TESTING SHORT-WAVE COILS—See page 63.

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Readers' Letters

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I JOIN THE HELL SHIP

By NIAL O'MALLEY KEYES

At the age of fifteen the author left Eton and his wealthy home to seek a job in the Californian oilfields. His money exhausted, without work, and faced with starvation, he became one of a crew of ocean outcasts on board a ramshackle whaling-ship which was a floating gutter.

There, as a greenhorn "Limey" with an English accent that earned derision, Nial O'Malley Keyes, who had been nurtured in comfort and elegance, learned to be tough amongst a wild cosmopolitan crew who drank and swore and fought, while doing one of the hardest, dirtiest and worst-paid jobs in the world... Read this thrilling TIT-BITS true series of life aboard a whaler.

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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 increase the H.F. stage. But there is a better scheme which not only increases range but at the same time improves the efficiency of the receiver and at the same time reduces the size of the unit which is made. We refer to the inclusion of a short-wave converter. The object of this type of unit is to bring the receiver out of all proportion to the small addition which is made. We refer to the addition of another stage which does not 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 types 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.

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 Northing and Raymond Gledinning. 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

A.N" edition of "Fan Fare," the Scottish sports radio magazine, will be presented once again 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 18th. He has re-created in dramatised form at the microphone exciting last minutes of famous sporting encounters in Scotland—Association and Rugby Football 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 Likes 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-Tyronc 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 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. Gardner is Clerk to the Evesham Rural District Council.
Radio Careers

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

In previous issues we have dealt with the subject of radio as a career, and although the industry has been subdivided into various sections none 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 in research. Metallurgists also play their part in the production of special materials for grids and other anodes. Many modern radio components, and even cabinets, are covered from bamboo, birch, 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 those professions require special training at the end of which some academic degree would be taken.

These specialisations are, of course, more suited to the young man who is just finishing his education, and who is thus 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 training without attending a centre where the necessary practical experience may also be obtained. A casual perusal of some of the "Situations Vacant" columns in the "Radio Times" 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 booklet, costing 8s. 6d.—Deco F 7300-2. A well-known work is Offenbach's "Tales of Hoffman," a selection from which is Ermally well known is Offenbach's "Tales of Hoffman," a selection from which is

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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 of which are included in the album. The original cowboy songs were folk songs in the strict sense of the term. The ranch boys used any old tunes there were for special tests in conjunction with tropical apparatus.

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Gershwin's Concerto in F

A LONG overdue recording featured in the Brunswick catalog for 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 jazzy style of the composition. The slow movement is particularly 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 parts. Brunswick O 2923-8.

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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, mount-
EXTERNAL AIDS
Simple Additions which May Be Made to Any Receiver for Improvement Purposes
By W. J. DELANEY

ANY constructor has 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

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 component, 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 transformer 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.

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

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 so 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.

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 main unit are used for the supply of 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 feed, and therefore it may be desirable only to make up one such unit first and connect that 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 bypass 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 this is divided out, that is, divide 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.

Wave-trap
Where the problem is one which concerns selectivity the necessary addition of a wave-trap may be effected in an exact manner. The choke 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 control purposes. This may be mounted on the side of the cabinet, and the control also be mounted inside the cabinet near the condenser. The aerial will have to be joined to one side of the wave-trap...
Definition of a Lowbrow

In a case recently heard at Tottenham Court, a lady was found guilty of stealing a pair of wire coat hangers. She had no ear for real music. The judge asked her what she had been listening to.

"My husband has no ear for real music. He listens to B.B.C. concerts, opens, 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 are very familiar. But did you know the man who was one of the earliest pioneers of wireless? He died on March 24th at the age of 96. He invented the first practical 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. Branyu."

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 details from the subject. Radio component manufacturers who originally founded their businesses on the demand for components required by constructors. When set manufacturers began to take over the construction, the component manufacturers tried to keep a foot in both camps by supplying components at special cut prices to set manufacturers. In many 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 prices.

There will always be a good market for component manufacturers, and I can assure the R.C.M.F. that this journal survives and not sponsored by this journal would require them to take stock of the past when constructors, the leading experts, the staff of announcers, but will broaden the scope of their duties. In future, announcing will take their specialised forms: there will be a co-operation 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 Germain. There will be four regular news readers in London, selected from Frank Phillips, Alan Howland, Joseph MacLeod, Alvar Lidell and Peter Curwen; the latter, though a new recruit as an announcer, is familiar to listeners as an actor. Stuart Hilbert 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 simple day concerts to light variety. News readers to the announcing staff will still 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, 2r, Fetter Lane, E.C.4.
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 enforced by the Poles and the Finns, it has been possible to some extent. But this mustn't hide from us the first and constantly maintained at "concert pitch" just as the modern motor-car highway was brought to its present state of perfection the moment the possibilities 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 conductor" and "drive our own car." Side by side with the lessons, and the one acting as the complement of the other, comes the technical training, so to say, 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 reward of 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 of the war to reconsider that decision, always provided that a reasoned appeal to those who have abandoned it will do with its result.

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 in order to call 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 rhythm of your number, even though you may 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 launching out into it with hopes of success.
A Simple Wire Gauge

The accompanying sketches give details of a simple but accurate wire gauge. The jaws are constructed from heavy gauge aluminum, 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.

**Figure:** 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 (E) is bored and the rod is passed through, the end of this 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 stock to the metal front.

The threaded rod has a pitch of 1/36in. It then one turn of the pointer will be sufficient for gauges 40-22, and a second turn for gauges 22-17. The gauge can also be used for sheet metal.

A Jack and Plug Adaptation

When modifying any A.F. set, or when one recently I decided to make provision for using the telephones 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 speakers, 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.

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 vane. When the moving vane 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.

Practical Hints

That Dodge Of Yours!

Every reader of "PRACTICAL WIRELESS" must have originated some little dodge that he has put into practice, and that he has found convenient. Any hint should be in clearly written form, and any additional information should be enclosed.

I decided to make provision for using the telephones by tapping the first L.F. stage in the manner shown inset in the accompanying sketch.

After examining 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, and the end of panel washer "W," the contact proper being of thin resilient copper soldered to the shank.

A Combined On-off Switch

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Solder of the pallet should be smooth and free of soldered, as shown in Fig. 1. The faces of the pallet and switch on 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 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 spaced 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 filament switch, as it is called, is a parallel-connected switch, and that it is worked electrically. The insertion of a 400-ohm resistance in one of the leads to the coils cuts the current down to about 5 mA, which is quite small compared with the current taken by the receiver. However, it may be found that the ammeter reaction on the coil have been cut so low that the current is switched off. Another point which requires attention is the fact 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 current 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 mA, which is quite small compared with the current taken by the receiver. However, it may be found that the ammeter reaction 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.

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 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 deduced 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 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 spaced 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 filament switch, as it is called, is a parallel-connected switch, and that it is worked electrically. The insertion of a 400-ohm resistance in one of the leads to the coils cuts the current down to about 5 mA, which is quite small compared with the current taken by the receiver. However, it may be found that the ammeter reaction on the coil have been cut so low that the current is switched off. Another point which requires attention is the fact 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 current 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 mA, which is quite small compared with the current taken by the receiver. However, it may be found that the ammeter reaction 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.
What purpose is served by a band-pass filter? Give a diagrammatic band-pass circuit to illustrate your answer.

The object of a band-pass filter is to provide the utmost 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 tuning is made highly selective the tuning "peaks"; in other words, the required signal can be heard only over 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 8,000 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. 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 phone 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.

It is not necessary for the resistance to be a normal resistor, but 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 lead or anode lead.

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.

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

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 feed 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 excited 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.

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 6BY5 type, and the anode 11 thereof is connected to a current source, through an anode lead 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 16, 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 current 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.

![Fig. 1.—Detector stage, showing the cathode circuit improvement.](image)

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.

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 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 re-arrangement 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 carter 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 utilized. 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 90 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,

Figure 3.—Relation between input and bias.
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 square one; it in no way to describe the detector circuit as being distortionless in operation over a pre-determined wide range of signal input voltage. 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 audio range of broadcast.

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 66 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 a source of 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 cathode circuit is the same as in the case of Fig. 1. The audio voltage is taken from the anode 33 of cathode 34 and 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 the region 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 output carrier amplitude by virtue of the direct current voltage drop in the detector plate circuit. H.T. supply may be 290 volts, and load resistor 12 can be 500 ohms.

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

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.

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 could be obtained by connecting primary and secondary windings in series and forming 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.—vad the series junction to the coupling condenser. By this means an effective ratio of 1:4 could be obtained when using a 1:3 transformer.

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

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

"Mutual conduction is a measure of the "goodness" or efficiency of a valve, and is stated in micro-amp 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 conduction is indicated by the anode current-grid voltage curve: the steeper the slope of the curve, the higher the mutual conduction.

Conversion conduction is a term used in connection with frequency-changers, 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 conduction is really the counterpart of mutual conduction of an amplifier valve.
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 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 multirange 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.

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 pentode. 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 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 diagram and the circuit diagram.
the small trimming component should be in the neighbourhood of 0.0005 mf.

With the tuning condenser mentioned, the aerial wave length of the coils will be 11 to 25 metres, 22.5 to 50 metres, and 45 to 95 metres, thus covering all the important frequencie.

The type 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 S.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 it is possible to have two separate condensers of the correct capacity are to hand, they can then 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 their relative settings can be altered, thus offering a more exacting degree of personal taste and the gear available.

**Construction**

A suggested layout is shown in Fig. 2. We would advise metal chassis construction for two separate controls, as once their positions have been fixed it becomes impracticable to move them. Supposing in your district it happens to be the positive side, well, that means that you would have to tune in the S.W. transmissions by adjusting the tuning controls of the unit to about 1,200 metres, and the volume switched over to the long waves and tuned to some 5 to 10 metres in the case of D.C. supplies that the polarity is decided upon to suit your requirements.

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

as this allows a neat assembly, good location of the components, and short wiring, but if readily available can be 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 circuiting switches. A suggested layout is shown in Fig. 2. We would advise metal chassis construction for two separate controls, as once their positions have been fixed it becomes impracticable to move them. Supposing in your district it happens to be the positive side, well, that means that you would have to tune in the S.W. transmissions by adjusting the tuning controls of the unit to about 1,200 metres, and the volume switched over to the long waves and tuned to some 5 to 10 metres in the case of D.C. supplies that the polarity is decided upon to suit your requirements.

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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 apparatus: the cathode and anode supplies to the sound and vision receivers were 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 single-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 ultrashort waves. 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 give a voltage of the order of 4,500. The balance of the power supplies 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 advantages 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 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. The only 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 every receiver in use, and the synchronising pulses inserted 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

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

Practical Wireless

New Patents

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Abstracts Published.

TWO-PART COUPLINGS.—Yoshida, K. No. 504241.

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 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).


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 a base as shown or direct to a panel, etc. Leads from the condenser may pass downwards and cut out through the sides of the base as at 22, 23, 24, or laterally from the flattened side 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 and short waves effected by sprung 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.

ADJUSTING WIRELESS APPARATUS; INDICATING APPARATUS.—Murphy Radio, Ltd., and Fisher, L. No. 507348.

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 another number of evenly spaced transparent lines on the transparent fixed plate 7. The spacings differ in known manner for vernier scales. The plate 7 carries a number mark 4 and each station in the long and medium wave bands 2, 3 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 cooperating with a series of spiral dots on the rotating drum. Greater subdivision may be obtained by mutually inclining the two sets of graduations and extending their length.

ARMSTRONG

Apologies for delay in delivery of some models, this unfortunately has been unavoidable owing to the present great difficulty in obtaining raw materials. However, we are pleased to announce that we are now in the position to give immediate delivery of our popular model, A.W.36, illustrated below.

NEW PATENTS

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Abstracts Published.

4237.—Loewe Radio Co., Ltd.—Television transmitters. March 6th.

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

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

Specifications Published.


51841.—Eichhorn, C. E.—Vibration-translating devices, such as loudspeakers or phonographic pick-ups.

51874.—Marconi's Wireless Telegraph Co., Ltd.—Cathode-ray tubes.


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

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ILLUSTRATED ART CATALOGUE ON REQUEST ALL CHASSIS SENT ON T. DAYS' APPROVAL
### Logarithms (continued)

<table>
<thead>
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<th>Logarithm</th>
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<tr>
<td>9</td>
<td>0.9542</td>
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</table>

### Linear Measure

- 1 Foot = 0.30480 Metre
- 1 Yard = 0.9144 Metre
- 1 Fathom = 1.8288 Metres
- 1 Hill = 9.144 Metres

### Cubic Measure

- 1 Cubic Inch = 16.387 Cubic Centimetres
- 1 Cubic Foot = 0.028317 Cubic Metres
- 1 Cubic Yard = 0.764555 Cubic Metres

### Weights

- 1 Dram = 0.0648 Gramme
- 1 Grain = 0.0648 Gramme

### Avoirdupois

- 1 Pint = 0.43896 Litres
- 1 Gallon = 4.54609 Litres
- 1 Milligram = 1.102314 Grammes

### Hectares

- 1 Hectare = 2.47105381 Acres
- 1 Acre = 40.468672833849453 Square Metres

### Metric

- 1 Millimetre = 0.001 Metre
- 1 Micrometre = 0.000001 Metre
- 1 Nautical Mile = 1852 Metres

### Conversion

- 1 Metre = 39.370079 inches
- 1 Kilometre = 1,000 Metres

### Temperature

- 0°C = 32°F
- 100°C = 212°F

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**PRACTICAL ENGINEERING — THE NEW WEEKLY**

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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 set, together with a log from February 1st, 1940, to March 16th, 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 metres: W3KJG, W3DIIC, W3AEF, W3FRY, W3IKU, W3BLO; W3FYBO, W3KZG5, W3KXY, W3M6Q, W3TFT; W3FMF, W3EEO2, W3EJU, W3MEMM; W4DSY, W4BMR, W4AHH; W3CPA, W3H3R, W3LQLU, W3Q6R, W3CUCO, W3MIC; IH1K, IRE; ES5IC, ES5FD; ES6G, ES6U, ES6YJ, K4FKC, HAST; HATF, HAQQ, TV1AQ, E7A96A and UK484.—A. Hazell (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 metal, the size required for the panel, whilst the sides of the chassis are made of pine, 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 Edistoone coils, 4-pin H.F., are used together with Utility microdials, with electric bandspread. In the H.F. stage I am using a Tungarman FP210 valve, which will allow 50,000 ohms potentiometer for grid bias to the grid. A Coscor SP7210 is used as double triode HP210 as first L.F. and a Triotron P250 in the output stage. The L.F. transformer is a R.I. Faradine. 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 (Ambala), VUD2 (Delhi), CXA2 (Monte Carlo), VLO (Sydney), XGOY (Chengking), WGEO, WRUL, WCBX, WPIT and WNBI.

I heard a station the other evening between 10 p.m. and 10:30 p.m. on 40 metres which announced itself as KBRM, Manila, Philippine Islands. I cannot find any tabulated list of stations on 40 metres. Try as I will, I have never been able to hear any station in Canada or B. Africa on this or any other set. I am very 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 head panel signal from Canada.—J. Krop (Milton Mornings).
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 (feedback), 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 am told in your paper that it was not advisable to do the latter, but I should like you to confirm this."—W. E. U. (Melton Mowbray).

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, you will be putting in your gain that it was not advisable to do the latter, but I should like you to confirm this."—W. E. U. (Melton Mowbray).

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

\[ X = \frac{1}{2\pi fC} \]

where \( f \) is the frequency of the supply, \( C \) is the capacity in farads, and \( \pi \) 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 on 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 (tritron) 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. We presume that your difficulty lies in the peculiar wavy lines with the two loops. In your diagram, you have used this circuit for reception, and it is, as you say, cut short. Usually, this is cut 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.

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 voltage, namely 400 volts. Otherwise, it is quite in order to use a lamp. 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. 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 work, 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. 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-spreading circuits, and fixed condenser capacity on the short waves and good quality components throughout.
PRACTICAL WIRELESS
April 6th, 1940

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