to cover. Hours of business: 9 a.m.-6 p.m. weekdays. Saturday, 9 a.m.-1 p.m. Please write your address in block letters.

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ALL Guaranteed. Postage Extra.

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

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

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

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

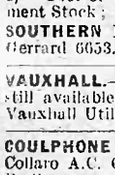
ORMOND Loud-speaker Units, 2/6; Crystal Sets, 5/6; Westectors Type W2, 2/6; Crystal Detectors, 2/-; Crystals, 6d.; Marconi V24 Valves, 9d.

2/- Tool or Instrument Carrying Cases, ex Government Stock; Wood, 9" x 7" x 7", 2/-.

SOUTHERN Radio, 46, Lisle Street, London, W.C. Gerrard 6653.

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

COULPHONE Radio, Grimshaw Lane, Ormskirk. 1940 Collaro A.C. Gramophone Motors 12" turntable **27/6**. Radiogram units **45/-**. American Valves all types **4/6**. Octal **5/6**. Record F.W. Rectifiers 5/6. Stamp for list.



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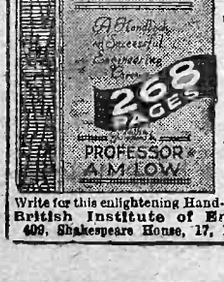

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Special Offer of Dual Range Screened Coils by well-known manufacturer. Aerial or H.F. coil. Accurately matched suitable Band-Pass. Medium- and long-wave operation. Complete with full diagrams. **2/9** each.

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Incorporating the Premier 3-Band S.W. Coil. 11-86 Metres without coil changing. Each Kit is complete with all components, diagrams, and 2-volt valves. **3-Band S.W. 1-Valve Kit, 14/9. 3-Band S.W. 2-Valve Kit, 22/6.**

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Complete to the last detail, including all Valves and coils, wiring diagrams and lucid instructions for building and working. Each Kit is supplied with a steel Chassis and Panel and uses plug-in Coils to tune from 13 to 170 metres.

1 Valve Short-Wave Receiver or Adaptor Kit 20/-
1 Valve Short-Wave Superhet Converter Kit 23/-
1 Valve Short-Wave A.C. Superhet Converter Kit 26/3
2 Valve Short-Wave Receiver Kit 29/-
3 Valve Short-Wave Screen Grid and Pentode Kit 68/-

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