SOME EXTRAORDINARY REGIONAL TESTS

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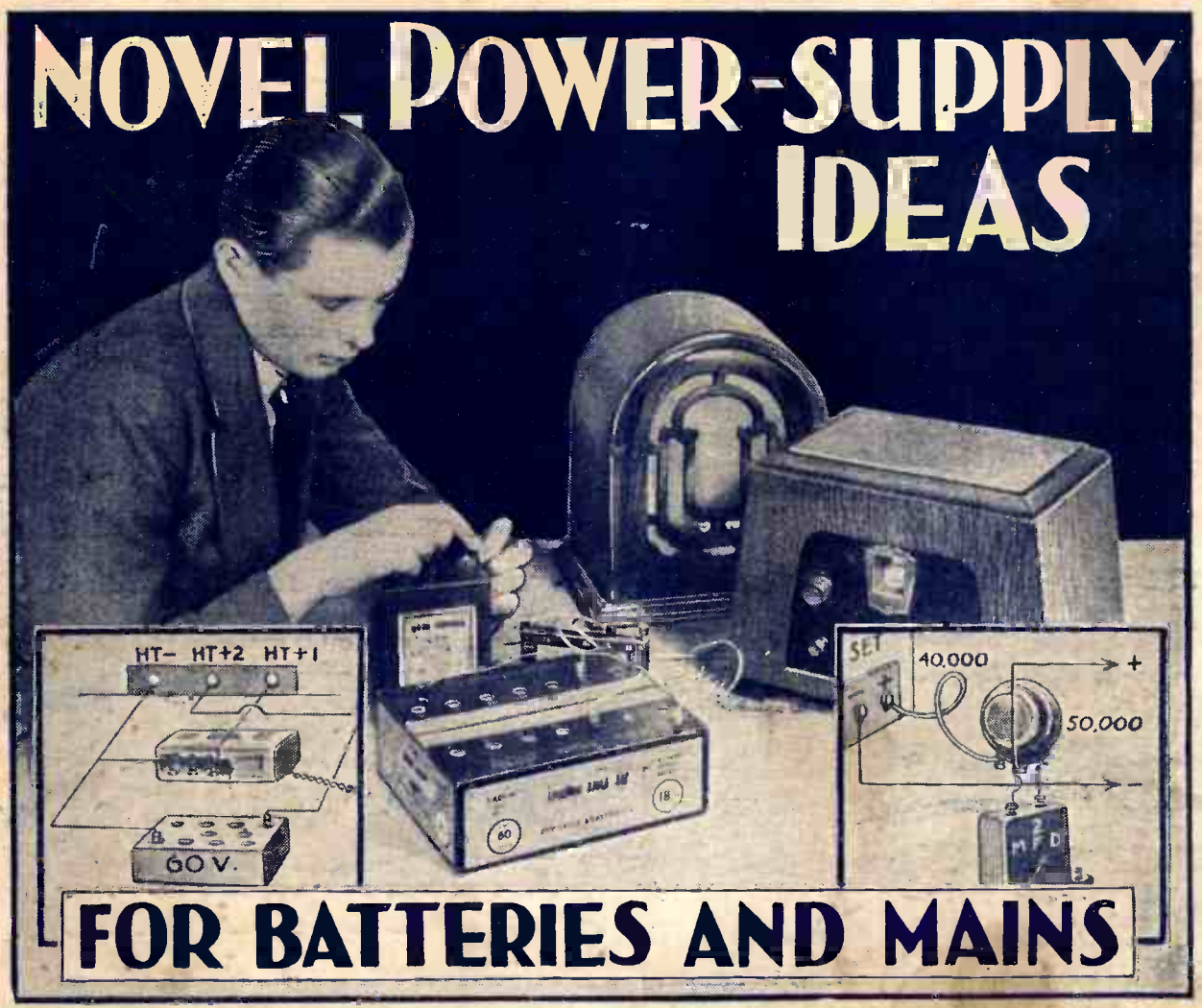
Amateur Wireless and Radiovision

Every Wednesday 3d.

Vol. XXII. No. 554 Saturday, January 21, 1933



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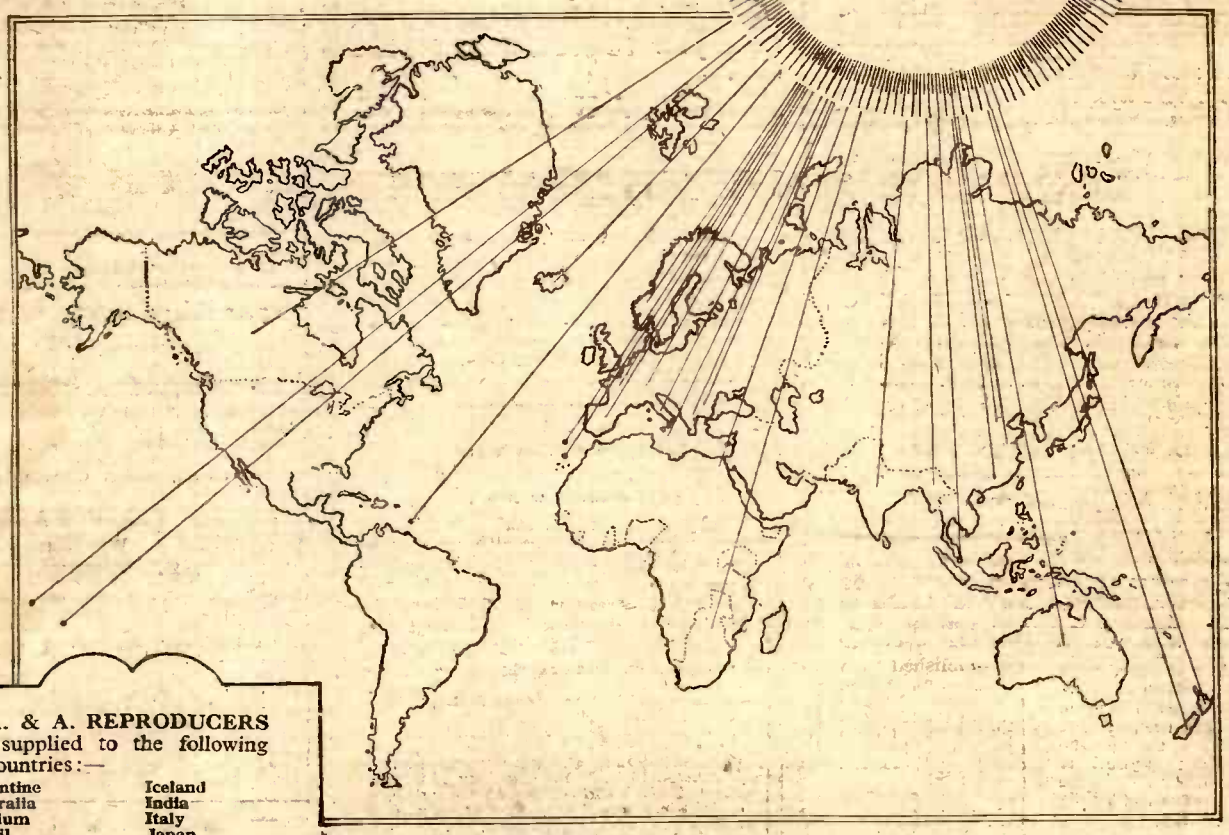

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No. 554. Vol. XXII. JANUARY 21, 1933

BRITAIN'S LEADING RADIO WEEKLY
FOR CONSTRUCTOR, LISTENER & EXPERIMENTER

EDITOR: BERNARD E. JONES. TECHNICAL EDITOR: J. H. REYNER, B.Sc., A.M.I.E.E. RESEARCH CONSULTANT: W. JAMES. ASSISTANT EDITOR: H. CORBISHLEY.

NEWS & GOSSIP OF THE WEEK

THE "MELODY RANGER"

WHATEVER you do, don't miss next week's issue! It will be a real bumper number, featuring "A.W.'s" sensational new receiver, the "Melody Ranger." It is this set, of course, which has been tested by "A.W." experts all over the country and which forms the subject of the interesting tour described on pages 92 and 93 this week.

A BLUEPRINT GIVEN FREE

NOT only will a special section of next week's issue be devoted entirely to pictures and an explicit constructional description of the "Melody Ranger," but a free full-size blueprint will also be included. Wiring and components will be shown very clearly and full size, so that everybody will be able to build the "Melody Ranger" without difficulty. This will definitely be the best practical description of a receiver ever published in a wireless journal.

SUCCESS AT DAVENTRY

Reports from the Empire

THIS week we publish reports received by the B.B.C. on the Empire transmissions since the service started on December 19. Everything appears to be going very favourably, and apart from the need for a longer wavelength for the Canadian transmissions, the engineers are satisfied with the wavelengths they have. A number of change-overs have been made with the various transmitter aerial arrays to feed the zones, and they say that as spring comes on the need for a longer wavelength for Canada will be less apparent.

TELEVISION PANTO!

Dick Whittington Televised

THE television pantomime was a novel idea. Mr. Robb and the other television people are not lacking in originality. Coming broadcasts include the popular dancer, Laurie Devine, who is to appear in "Invisible" vaudeville on February 6. She has invented a new character, Miss Amelia Ruth Barry—an American.

B.B.C. AND BRITISH MUSEUM

TELEVISION broadcasts continue to star some interesting and novel features. Recently Ina Souez appeared before the televisor in the guise of Christine Nilsson, the famous prima donna of other days, who gave her farewell concert in the Albert Hall on January 20, 1888. The television producer wished Miss Souez to be dressed in a replica of the creation worn by Madame Nilsson forty-five years ago, so he sent an artist to the British Museum to copy an illustration of the prima donna entitled "Rotundité in the Albert Hall," which was published about the date of Madame Nilsson's farewell. Miss Souez, of course, sang the same songs given by Madame Nilsson at her farewell.

THREE ORCHESTRAS

In a Radio Play!

THE authors of *The King Can Do No Wrong*, C. Denis Freeman and Mark A. Lubbock, are now engaged in the preparation of a new operetta for broadcasting in March. The title is *The Castle on the Hill*, and the plot is enacted in Hungary at the time of the revolution of March, 1919. Mr. Lubbock is concentrating on the musical score.

ON A BUS!

A coach service between London and South Wales now provides radio entertainment for passengers. The coach conductor is seen operating the super-het

Also in this Issue—

FEATURES YOU SHOULD NOT MISS

An Extraordinary Regional Test.

Making a Simple Condenser Microphone.

J. H. Reyner on Transformers.

SPECIAL EIGHT-PAGE SUPPLEMENT—"WIRELESS FOR BEGINNERS."

BARTLETT'S NEW TALKS

Watched by Fascists!

VERNON BARTLETT has now returned from the Continent, where he has surveyed contemporary Europe from some of the important capitals, his talks being broadcast to British listeners. For the next few weeks he will talk from Broadcasting House, and then he intends to start on a fresh tour of Europe to conduct a series of broadcasts entitled "Leaders of Europe." Some of the talks will be in the form of interviews; in other cases he will bring prominent persons to the microphone to speak for themselves. It should be interesting to British listeners to hear the leading statesmen of Germany, Italy and Poland. When Mr. Bartlett broadcast from Milan he was watched all the time through a glass screen by a party of young Fascists.

Sunday Orchestral Concerts

THE season of Sunday orchestral concerts opens at the end of this month with a broadcast of "The Seasons." As usual, Dr. Adrian Boult, Music Director of the B.B.C., will conduct a number of the concerts and other conductors will be Albert Coates, Malcolm Sargent, Basil Cameron, Frank Bridges and Anton Webern. Mr. Coates' programme, on March 5, will be devoted to Russian music. Dr. Sargent's appearance, on February 5, will be in connection with a performance by the Philharmonic Choir of Verdi's "Stabat Mater." A number of famous soloists will take part during the season, including Arthur Catterall, Maggie Teyte, Paul Hindemith, Benno Moiseiwitsch and Marcelle Meyer.

NEXT WEEK: 'A.W.'S' SENSATIONAL NEW RECEIVER — SEE PAGE 80

NEWS & GOSSIP OF THE WEEK—*Continued*

MORE POWER FROM GERMANY

120 Kilowatts from Berlin

LATEST news is that the 120-kilowatt Berlin and 60-kilowatt Hamburg stations will be ready within four months or so. Leipzig is, of course, already on 120 kilowatts, and it is power of this order which will give the U.I.R. something serious to think about when the next meeting takes place at Lucerne, and when they will have to get out a Lucerne Plan as a successor to the Prague Plan. Germany has been doing some wavelength changing recently and two new relays are to work on the same wavelength as Frankfurt. Although extravagant in power, the Germans are economising in wavelengths!

ANOTHER MACKENZIE PLAY

Successor to "Carnival"

ONE of the outstanding novel adaptations of recent years was that of Compton Mackenzie's *Carnival*. Now Mr. Mackenzie is considering the adaptation for the microphone of another of his books, *The Vanity Girl*. This, also, has a theatrical flavour and should make an eminently suitable radio drama.

THE POPULAR SIR HENRY

ALTHOUGH the last night of Rupert D'Oyly Carte's season of Gilbert and Sullivan operas at the Savoy Theatre will be relayed in the National programme on January 21, no advance announcement is possible of the name of the opera, as no selection is made until the day of the performance. The occasion will have special interest, in that it is the farewell performance in London of Sir Henry Lytton, who has been playing in Gilbert and Sullivan since 1884.

WILL FRANCE BE TAXED?

THEY are always toying with the idea of having a radio tax in France and when the Chamber of Deputies (the French Houses of Parliament) set up a commission to probe the possibilities of getting revenue this way, French listeners thought they were definitely "for it." The commissioners have suggested that there should be a tax of fifty francs on valve sets (which would work out at a slightly higher rate than our own tax) and have said that the Post Office should have the job of raking in the money. As there might be a mild public outcry, the commission's experts have given the powder in the jam—the jam in this case being a suggested Bill to prevent electrical interference. In other words, if French listeners pay a tax they *may* have their reception made interference-free.

EMPIRE-SET INQUIRIES

NUMEROUS inquiries from the wireless trade of this country have already been received by the B.B.C. as to the most suitable sets for use by overseas listeners to the new Empire service from Daventry. It appears that three types of set will be needed to meet all requirements. Firstly, an all mains set; secondly, a set for use with batteries that can be charged; and, thirdly, a set that works for long periods on batteries that need no charging—for backwoods-men! At present the B.B.C. is not committing itself, but offers to pass on any conclusions arrived at when sufficient correspondence has been received in connection with the Empire service questionnaire forms now being circulated.

INSTALLING THE ORGAN

OWING to the need for the Concert Studio for broadcasts, work on the organ at Broadcasting House has to be restricted to the somewhat extraordinary hours of 3 to 9 a.m. in the mornings. An interesting point about this organ—which literally bristles with novelties—is that as the first note of the organ is struck the shutter between the organ and the ornamental grille in the studio automatically opens and after a suitable interval at the conclusion of the playing of the last note the shutter automatically goes back into place!

Behind the scenes of the Childrens' Hour. This photograph, actually taken recently in a Broadcasting House studio during a Childrens' Hour broadcast, shows the "Uncles" and "Aunts" busy before the mike.

TRUTH ABOUT DAVENTRY'S AERIAL

MAY we clear up the conflicting reports about Daventry's aerial system? On October 22 the normal aerial was taken down and a special high-capacity type was tried out. This proved to the engineers that better high-note response could be thereby obtained. On the outlying fringe of Daventry's extensive service range the signal strength was slightly reduced, so on December 9 the old aerial was put up again. When Droitwich opens up, the high-capacity type of aerial will be used and, with the extra power available, the slight loss of signal radiation will not be noticed; in fact all listeners will get not only better quality, but much better strength.

OUR REGIONAL TEST

On pages 92 and 93 this week we give a description of the Regional test conducted by "A.W." experts with The "Melody Ranger," the sensational new receiver to be described next week. The set has been tested all over the country in the most difficult places and it has been tried out, not only on the medium and long waves, but on the short waves below 100 metres.

A bag of 157 stations has been obtained. The "Melody Ranger" is definitely a winner.

Interesting sidelights on our Regional tour are given in the centre-page feature this week. You will be convinced that our new set has been thoroughly tried and has come out with flying colours.

DON'T MISS THE "MELODY RANGER"

PLYMOUTH'S TWO WAVELENGTHS

AT the moment the Plymouth relay station is enjoying the luxury of two wavelengths. There is the normal transmission on 288.5 metres—now rather badly interfered with by the Scottish National on that wavelength—and there is the new experimental wavelength of 218.5 metres, on which the station's local programmes will later be radiated when the 288.5-metre wavelength is given up at Plymouth. The gear being used for the 218.5-metre transmission is that lately removed from the Edinburgh centre.

"MAINS POWER" FOR BATTERY SETS!

By adding push-push output to a battery set it is possible to make it sound as good as a mains receiver—and without any increase in running costs. How to make the addition is explained by W. James in the February *Wireless Magazine* published on Friday, January 20, at 1s. By the way, some people call "push push" quiescent push-pull.

The Halle concert relayed from the Free Trade Hall, Manchester, on January 26, is of great importance because Sir Edward Elgar is himself to conduct his own *Dream of Gerontius*.

An excerpt from Francis Laidler's Yorkshire pantomime, *Humpty Dumpty*, will be relayed from the Theatre Royal, Leeds, to North Regional listeners on January 28. This is the second of the Christmas pantomimes to be broadcast this season.

Novel Power Supply Ideas for Batteries and Mains

Here are suggestions for increasing high-tension output, for improving low-tension arrangements, for feeding variable-mu valves and for providing automatic grid bias

HIGH-TENSION SUPPLY

NO matter whether you take your high-tension from batteries or mains, it is necessary to economise. Excessive high-tension current spells waste even in a mains driven outfit as there is no point in over-running the valves.

The actual current consumed can always be kept down by putting as much bias as possible on the grid of the power valve, and by using as low an anode voltage as is possible with the power output required.

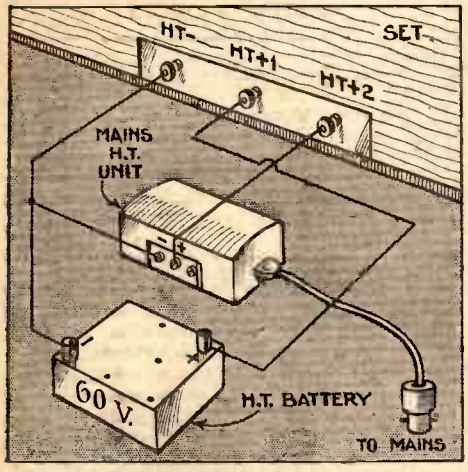


Fig. 1. It is possible to use a small mains unit with a dry battery to increase the H.T. output. The scheme of connections is shown here

A difficulty arises when a small mains unit, giving, say, 15-milliamperes at 120 volts, is required to work a new and much larger receiver. You will find that if the valves are normally biased and the H.T. current is somewhere near the full maximum value rated for the unit, the actual H.T. voltage drops by a noticeable amount. In fact, if the voltage regulation is not good, the output of a unit of this type may drop down to a bare 100 volts or so.

You can put the voltage up again by increasing the grid-bias, which cuts down the anode current.

But this may cause distortion.

The best plan is to use the mains unit for only one, or at the most two, stages in the set. A dry battery can be used to supply the other stages.

This is really a workable plan in many cases and it saves you buying a new eliminator. The economical way to arrange things is to have the H.T. unit connected to the power output stage and perhaps also to the screened-grid stage or to the first L.F., if there is an intermediary low-frequency valve. The dry battery is then needed only to supply the detector stage and a double-capacity battery of sometimes not more than 60-volts will do the trick admirably and will last the best part of a year as it will be very much much under run.

The connections are shown by an accompanying diagram, Fig. 1.

If the set is not adequately decoupled you may need to put a 2-mfd. condenser across the high-tension battery to cut out interaction. This just depends on the set arrangements.

In home-made eliminators it is often possible to increase the high-tension output by altering just one or two of the components.

In a D.C. unit you will often find that it is only the smoothing choke which sets a limit on the effective current that can be taken. If the choke is small and has not much of a core, there will be bad smoothing when the anode current goes up, as the choke will then be in saturation. All smoothing chokes are rated with their inductance value when a given value of D.C. is flowing. It is this rating which sets a limit on the output obtained from the maximum tapping. The intermediate tappings, of course, are regulated by a voltage dropping resistance. In a D.C. unit, therefore, you may find that it is only necessary to fit a new choke in order to get more H.T.

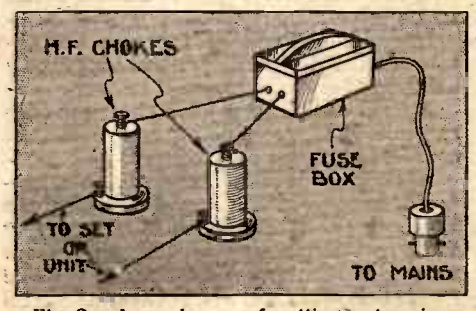


Fig. 2. A good way of cutting out mains interference (stray H.F. introduced through the mains wiring) is by connecting two chokes as shown

In an A.C. unit, the rectifier side has to be considered as well as the smoothing circuit. To get more current from a small A.C. unit, you will generally have to fit a new input transformer and rectifier. This means that you will also have to watch the working voltages of the smoothing and filter condensers, as with the increased output you may be working too close to the safety limit.

Generally speaking, it doesn't pay to alter the circuit arrangements of an A.C. unit and you should try the additional battery scheme recommended if you do not want to scrap the unit altogether and get a new one.

In the majority of cases, H.T. batteries

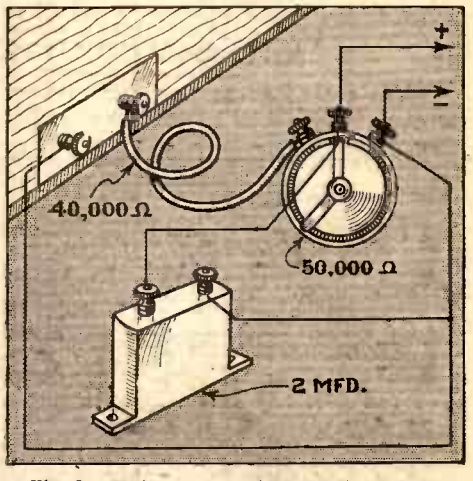


Fig. 3. This scheme of connections shows how to add a variable tapping to a fixed-output unit

are thrown away some time before they are actually useless.

When a battery having only a small capacity is used, the internal resistance increases enormously as it runs down. Even a slight drop in voltage results in a big increase in internal resistance, and this has the effect of causing back coupling in the set.

Generally a high-pitched whistle is the result of the back coupling, and if you cure this by making a slight alteration to the set's wiring, you can prolong the battery's useful life.

The detector stage is that most likely to be affected by internal resistance of the H.T. supply. Check up the wiring, and if the detector stage is not adequately decoupled, then fit a decoupling resistance of 20,000 ohms (in the case of transformer coupling) and a by-pass condenser of 1 microfarad.

(*Continued at foot of next page*)

Double Number with Full-size Blueprint

NEXT WEDNESDAY'S "MELODY RANGER" SPECIAL ISSUE

IT has been my pleasure in the ten and a half years' happy life of "Amateur Wireless" to announce to my readers a great many successful receivers, but never have I taken up my pen to write of a forthcoming set more confidently than I do now.

Our announcements during the last two or three weeks will have prepared you for our new set, and the more "detectively-minded" will have deciphered the picture clues given in the three preceding issues of "A.W." and will already know a great deal about it, but I am not satisfying here and now the picture-clue competitors—they must wait. I am simply saying that the "Melody Ranger," to which many pages of next week's double number (usual price, 3d.) will be devoted, is a real novelty and

THE FIRST HOME-CONSTRUCTOR SET OF ITS KIND.

A simple turn of a switch will bring in the broadcasting stations of the world—*of the world*—whether ultra-short wave, short-wave, medium-wave or long-wave. Just a turn of a switch does this

WITHOUT COIL CHANGING.

We are so presenting our instructions next week that everybody—both beginner and radio enthusiast—will have no difficulty whatever in building the "Melody Ranger," and

WE GUARANTEE

that the results achieved by our staff in their tour with the set through Great Britain can be obtained by any reader.

You will all appreciate the refinements with which the circuit fairly bristles.

The "Melody Ranger" is cheap. Judging it just as a broadcast set, it is cheap. Judging it as a bringer-in of world-wide stations, it is astoundingly so.

Every copy of "A.W." will contain a stitched-in

FULL-SIZE BLUEPRINT

showing the complete plan and wiring diagram of the "Melody Ranger." The issue itself will contain Practical Constructional Tips, a Step-by-step Building Guide, Full Descriptions, etc., making it possible for any and every reader to build our new all-wave receiver with absolute confidence as to results.

Our "Melody Ranger" Double Number, on sale next Wednesday, January 25 (usual price, 3d.), will be heralded by special publicity of a national character. We shall print a huge number of copies, but whether you get yours depends very largely upon your remembering to ask your newsagent or news-stall to reserve one. My best tip to every reader is

ORDER NEXT WEEK'S "AMATEUR WIRELESS" NOW.

THE EDITOR.

"POWER SUPPLY IDEAS"

(*Continued from preceding page*)

Take the H.T. tapping to a higher point than normal on the battery, to compensate for the voltage drop across the decoupling resistance.

Some batteries crackle as they run down. You can generally cure this by fitting a

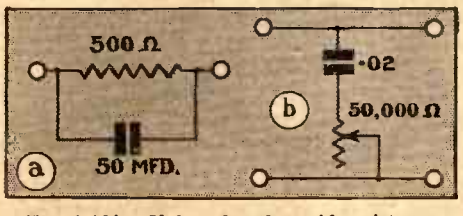


Fig. 4 (A). Values for the grid resistance and shunt condenser in an automatic bias circuit for a pentode as shown here. (B). A suitable tone-corrector circuit for pentode output

large condenser across the main positive and negative socket. A 2-microfarad condenser with very good insulation should be used.

Crackling is sometimes caused in a mains supply owing to stray high-frequency entering the set through the mains wiring. Buzzing and howling similar to motor interference is also introduced in the same way on some supplies. It is often difficult to cure this, but one method you can try is shown by an accompanying diagram, Fig. 2.

Here two high-frequency chokes are put in the mains supply, one in each lead. Keep the chokes well apart, as there is the full mains voltage across them. The mains leads should be taken through a fuse block before a connection is made to the chokes, so that if there is a "short," the mains wiring and fuses will not be damaged.

The chokes will need to have a fairly high inductance value.

PROVIDING H.T. TAPPINGS

The "A.W." Query Staff receives many letters from readers who want to know how to work a set having a number of H.T. tappings with a unit which has perhaps only two. Often also it is required to fit a variable tapping to an eliminator which has fixed outputs.

Intermediate voltage tappings are obtained from the mains positive tapping by using fixed resistances.

A fixed condenser is joined between each subsidiary tapping point and earth, of course, to prevent back coupling.

A 5,000-ohms resistance with a 2-microfarad condenser, connected between the tapping point and earth, provides a suitable intermediary tapping on a fixed voltage eliminator. A 25,000-ohm variable resistance also connected between the main H.T. tapping and a third terminal (and also shunted by a 2-microfarad condenser) provides a suitable variable tapping.

The connections for a second variable tapping are shown by Fig. 3. Here a 40,000-ohm flexible resistance is used to drop the voltage, and a further voltage drop occurs across the windings of the 50,000-ohms "pot."

The arm of the potentiometer and the negative side of the mains unit wiring give

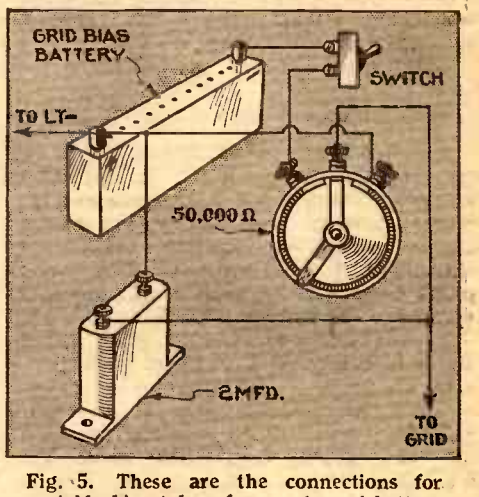


Fig. 5. These are the connections for variable bias taken from a tapped battery in a battery-fed variable-mu circuit

the intermediate variable tapping. A shunt condenser of 2 microfarad is provided.

LOW-TENSION SUPPLY

The heater wiring of an all-A.C. set must be carried out carefully. Although it appears to be the simplest part of the circuit, it is actually that in which trouble can arise, and to which a great deal of mains ripple and hum is often due.

Watch the L.T. transformer connections

(*Concluded on page 105*)

20,000 PIECES of MUSIC — AT BROADCASTING HOUSE!

Our B.B.C. Commissioner gives some amazing facts regarding the huge music store of the B.B.C., in which are orchestral works and vocal scores of every kind

WHEN the B.B.C. moved from Savoy Hill to Broadcasting House, two big lorries were filled with music and band parts (including Bach cantatas) in transit from the old music library to the new!

Now the huge store of music rests in state on the fifth floor of Broadcasting House.

There are people who will tell you that Broadcasting House's fifth floor is the least interesting in the building for there are no studios on that stage.

They are wrong.

The music library is one of the most interesting features in the studio-tower. It is unique in the musical world.

A few facts will convince you.

A Giant Music Store

The B.B.C.'s music library is said to be the largest in the world. **It contains music of every kind from manuscript parts of Bach cantatas to the latest comic song. It has an orchestral library of 10,500 works, military band parts for 4,000 pieces, and 32 copies of vocal scores of every kind.**

As you can imagine, this giant music storehouse has to be indexed in a most intricate way.

The indexing is up to date. It is the talks department which loses manuscripts, not the music department! All the musical parts are kept in special files in steel racks and a code system enables any of the numerous parts of the special orchestration to be obtained in a few minutes. Normally, there is no rush for the orchestral programmes are made out well in advance and the parts needed for the first rehearsals are sorted out as part of the routine job of the Music Library staff.

The man in charge of the giant library was formerly a member of the B.B.C. Orchestra, and so he knows what parts are needed for each of the sub-sections of the orchestra. One or other of the various sub-sections of the main orchestra is always rehearsing or broadcasting—generally in the Concert Hall—and detailed musical knowledge is needed to select the orchestral parts for each sub-division of the orchestra. On the other hand, a very wide general knowledge of music is needed to cover the whole field of musical comedy and vaudeville numbers.

Some idea of the comprehensive nature of the Broadcasting House libraries will be obtained from these photographs — that on the left shows the reference library and the one above the sheet music store

Special music is filed and frequently required for particular jobs, such as the incidental music in radio plays and—not so frequently—for the Effects Department!

The whole library is contained on the one floor of Broadcasting House. It is sandwiched in between the religious and dance band studios (below) and the radio play and gramophone studios (above). The idea of this is to form a sound insulation in the building between the two main groups of studios on the fourth and sixth floors.

There is an office block connected with the library at the side of the large library room and just at the end of the passage is a small listening room so that the library officials can listen in either to broadcasts or rehearsals.

Gramophone Records

It is a surprising fact that very little music broadcast by the B.B.C. is not contained within the library, although in some cases artistes may bring their own copies of vocal scores and special arrangements. **And yet although all the broadcast music is contained within Broadcasting House, the library itself is only half as big as the concert hall studio.**

Only sheet music is stored in the library. Gramophone records and books on music are kept in two separate libraries.

The library in which books on music are kept is in one corner of the building outside the studio tower and is fitted out with studious looking apple-green shelving, which, on closer inspection, is seen to be of pressed steel and is much more modern than one usually finds in libraries.

The other B.B.C. library of gramophone records is mainly taken up by the effects records.

This, under the careful charge of Mr. Mickey, who presides in the effects studio, embraces nearly four thousand special effects records. A large number of these have been bought from Germany, where they specialise in the manufacture of noise records, but the O.B. engineers have also made some records of their own of bird noises and of noises on London Underground railways.

A very large number of effects records, though, are made by the leading gramophone companies in this country and, by a curious mistake, some of them are labelled with the new "not for broadcasting" mark which is attached to most of the ordinary records sent to Broadcasting House in order to cover copyright.

Slowly the B.B.C. is building up a new library of ordinary records, mainly for broadcasting early on Sunday afternoons. Until the Sunday programmes are extended there is no need for the B.B.C. to have a record library of its own, for Christopher Stone brings his own records when he broadcasts, they mostly being new releases.

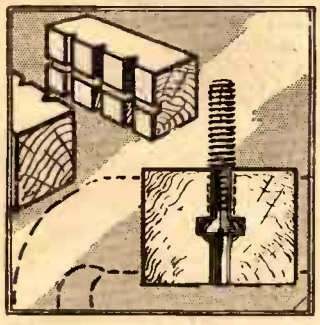
Regular gramophone record programmes are given now on Sundays and a store of these is being kept.

And yet, in spite of the extensive libraries of sheet music and gramophone records, the tock-tock interval signal is still heard far too often!

That Radio Dodge

PROTECTING SCREW THREADS

SMALL bolts and pieces of threaded rod should always be held in wooden clamps in a vice, to prevent the threads and



heads from being damaged. The sketch shows wooden clamps suitably cut to accommodate the small bolts used in wireless work.

CHEAP PANEL BRACKETS

IF your ebonite panel is not firmly screwed to the baseboard, or has worked loose, a cheap and simple method of strengthening can be effected with a block of wood, say 4 in. square and ½ in. thick. Cut diagonally across the block and you have two good panel brackets!

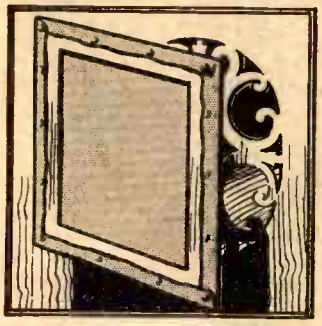
PROTECTING INDICATORS

CARDBOARD name tags and panel indicators are apt to discolour and crinkle at the edges. A much neater job can be made by painting over them with clear cellulose varnish or paint.

Strips of celluloid of the same shape and size as the indicators can even be cut, and fixed in position over the tags by cellulose varnish.

NEAT SPEAKER FRET

THE gauze or silk cloth used behind a speaker opening should be stretched tightly for if creases can be seen the appearance



is very untidy. Stretch the material over a light wooden frame as shown, and screw this frame to the plywood front.

BETTER EARTH CONNECTIONS

IN making earth connections to a metal-foil covered baseboard, an ordinary ¼-in. round-head wood screw serves the purpose, but sometimes the wire refuses to stay under the head. Slip a 4BA or 6BA washer on the screw, and the wire will then be gripped with a greater surface area.

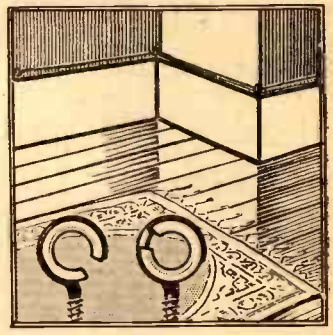
CONTROL INDICATORS

DON'T have unmarked knobs on the panel. It is quite a simple matter to put indicating tags on each of the controls, as shown on the accompanying

sketch. The "volume" tag illustrated is cut from cardboard, lettered in Indian ink and clamped underneath the one-hole fixing nut.

SPEAKER EXTENSIONS

INSULATED hooks as shown inset in the accompanying sketch are very handy for supporting wires run round skirting boards. Loud-speaker extensions



can easily be carried in this way. The wires do not need to be twisted as they can be kept in place with the insulated hooks.

GROUPING FLEXES

IF the battery connections on your set are made with flex connections and not to a terminal strip, you may have a deal of trouble with these wires becoming entangled. Sort out the H.T. wires, twist them together, then the G.B. and finally the L.T. Secure each "cable" by means of an insulated staple driven into the baseboard.

SHORT-WAVE NOTES

By "SHORT-WAVER"

THE conditions during the past week have been very patchy and mainly bad. On Friday afternoon, for the first time for some months, I heard W3XAL on 16 metres, W8XK, and W2XAD, all within a quarter of an hour, at about 5.30 p.m.; this is distinctly unusual, as W3XAL usually fades a little after 4.30 p.m.

Recently I have been making a trip round the country and so far I have discovered some very interesting details regarding local conditions. On the East Coast W2XAD appears to be very difficult to obtain, whereas its neighbour, W8XK, is received quite easily. Higher up the coast, at Kings Lynn, stations under 20 metres appear to be non-existent, whereas the 50-metre band is unusually good. In Birmingham the conditions are very similar to those existing in London, with the exception that the Empire stations, which originate at Daventry just close by, are infinitely weaker.

A new station I have not heard before is Zeesen, on 49.83 metres (6,020 kilocycles), call sign DJC. This station can be heard testing with New York (WEJ).

Selectivity still appears to be a problem, not only on the medium- and long-wave bands, but also on the ultra shorts. There is bound to be a little trouble between Prangins, HBL on 31.32 metres, and Daventry GSC, on 31.3 metres.

Prague, which my log shows as testing on 58 metres, appears to have varied slightly and is now quite a strong signal on 52 metres—the strength usually is R8/9. The station operated by the Teneriffe Radio Club on 7,211 kilocycles has recently been heard very well indeed. This is unusual, considering the power, only .05 kilowatt.

The English amateurs on the 40-metre band appear to be taking a little more interest and quite a number of these can now be heard, particularly on Sunday mornings and after midnight during the week. These are of little interest, but they certainly help to give one an idea as to the efficiency of the receiver, as the average power used is never more than 10 watts.

I have heard the *Bremen* with a call sign DDAS calling up New York, usually Ocean Gate, but I have never been able to hear the reply. The wavelengths varied, of course, but have usually been between 32 and 36 metres. I listened at intervals for two hours one afternoon to Buenos Aires LSY, on 20,730 kilocycles, and during the whole of that time all that could be heard was their peculiar interval signal of three oscillating notes.

I am given to understand that GSH, on 21,470 kilocycles, has not yet commenced transmitting. I should like to have any reports from readers who may receive this station.

The whole of the Empire stations at Daventry are very well received in this country and I understand that reception in the countries for which they are intended has so far been very satisfactory, considering the little amount of testing that has taken place.

It was mentioned previously that DJC, on 6,020 kilocycles, is now testing. A sister station to this is DJD, on 11,760 kilocycles, and this can also be heard. As this station has now commenced broadcasting officially, it may cause great interference with GSD on 11,750 kilocycles. This makes very apparent the increasing congestion on the popular short-wave bands.

Radio Colonial, on 16 metres odd, seems to be "on the air" practically the whole of the day at irregular intervals. If your receiver has not been carefully calibrated, it may be as well to log the station, as it can be heard quite easily and will serve as a guide to W3XAL.

On Your Wavelength!

BIGGER AND BETTER BATTERIES

THERE is only one way of obtaining first-rate quality from dry-cell high-tension batteries, and that is to use an H.T.B. of such capacity that its average drop in voltage during the evening will not be more than about two per cent., the measurements being taken with the battery under load. Besides giving much better quality, the big battery is far cheaper to run. With a 10- to 12-milliampere load a good-quality super-capacity battery should give a whole year's satisfactory working.

I SHOULD SAY SO!

ONE comes across some little gems in advertisements from time to time. One of the best cropped up the other day in an announcement by one of the large stores which offered "An A.C. mains set specially designed for complete freedom from D.C. mains hum." What do you think of *that*?

SOMETHING FOR NOTHING?

THERE will, I suppose, always be flats waiting to be caught by the vendors of devices which give you something for nothing. I am quite sure that if you advertised an arrangement which enabled a man to lift himself by gripping his own bootlaces and pulling hard there would be some people who would not merely buy it, but would also send you glowing testimonials as to its efficacy!

In wireless the dry H.T.B. offers a magnificent field for the inventors of something-for-nothing devices. It is always requiring renewal. Cannot its life be prolonged? Cannot it be given a fresh lease of youth? Unfortunately, it cannot, for the very excellent reason that a primary cell operates on much the same principle as a coal fire. The latter gives out heat by consuming coal; the former provides power by burning up zinc. The dry cell comes to an end from one of three causes. The first is that the zinc pot is perforated, the second that the chemicals of the electrolyte become inactive, the third that the depolariser fails for the same reason. There is no effective way of restoring a dead high-tension battery short of renewing its cells or their contents.

SOME TIP!

THAT reminds me of a tip which I came across—and not so very long ago, either—in the wireless column of a lay paper. It was explained that a decrepit H.T.B. could be resorted to full voltage by piercing holes in the cardboard case and standing the whole contraption in a basin containing a solution of sal-ammoniac and water. The idea of a common electrolyte for all cells is quite beautiful—*and* an electrolyte outside the cell-pots!

LITTLE THINGS THAT MATTER

SOME of the little refinements that makers introduce nowadays into wireless components may not be very striking to the eye, but they are of real importance in actual working. One that might seem almost trifling at first sight is the copper plating of the ends of the pole pieces of loud-speaker magnets. The copper covering prevents rust from forming and, as I know from experience, a loud-speaker can be put pretty well out of action by corrosion of the pole pieces. The clearance is often so small in both moving-coil and balanced-armature loud-speakers that a minute quantity of rust is sufficient to ruin the working. The air of living-rooms always contains a good deal of moisture—quite sufficient to cause unplated steel parts to rust when the loud-speaker is placed, as it usually is, in some corner right away from the fire.

TESTING A VALVE

I CAME across an example the other day of the need for a valve tester if one is carrying out any appreciable amount of servicing. I had to look at a receiver which, for some reason, had ceased to function. Everything appeared to be O.K., and as the valves were all of the old thoriated type in which the filaments could quite easily be seen I was able to inspect them visibly and noted that they were all lighting up. I therefore spent some time chasing round other "bugs" in the circuit but eventually found strong indication that one of the filaments was touching the grid. It lit up and appeared to be in order until it was more thoroughly examined. Had I done what I usually do, that is, insert every valve in a valve tester as a matter of form before starting anything else I should have located the fault at once.

ANOTHER PARIS GIANT?

IT is rumoured that another Paris station, the Ecole Supérieure, is shortly to increase its power to 60 kilowatts. In addition to smaller fry, such as Radio LL and Radio Vitus, Paris already possesses the 75-kilowatt Radio-Paris, the 60-kilowatt Poste Parisien, and the 13-kilowatt Eiffel Tower. If the Ecole Supérieure really does increase its power to 60 kilowatts, Paris will be about the most over-wirelessed place in the world. There is absolutely no reason for anything of the kind unless the closing down of the Eiffel Tower—also, I believe, run by the PTT—is contemplated. Let us hope earnestly that the rumour has no foundation, for any unnecessary super-power station on the overcrowded broadcast band would be positively tragic.

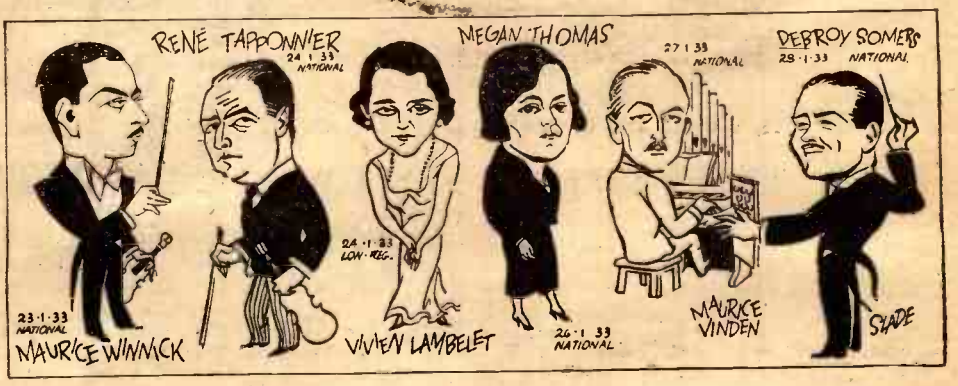
CAUGHT

SETS do go mad at times, of course. One of mine did the other day. It was an experimental arrangement containing quantities of valves and it had been working pretty well when previously used. On bringing it into action a day or two later, I found that it had become absolutely unmanageable. Half of its valves oscillated on the slightest pretext and the thing squealed if you so much as looked at it. I expect the reader by this time has diagnosed what the trouble was, though in my foolish way I failed to find it until I had done quite a bit of harassed investigation. It was, of course, a broken earth lead. Yes, I know that I ought to have spotted it at once, but . . .

ARMOURING PICK-UP LEADS

IF your pick-up leads are more than a few inches in length it is always as well to armour them by running them through a woven metallic insulated covering. You can buy twin flex with such a covering at most electrical shops. Be careful, by the way, to "make off" the ends of the metal covering with care, or you may have some quite surprising results through short-circuits. Don't forget, too, that it is necessary to earth the covering. The best way is to solder a small piece of flex to it and to connect this to the earth terminal of the set.

PERSONALITIES IN THE WEEK'S PROGRAMME



On Your Wavelength! (continued)

OLD AND NEW

TURNING out some old papers the other day, I came across the diagram of a five-valve battery-operated set I built almost exactly ten years ago. I remember that it was amazingly inefficient. I placed the diagram side by side with an up-to-date five-valve mains set I am now building—and laughed.

My ancient friend had three variable condensers, each worked by a separate knob, and two fixed condensers, one in the grid of the detector and the other across the primary of the first intervalve transformer. It had also one fixed resistance—the grid leak—and two filament resistances. The present set has a four-gang variable condenser, seventeen fixed condensers, two potentiometers, and seventeen fixed resistances.

A WONDER SET

THE old set had two high-frequency transformers, two intervalve transformers, and an output transformer. It made use of four "R" valves and one small transmitting valve which handled the output, and to which, only, grid bias was applied. The Eiffel Tower, Radiola, PCGG, and London could be tuned in if one stood quite still with one foot on the bath and the other on a bath-mat. The stations could just be heard on a home-assembled horn-type loud-speaker. I have mercifully forgotten what the quality was like. I am reminded by one of the family that eventually quite good volume was got from this set, but that ordinary speech was quite unintelligible. For all that, two stages of H.F. amplification were considered so extraordinary that the chief engineer of a big company came forty miles in the pouring rain to hear the set at work—and thought it mighty fine!

THAT FOREIGN TOUCH

A CORRESPONDENT asks whether it is correct to call the Himalaya mountains the "Himawleeas," as the actors did in the recent broadcast of *The Green Goddess*. Well, no doubt that is what they are known as locally—because the B.B.C. is a notorious stickler for pronunciation—but I must confess that I should say "Himmalayas" myself in ordinary conversation. When it comes to broadcasting foreign place-names to an English audience it is better to keep as close as possible to the common standard, because, after all, the main thing is to "get across" to your audience and not to leave them guessing. For instance, most of us sound the final "s" in Paris, and speak of Vienna, though the latter is spelled Wien and pronounced *Veen* on the Continent. It is all very well to start this kind of thing, but by no means so easy to know where to stop.

TELEVISION

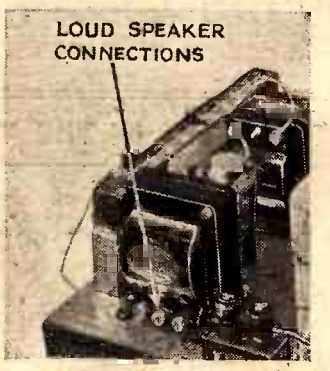
THOUGH I am still hoping that television will reach a stage of development which will make the viewing screen as common a part of our household furnishings as the loud-speaker, I hardly anticipate that this will occur in 1933. I have always maintained that the ideal could not be realised so long as we rely upon the scanning disc or any contrivance working on the same principle. I still hold this view, believing that before we can have real television of the kind that will make possible illustrated running commentaries or news bulletins, a basic invention is required. Television will come into its own when something is invented which corresponds as closely with the eye as do the loud-speaker and microphone with the human vocal chords and the ear.

BADLY WANTED

THE universal mains set is a form of wireless receiving apparatus that is very badly wanted just now. There are heaps of people at present on D.C. mains who know that a change over to A.C. will be made some time within the next year or two. They want mains sets, but they don't like the idea of purchasing apparatus which can be converted for use with the new supply only at considerable expense. There are others again whose jobs make it necessary for them to move about the country a good deal. They may be living for six months in an A.C. district and then comes a transfer to one where D.C. is the rule. You can see at once how convenient it would be to have a set that would work equally well from alternating or direct current. It will be a good many years before the whole country is supplied with standardised A.C., and in the intervening period there should be a big demand for apparatus of the kind suggested.

DO THEY SKIP?

NOW that Marconi has shown by actual tests that centimetre waves can get a long way round the "hump" formed by the curvature of the earth, it is up to the physicists to explain exactly how it is done. Up to the present we have been told that all wireless waves are guided around the earth's surface—instead of shooting off into space—by the action of the Heaviside and Appleton layers. One imagines the shorter waves "bouncing" from ground to layer and back again to ground, and so circumnavigating the globe in a series of "skips." But this doesn't seem to hold water where centimetre waves are concerned, because the nearest layer is at least thirty to forty miles high, and there is no evidence that these very short waves have any "skip" action. On the contrary, they appear to be strictly earthbound all the way between transmitter and receiver.



SAVING TERMINALS!

If you have an output transformer in your set, there is really no need to have a separate set of terminals for the loud-speaker output. Wire the speaker direct to the secondary terminal of the output transformer, as shown here

MORE HEAVY(SIDE) RESEARCH

BY a happy coincidence the authorities of King's College, London, have now decided to establish a new research laboratory in the comparative peace and quietness of Hampstead. Here Professor Appleton—who is following in the footsteps of Maxwell, Wheatstone, and Richardson—will be able to continue his experiments on wave propagation under more favourable conditions than exist in the main college buildings in the Strand. One of his methods consists in shooting short-wave impulses "into the blue," and measuring the time taken by the signal to come back to earth, after reflection from the layer. This, as can well be imagined, requires very sensitive recording instruments. So delicate, in fact, that they are "swamped" by the electrical interference from passing traffic and near-by machinery during London working hours. The consequence is that most of the experiments have had to be limited to the small wee hours between midnight and sunrise. However, things will be very different in the new laboratory, and we shall probably soon learn a lot more about the present mystery of short-wave propagation.

LARGE AND SMALL

IT is not easy to get a heavy power output when generating ultra-short wavelengths. I know amateur transmitters used to be quite content with a few watts in the aerial—with which they managed to cover hundreds and even thousands of miles. However, now that short-wave working has taken on a definitely commercial aspect, the question of power is becoming all-important, and some interesting progress is being made in this direction. For instance, I notice that it is now possible to generate as much as 16 kilowatts of energy on a wavelength of between 3 and 5 metres. The old difficulty was due to capacity coupling between the valve electrodes, but this has been overcome in a very ingenious way. Instead of using an ordinary tuned output circuit, the grid and plate electrodes are brought outside the valve and formed into a concentric transmission line along which the tuning inductance and capacity are uniformly distributed. The output energy is built up as a "standing wave" along this line, and is then transferred directly to the transmitting aerial.

THERMION.

Graham Farish says

"MAKE IT RIGHT"

Graham Farish set a very high standard for his components when he began business in the earliest days of wireless.

Since then firms have come and gone. Graham Farish goes from strength to strength on the quality and efficiency of his products. Year after year the Bromley factory sees some new addition — to cope with the constant increase of demand.

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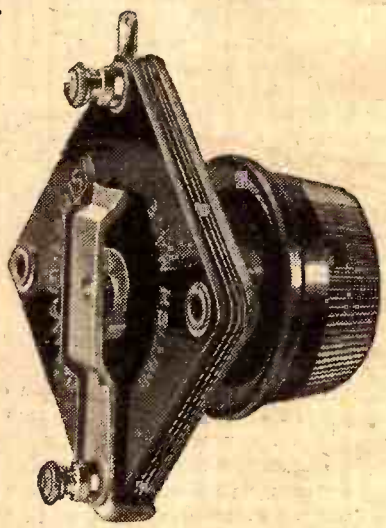
Graham Farish LIT-LOS SOLID DIELECTRIC VARIABLE CONDENSERS

2/- EACH

A very carefully constructed instrument, compact in size and efficient in design, with accurately gauged bakelite dielectrics and solid brass pigtail connection to moving vanes. Made in all capacities up to .0005 mfd. in tuning, straight line capacity and differential types. Used by many leading manufacturers and specified in sets by famous designers. One hole fixing; supplied complete with terminals.



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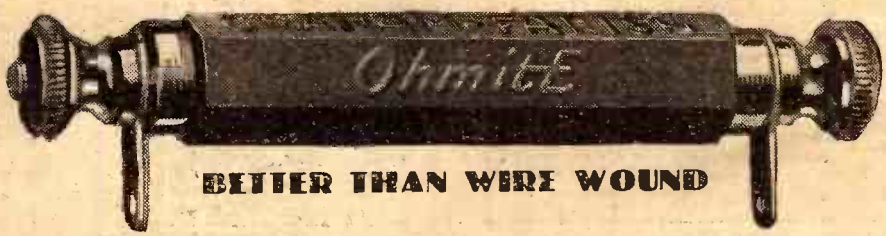
The popular and efficient resistances for all general purposes. All values 300 ohms to 5 megohms. 1/6d. each.

The "Melody Ranger" requires—

one ...	1,000	one ...	30,000
„ ...	40,000	„ ...	1 meg
one ...	4 meg		

together with one vertical mounting holder.



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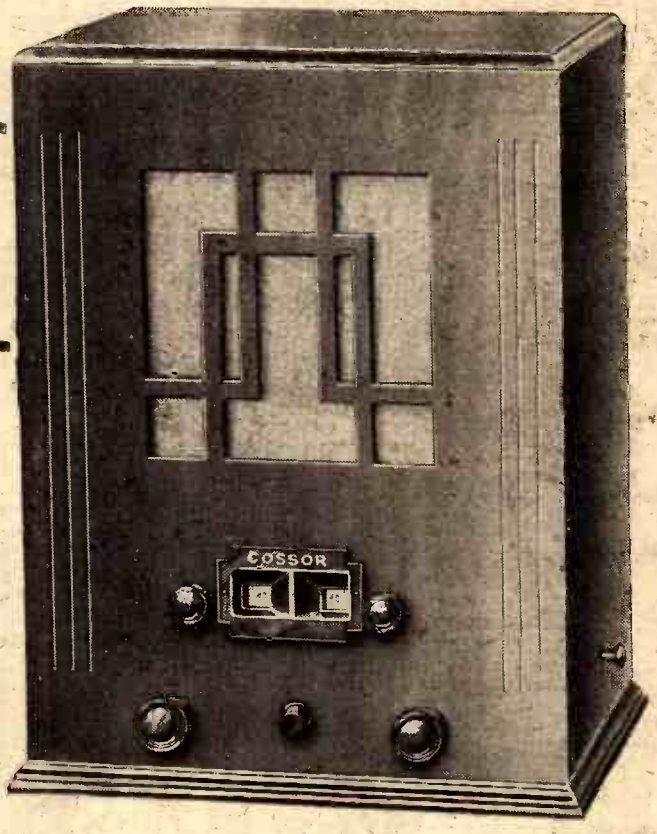

For less than ever before you can now own an up-to-date Screened Grid Receiver — the Cossor Melody Maker—equipped with every modern refinement and having the performance and appearance of an expensive factory-built set. The remarkable efficiency of the Cossor Melody Maker—its selectivity, its range, its high all-round performance—has resulted in an extraordinary degree of popularity. So great has been the demand that even the vast resources of the great Cossor works have been severely taxed to meet it. The enormous production of Melody Makers has permitted wholesale reduction in manufacturing costs. This reduction is passed on to you. Send the coupon for full details.

BATTERY MODEL 335

with Self-Contained Loud Speaker

Kit of Parts includes 3 Cossor Valves (220 V.S.G. Variable-Mu Metallised Screened Grid 210 H.L. Metallised Detector and 220 P. Output); Individually Shielded Coils. All-Metal Chassis and all parts for assembling the Receiver as illustrated: handsome cabinet 18½ in. x 13½ in. x 10½ in. and 10 in. Balanced-Armature Loud Speaker. Provision is made for fitting Gramophone Pick-up Socket and Plug. Price **£6.17.6**

Hire Purchase Terms: 17/6 deposit and 9 monthly payments of 15/-

BATTERY MODEL 334

Kit of Parts, similar to Model 335 except that no loud speaker is supplied. Handsome cabinet 9½ in. x 13½ in. x 10½ in. Price **£5.15.0**

Hire Purchase Terms: 15/- deposit and 9 monthly payments of 12/6.

BATTERY MODEL 333

Kit of Parts, complete with valves for building Cossor Melody Maker Chassis for fitting to your own cabinet. Specification as Model 335 but without loud speaker or cabinet. Price **£4.19.6**

Hire Purchase Terms: 15/- deposit and 9 monthly payments of 10/6.

ALL-ELECTRIC MODEL 337

with Self-Contained Loud Speaker

Kit of Parts for All-Electric Melody Maker Model 337 similar to Model 335 (as illustrated) but for all-electric operation, including Cossor Valves, handsomely finished Cabinet, 18½ in. x 17½ in. x 10½ in., Loud Speaker and all parts. For A.C. Mains only 200-250 volts (adjustable), 40-100 cycles. Price **£10.17.6**

Hire Purchase Terms: 25/- deposit and 10 monthly payments of 21/6

Prices do not apply in I.F.S.

ALL-ELECTRIC MODEL 336

Kit of Parts, similar to All-Electric Model 337 except that no loud speaker is supplied. Handsome cabinet 10½ in. x 17½ in. x 10½ in. Price **£9.15.0**

Hire Purchase Terms: 19/6 deposit and 10 monthly payments of 19/6

ALL-ELECTRIC MODEL 338

Kit of Parts for All-Electric Melody Maker Model 338 Chassis. Identical with Model 336 except that no cabinet is supplied. Escutcheon and template for drilling your own cabinet is included. Price **£8.15.0**

Hire Purchase Terms: 32/6 deposit and 8 monthly payments of 20/-

Models 336 and 338 are available for use on A.C. Mains only, 220 to 250 volts (adjustable), 40-100 cycles.

To A. C. COSSOR LTD., Melody Dept., Highbury Grove, London, N.5.

Please send me free of charge a full size Constructional Chart, which tells me how to build the Cossor *Battery / *All-Electric Melody Maker.

(Strike out type not required.)

Name .....

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A. C. Cossor Ltd., Highbury Grove, London, N.5. Depots at Birmingham, Bristol, Glasgow, Leeds, Liverpool, Manchester, Newcastle, Sheffield, Belfast, Cardiff and Dublin. ♡ 2262

How to Make a Condenser Microphone

There are many uses in the home for a simple microphone. It is often considered a too difficult job for an amateur to build a condenser microphone, but this article explains a simple type of "mike" which has actually been built by two London readers of "A.W."

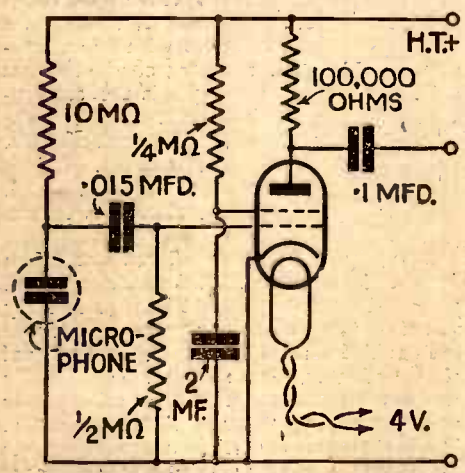
THE B.B.C. now uses condenser microphones for all important broadcasts and it is realised that even for ordinary amateur jobs, such as home recording and small public address work, a condenser "mike" has many advantages over the ordinary carbon type.

It is, of course, fairly simple to make up a carbon microphone which will give tolerable results; but it is generally thought to be a too-difficult job for an amateur to make a condenser microphone.

Not only is the actual condenser difficult to construct in the ordinary way, but a valve amplifier must be connected close up to the condenser, as the output from a microphone of this type is very low. Unless the amplifier is close to the diaphragm, interference may be picked up on the wires leading to the first stage of amplification.

Two London readers of AMATEUR WIRELESS, Messrs. E. J. and John W. Holmes, however, have made up a successful condenser microphone and this is shown by the accompanying photographs.

This "mike" which has been tested in our laboratory and found very successful, is made up in a very workmanlike way, but the actual construction could be simplified in many ways if you do not want to make up a microphone of B.B.C.-like accuracy.



This is the circuit diagram of the little one-valve amplifier, using a mains-type screen-grid valve fed from batteries, which is coupled to the condenser

As the photographs show, this condenser microphone is very compact. The condenser is supported on rubber bands beneath the canister which holds the amplifier. A mains screen-grid valve is used in this amplifier stage and the amplification is so satisfactory that the output is of about the same level as that of a carbon microphone. The quality, of course, is much better than that obtained with the average carbon mike and in addition the condenser mike has a number of advantages of its own in the way of a silent background, and so forth.

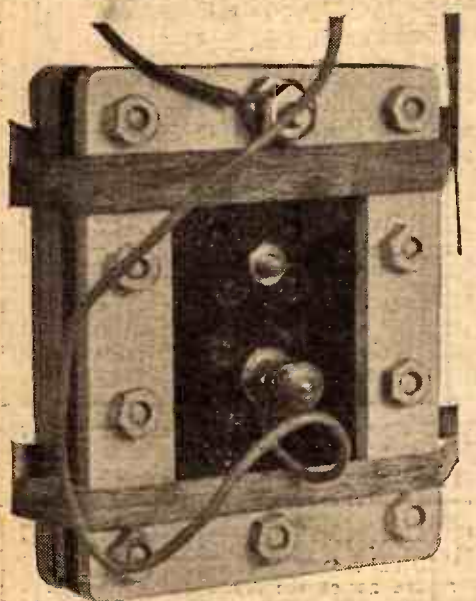
A part section of the condenser is shown by an accompanying sketch. The body of this component is cut from thick brass sheet, rectangular pieces being formed, somewhat similar to transformer laminations. These plates are bolted together, making a "sandwich" of the condenser backplate, spacer and diaphragm. It will be seen that there is a grid formed of pieces of wire soldered together over the opening of the diaphragm to protect it.

It will be clear from the sketch that the brass back plate (which is actually one of the pieces of brass cut out of the thick sheet forming the side pieces) is bolted to an ebonite piece which acts as an insulator and as a support. A terminal is carried out to the back of this ebonite plate for one of the condenser connections.

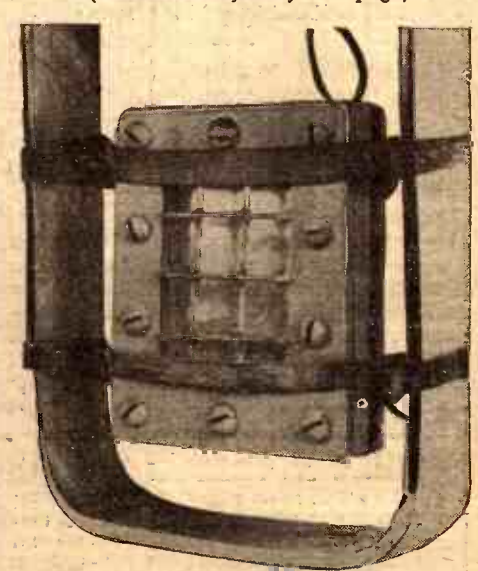
Holes are drilled through the backplate and ebonite so that there can be no resonances, owing to the air-gap. This ensures a good low-frequency response. It is possible to see the back of the diaphragm through these six holes.

The diaphragm is of foil, .0005 in. thick. The best material to use is duralumin, but this is difficult to obtain. It has been found that quite good results can even be obtained from a sheet of the metal foil in which Player's cigarettes are wrapped. No

(*Continued at foot of next page*)



This back view of the condenser unit shows the way in which the back piece is drilled to ensure a good frequency response, and also the way in which the connection to the back piece is brought out



A front view of the condenser, showing the protecting cover of cross-wires over the diaphragm

DESIGNERS OF FAMOUS "A.W." SETS

THE SENSATIONAL "MELODY RANGER"

(III) S. RUTHERFORD WILKINS

MR. S. Rutherford Wilkins, who was born in Westcliff-on-Sea in 1911, started to take an active experimental interest in wireless at an early date and for about two years was engaged in study and experimental work in connection with the subject besides being a keen amateur.

In order to acquaint himself with commercial ideas of design and construction, he joined the radio department of Philips Lamps, Ltd., and worked for some time in the service laboratory.

Wide Experience

Later, he turned his attention to the heavier side of the business and joined the power amplifier department. Here he was able to study the design and operation of talkie and public-address equipment and was responsible for many large installations. He paid special attention to development work in connection with electrical gramophone reproduction and pick-up design, a subject which had always interested him.

Later, after a spell in the radio laboratory he left Philips and set up on his own as a radio engineer and designer.

This venture achieved a good measure of success and gave him scope to do a fair amount of personal experimental and development work.

In April, 1931, he joined the technical staff of AMATEUR WIRELESS and the *Wireless Magazine*, and since then has produced a large number of successful set designs.

Apart from his professional interest, Mr. Wilkins is still, and always will be, an enthusiastic "amateur." As such he has always the needs of the constructor at heart and his sets are therefore produced with a view to simplicity of construction and ease of operation.

THE SET THAT HAS BEEN TESTED IN YOUR REGION

The "Melody Ranger"—full details next week.

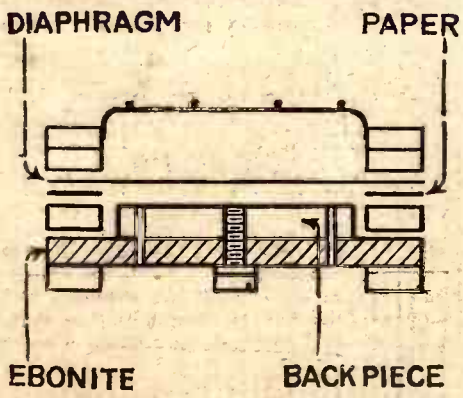
S. Rutherford Wilkins

"HOW TO MAKE A CONDENSER MICROPHONE"

(*Continued from preceding page*)

matter what foil is used, it is essential that it should be absolutely flat, as there is only about a .004 in. gap between the backplate and the diaphragm.

The diaphragm is clamped up against a



This diagram shows a cross-section of the condenser unit, and makes the construction quite clear

ring of paper of about this thickness (.004 in.), but the working airgap is less than this and is more like .002 in. when the voltage is applied to the plates of the condenser. An insulated connection is taken through the side plates to the diaphragm, and the whole assembly is then bolted very firmly together.

Circuit connections for a suitable amplifier are shown by an accompanying diagram. A mains screened grid valve (fed from batteries of course) is used and there is a 10-megohm leak in series with the microphone. The grid coupling condenser has a value of .015 while there is the conventional ½-megohm grid leak.

Although the amplifier is very sensitive, this valve stage is not microphonic. Owing to the rubber suspension of the microphone, the whole outfit can be carried about while in use.

Long twisted battery flexes are taken for the high-tension, L.T. feeder circuit and the condenser output. It is not necessary to shield these wires in any way.

Provided care is taken in the assembly of the condenser, the microphone is really worth while making, as it gives a frequency response well up to professional standards. The instrument shown has the side supports chromium plated and the amplifier case cellulosed grey to give it a workmanlike appearance.

It is of interest that the two keen readers who have made up this condenser microphone are the owners of the home-built television receiver described last year in "A.W." They have now succeeded in carrying out daylight television and they use the condenser "mike" in these room-to-room television tests.

Let "AMATEUR WIRELESS" solve your wireless problems

A close-up of the amplifier compartment of the "mike," in which the valve and its associate components can be seen

---

DO YOU KNOW—

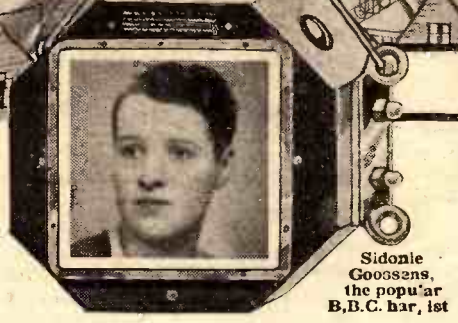
THAT in some output units, consisting of a choke and condenser, there is distortion and loss of volume because the condenser used is not large enough? A 2-mfd. condenser is generally sufficient. If you are in doubt about your own condenser, connect another in parallel.

THAT metal shielding of mains transformers does not always prevent mains hum? Do not put parts too close together in your mains unit.

THAT with most modern sets an R.C. valve cannot be used as a detector, for it is too easily overloaded?

THAT a "pot." of 50,000 ohms connected across the aerial and earth terminals, and with the slider connected to the aerial, makes a handy pre-detector volume control? It is worth trying in big sets where there is a danger of overloading.

OUR BROADCAST CRITIC ON ADAPTATIONS



Sidonie Goossens, the popular B.B.C. harpist

THE revival of *Jane Eyre* interested me profoundly, especially as I missed it the first time it was produced. Perhaps it would be as well to be honest and confess that three times in my life I have made an attempt to read the book and have not managed it. That I was able to listen to the play may (or may not) be saying something for the skill of Barbara Couper and Howard Rose who adapted scenes from the book for the microphone.

I was rather curious to see how they had done it, and also to hear how Jane herself would "come out" as a character in a play. I think she might have been very irritating indeed had she not been played by Lilian Harrison, whose sympathetic voice made so great a difference to the part. I thought it would, having had an opportunity of studying Miss Harrison at close quarters. She was Constanze in *Mozart*.

When it was all over I did not know quite what to think. I must confess I thought the whole thing "dated" rather badly, and was not altogether surprised to find that young people, especially, had thought it rather irritating. I heard a good deal about it the following day, and that seemed the general opinion. All the same—even though it exasperated me once or twice—I cannot pass it by without saying it was a good production.

◆ ◆ ◆

The Delius Prom must have attracted some and puzzled others. I am bound to say I felt at a loss in places, and wished I were in the hall. I am afraid that is the trouble with modern music, even so mildly modern as his. *One does need to be there and see everything.* The violin concerto, for example, is a little puzzling when taken in by the ear alone. I know the work fairly well—that is to say I have heard it three, or perhaps four times—but I confess to finding it difficult to grasp through a loudspeaker. If this is so to one who has devoted his life to music, what of the amateur?

◆ ◆ ◆

Did you hear all that bumping before the concerto began? I thought Sir Henry was throwing bricks about. It was quite uncanny. Great applause at the appearance of Albert Sammons; that was obvious. Then it all quietened down. Not a sound from the audience, but all this bumping on the stage.

My wife happened to be at Queen's Hall and I made inquiries when she returned. It appears that Sir Henry suddenly decided that Miss Goossens must have her harp *behind* Mr. Sammons. So off he went to fetch someone strong enough to remove the harp. Then he returned to his desk and remained there, pretending he had nothing to do with the delay. Ultimately the harp and stand were removed, and Miss Goossens went after them. That is what all the noise was about!

◆ ◆ ◆

I heard two vaudevilles this week. Or, to be absolutely honest, I switched in and out of Proms on both occasions.

Amongst other things I listened to "That's Love—That Was." I thought it very poor stuff and wondered why it was ever written, much less broadcast. The lines in it were very weak.

◆ ◆ ◆

I cheered up when Stanley Holloway came on. Some of his imitations were amazingly clever. I will honour him by telling him that when he spoke like Claude Hulbert he completely "had" me for a moment. I thought it was the good Claude himself. I hope Mr. Holloway will give us some more north country recitations. "Albert and the Lion" was really funny. He is very good at that sort of thing.

◆ ◆ ◆

What are we to do about these *compères*? I wish they would not be so silly. That is just what those I have heard have been—*silly*. I am afraid the idea is a forced one, in any event. It has certainly proved a failure thus far. Better to drop it altogether unless someone can be secured who can be really funny.

◆ ◆ ◆

Kathleen Long interested me when she played the Schumann A minor piano concerto in the Wednesday Prom. I have generally heard Myra Hess play it. The difference was so marked that I found myself regarding the work from an entirely different angle. That sort of thing happens when you yourself know a concerto by heart; you notice tiny little differences that you would otherwise miss.

◆ ◆ ◆

Alec McGill and Gwen Vaughan jabbered away amusingly, I thought. I like those two. I used to like Haver and Lee better than I do now. I think it is because I am a little weary of their style. It may be my fault; if it is not, they might do worse than alter their style a little. This is not intended to be a negative criticism in the least.

◆ ◆ ◆

Norman Long always makes me laugh. His story about "Two Pints" was very clever and made the studio and the orchestra fairly roar with laughter. The one about the ducks was quite good also. There is no doubt that he is a very experienced broadcaster.

◆ ◆ ◆

I did not listen very long to Ronald Gourley's whistling as I was after something at Queen's Hall at the moment, but when I "returned" I caught his last item and marvelled that anyone could whistle so beautifully.

◆ ◆ ◆

The Saturday night Prom was something new and strange, surely? Choruses, one after the other from the *Messiah*, seemed rather unusual. Heavy choruses are difficult to broadcast successfully but I was quite pleased with the first part of the concert. After a while—having noticed the Kentucky Minstrels on the other side advertised as a real old-time minstrel show—I thought I would leave Handel to himself and went Kentucky-wise. I thoroughly enjoyed the show. There is something to be said for "dem niggers," after all.

◆ ◆ ◆

I noted with satisfaction that there were two recitals between the hours of five and six again on Sunday. One was for two violins and the other a piano recital by Pouishnoff playing works not often heard.

WHITAKER-WILSON.

PROGRAMME POINTERS

Keith Faulkner, singing in the chamber music concert on a recent Sunday evening, gave a lead which I should like to see followed by all singers of classical lieder originally written in foreign languages. Mr. Faulkner had the good taste to sing Robert Whistler's English translation of Schumann's "Dichterliebe." I have often urged in these columns that it is wisdom to sing classical lieder—Schubert, Schumann, Brahms, Wolf, etc.—to a good translation where one exists. Where one does not exist—well; it can be made, surely? The great aim is to endear classical music to English people. If it is not, then I have misunderstood the whole meaning of this type of broadcasting. I suggest that, wherever at all possible, classical songs of this kind should be sung in English—and good, standard English at that.

OUR REGIONAL TEST of THE MELODY RAN

The Sensational New Receiver to be described Next We

IT'S NEW—IT'S DIFFERENT—IT'S GUARAN

90 STATIONS—BLACKPOOL During an evening test

60 STATIONS—KING'S LYNN. 23 received during a brief daylight test on a very bad aerial

67 STATIONS—BRISTOL, including 6 short-wavers

110 STATIONS—BIRMINGHAM. 91 were definitely identified using a picture rail aerial!

TESTING a set all over the country!
It's an amazing job!
And yet a happy one.

We have been all over the country from London to Clacton, King's Lynn, Birmingham, Manchester and up through Newcastle to Glasgow and Edinburgh, visiting many other places en route.

Then we came down through Blackpool, to Bristol.

We have tried the new "Melody Ranger in all the B.B.C. regions, in the Midland Regional, Northern Regional, Scottish Regional and Western Regional areas.

As a result, we are not guessing when we say that the "Melody Ranger" is an absolute winner. **Our total bag of stations to date is 157.**

FOUR WAVEBANDS

We have tried the set out not only on normal, medium and long-wave reception, but also on the short waves below 100 metres. In this way even America has been fairly consistently received.

In Manchester where some of the best reception was done, and where a total of 113 stations was bagged, fifteen short-wave stations were picked up, including some notable Americans.

W8XK and W3XAL were very well received. Even Sydney was heard, in Walsall, at good 'phone strength, although mush and noise were terrible. In Walsall we had our best short-wave reception, dozens of stations were picked up on all wavebands, but the conditions were fine for short-wave reception and we picked up no fewer than twenty-six short-wavers.

PICTURE-RAIL AERIAL—110 STATIONS

Bad reception conditions and local difficulties made no difference to the "Melody Ranger's" seven-league boots.

In Birmingham we could only manage a picture-rail aerial, but in spite of this we bagged over 100 stations, of which ninety-one were definitely identified. Of this grand total ten were on the ultra-short waves.

If we had any doubts about the short-wave efficiency of the "Melody Ranger," they were quickly dispelled.

In King's Lynn we had about the world's worst reception conditions. The best aerial we could manage was something like 12 ft. long and 15 ft. high and within a foot of a roof gutter

And yet, with this atrocious aerial, we picked up sixty stations—forty on the medium waves, ten on the long, and ten on the short. All these stations we obtained during a night test.

In daylight, on the same bad aerial, we picked out no fewer than twenty-three stations.

At Glasgow, owing to the courtesy of the Scottish Wireless College, we were given much more favourable local conditions and W3XAL was heard at good loud-speaker strength at 3.30 in the afternoon.

In addition, we picked up four trans-Atlantic telephony stations.

DOING THE "IMPOSSIBLE"

A remarkable thing is that on many occasions we have astounded local inhabitants by picking up stations which they say are practically unreceivable in localities where the tests took place. Some almost blind spots are obliterated by the "Melody Ranger's" reaching-out powers.

King's Lynn not only gave us a chance of seeing how the set functioned on the East Coast, but in addition it is a notoriously bad spot for general reception. And yet we bagged sixty stations, including America.

At Bristol, again, we were warned of the bad local conditions.

One or two pessimists told us it wasn't worth while trying to get many stations even with a good aerial.

As a matter of fact, we *couldn't* get a very good aerial, but we nevertheless bagged fifty-three medium wave stations, eight long-wave stations and six on the short waves. Incidentally, at Bristol we were able to see the building taken over by the B.B.C. for the new Western Regional studios.

The "Melody Ranger" has been tested in your region and results are guaranteed

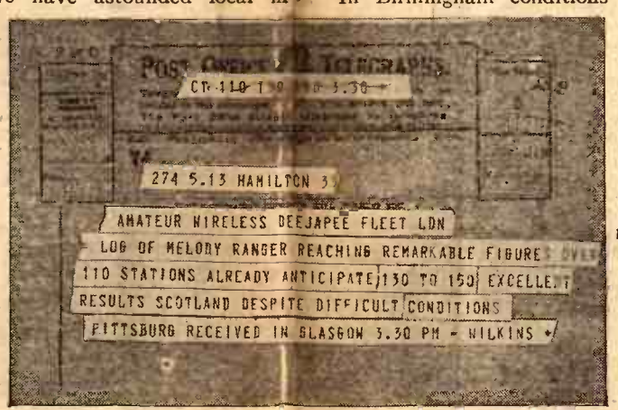
AMAZING SELECTIVITY

Within sight of the Newcastle station, during a brief one-hour test, we picked up sixty-four stations.

The "Melody Ranger" just goes on getting them and getting them.

In Birmingham conditions were even

See special announcement on page 80



You will be able to get results as good as this!

THE "MELODY RANGER" BRINGS IN STATIONS THAT O

TEED

worse than in King's Lynn. We arrived about twenty-four hours before we were expected and the best that could be improvised was a picture-rail aerial, 7 ft. high from the set, and an earth connection consisting of a poker stuck into the ground.

Definitely not a very efficient system, but the "Melody Ranger" ranged satisfactorily.

5GB and 5XX are naturally very strong signals here, but we managed to cut them out in quite a few degrees and on the long waves could listen to a programme from Zeesen with negligible interference from 5XX. Local experts congratulated us.

RECEPTION IN SCOTLAND

Scotland is in many ways a difficult spot for reception, but not only did we receive America as stated one afternoon in Glasgow, but we really made the ether hum in Edinburgh.

The only aerial we could improvise consisted of a short wire strung out of the window. On this we heard sixty-six medium- and long-wave stations and eight short-wavers.

Further interesting facts of this nation-wide Regional tour will be given next week, together with further signed reports from "A.W." readers who were kind enough to offer us set-testing facilities at the various places visited. It is of outstanding interest that the "Melody Ranger" has been tested under ordinary home conditions over the whole country.

Facts, figures, dial readings and reception logs will be given in connection with the Regional tour to prove its value. But the outstanding fact is that—

The "Melody Ranger" is a Winner.

We have tested in YOUR region and we can guarantee its performance.

157 STATIONS IS THE GRAND TOTAL!

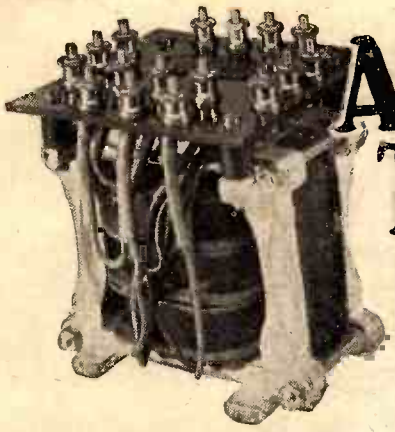
113 STATIONS—MANCHESTER. An amazing reception log under difficult conditions

U.S.A.—CARDIFF! W3XAL was received during the afternoon on a short aerial

66 STATIONS—In EDINBURGH, including 8 on the short waves

14 STATIONS — CLACTON, during a brief test at 11 a.m.

THERS CANNOT GET



Are Large Transformers Necessary?

The mains transformers used for various types of A.C. set differ quite appreciably in size, and one sometimes finds transformers of the same rating differing by about as much as 50 per cent. in their overall dimensions. This article by J. H. Reyner shows how both may be suitable for their particular job

THIS problem of the size of power transformers is an interesting one and a few comments on the subject of transformer design may clear up several points which are usually imperfectly understood.

A transformer is a device for increasing or decreasing the voltage. We connect our mains to a "primary" winding wound round an iron core, as shown in Fig. 1. On the same core we wind a "secondary" coil and

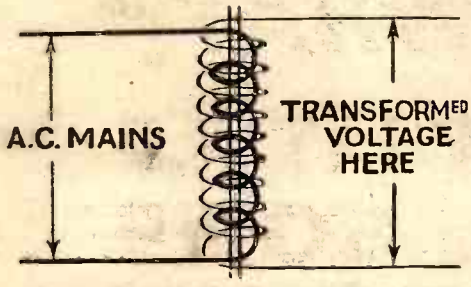


Fig. 1. The transformer consists of two separate windings which are shown here diagramatically

this delivers a voltage which is more or less than the mains voltage according to whether the secondary turns are more or less than the primary turns, being, in fact, proportional to the ratio of the turns in the two windings.

This, of course, is fairly common knowledge. The trouble starts when we have to make up our minds as to exactly how many turns to use. Shall we put 200 on the primary or shall we make it 2,000? The answer to this depends upon the size of the iron core. When the transformer is first switched on, a small magnetising current flows which set up the magnetic field in the iron core. If we connect a circuit across the secondary and draw some current, the primary current increases in proportion, but there is always this magnetising current, whether we are using the transformer or not.

Obviously, we want to keep this magnetising current small, and we do this by ensuring that the primary winding has a large inductance. We can accomplish this either by using a large number of turns or increasing the size of the iron core, or both. Either of these methods means additional expense and it is not commercially practicable to make a perfect transformer. What we have to decide is how bad we can afford to make it without affecting the performance.

If we have a large magnetising current, this produces a strong magnetism in the core, which is undesirable for two reasons. Firstly, since the current is fluctuating all the time, the iron is in a state of continual strain and the molecules interfere with each other and heat up the iron. This naturally causes waste of energy and is known as the *iron loss*. To minimise this, we use thin sheets of special steel for the core instead of a solid mass of iron.

Secondly, if the magnetism is too strong, the iron becomes saturated, which has two bad effects. In the first place, the voltage produced on the secondary is not pure, but contains harmonics, and this renders smoothing difficult, so that the circuit tends to hum more than it would normally do. Also, with a saturated iron circuit, there is a very large stray field around the transformer and any L.F. transformers or chokes in the neighbourhood will pick up hum. This induction hum is very difficult to get rid of. It cannot be removed by the ordinary smoothing circuit and often causes considerable trouble.

Therefore we must keep down the magnetism in the iron, and there are certain quite well defined limits beyond which we must not go. The usual value is about 50,000 lines of force per square inch.

Now we can keep our magnetism within these limits by two means. Either we can increase the size of the iron core, or we can use more turns on the primary. Let us consider the effect of increasing the number of turns. Apart from the fact that this costs more, it also increases the resistance of the windings. This means that the voltage actually delivered at the terminals of the transformer is less than the theoretical amount because of the voltage drop caused

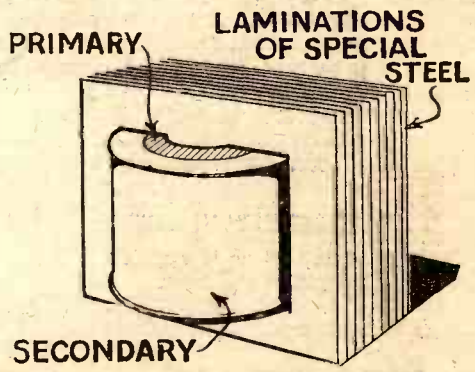


Fig. 2. The number of turns in the windings depends upon the size of the core

by the passage of current through the winding. Consequently, the voltage delivered by a transformer is not constant, but falls with increasing load. This is called the *regulation* of the transformer.

It has been our practice for some time past to publish regulation curves of transformers tested in our laboratories and it

(*Continued on page* 98)

THE PROGRESS OF WEST REGIONAL

The new West Regional Station is rapidly nearing completion and it is expected to be ready for the tests during the next few weeks. The new station will commence transmitting very shortly

SETS OF THE SEASON

MARCONIPHONE MODEL 256 SUPER-HET

IN a year of notable super-het sets the Marconiphone Model 256 is, I think, outstanding. It is free from all the troubles of the earlier super-hets and gives a fine performance. The circuit consists of a six-valve super-het sequence with an extra valve for the mains rectification.

The output valve is a PX4, well known for its full, rich bass-note output when used with a good loud-speaker. This valve drives an energised moving-coil loud-speaker of Marconiphone design.

As would be expected, the set takes the form of a self-contained table-cabinet set, with the set chassis at the lower part of the walnut cabinet and the moving-coil loud-speaker at the top.

The cabinet is rather larger than usual. This is a great advantage, as the ample baffle area offered to the loud-speaker enables the bass-note response of the power valve and speaker to be fully exploited. Moreover, the use of this large cabinet, which is very pleasing in appearance, prevents objectionable resonances.

AMPLE POWER

So powerful is the circuit that there is no need to use an external aerial for the reception of most of the home and foreign stations. On the mains-aerial plug connection I have obtained thirty stations at full loud-speaker strength on the medium waves. Even on the long waves, where the mains aerial is not usually very effective, such stations as Radio Paris, Hilversum, and Kalundborg came through well.

With a short external aerial the number of stations is limited only by the conditions prevailing in the ether. That is to say, if the ratio of the signal to the general background is sufficient to make entertainment value of the signal it can be brought in on this set.

SIMPLE CONTROL

The control is very simple. Tuning is done with one knob, and in addition to working the four-gang condenser this knob actuates a well-planned wavelength-calibrated tuning scale.

This is, of course, illuminated when the mains are switched on. The combined wave-change and mains-switch knob works a neat little indicator below the tuning scale, showing which waveband is in action. It also shows the position for gramophone reproduction and for the mains "off."

One of the most commendable features of this excellent set is the tone control. This is worked by a small knob above the tuning knob. It enables the top notes to be cut down so that background noises, which are usually of fairly high frequency, can be kept down at some slight loss of quality.

I found this a great advantage in logging some of the more distant stations which, through no fault of the set, were suffering from crackles and high-pitched whistles. The range of the tone control is very wide and should enable the listener to cope with all conditions. A station normally suffering from rather bad background could be heard with a suitable adjustment of the tone control at something like entertainment value.

BRIEF SPECIFICATION

Makers : The Marconiphone Co., Ltd.

Price : 24 guineas.

Valve Combination : Six-valve super-het sequence with PX4 output and U12 mains valve rectifier, making seven valves altogether.

Power Supply : A.C. mains.

Type : Table-cabinet set with self-contained energised moving-coil and mains-aerial attachment.

Remarks : Fine super-het with tone control and remarkable range of programmes of entertainment value.

The only other control is for the volume. This works very smoothly on the variable-mu valves of the super-het sequence, giving the set full power to cope with the widely differing signal strength values met with in present-day reception.

The Marconiphone super-het employs six valves with an extra valve for the mains

There is no loss of quality when this volume control is reduced so that the local stations are heard at moderate strength. Moreover, this volume control works on the gramophone pick-up connections at the back, so that when you add a pick-up there is no need for any external volume control.

The quality is very pleasing when the tone control is adjusted for the maximum high-note output, and owing to the large reserve of power imparted by the PX4 it is easy to get full concert strength without any sign of overloading.

There is sufficient power to work an external loud-speaker as well, and provision for its connection is made at the back of the chassis.

EXCELLENT SELECTIVITY

On the highly important test of selectivity this model 256 came through with flying colours. It was a matter of the greatest ease to get Mühlacker clear of London and, what is equally important, adjacent foreigners could be brought in without any trace of "side-band twitter."

The wavelength range on the medium waves is good, tuning going from about 200 metres up to beyond Budapest on 550 metres. On the long waves the range is just as good and the selectivity is commendably high. I was able to get Zeesen with only the faintest trace of side-band interference from Daventry.

Mains hum is not noticeable when receiving programmes and the background was not appreciably increased when I plugged into the mains-aerial attachment.

Altogether, I should say this is one of the best of the table-cabinet super-hets at present on the market, with the notable feature of a really fine control of the tone.

SET TESTER.

The Welsh Interlude for Daventry National listeners on February 4 will be given by Mr. R. Williams Parry, Extension Lecturer at the University College of North Wales, Bangor. He will read selections from his own poems.

The annual dinner of the Society of Somerset Folk (Cardiff Branch) will be held on January 30, and a relay will be taken for West Regional listeners.

Listeners will be interested to know that Messrs. H. Clarke & Co. (Manchester), Ltd., have now arranged for a special Atlas sponsored programme to be given from Radio Paris and Radio Normandie. The Radio Paris programme will be given from 3 to 3.30 and the Radio Normandie programmes from 5.30 to 6 p.m. and from 10 to 10.30 p.m. each Sunday.

WHAT IS THE SECRET OF "SKYSCRAPER" POWER ?

GREATEST CHART EVER PUBLISHED! GREATEST SET EVER BUILT!

Never before was there such a set within the reach of the home constructor. Never before such power from a battery set. Never before so many enthusiastic letters from constructors or so much talk about any radio set as this Lissen "Skyscraper" Kit has elicited. 50—60—70 loud-speaker stations—everybody who builds a "Skyscraper" gets results like that!

THE ONLY KIT YOU CAN BUILD YOURSELF EMPLOYING METALLISED S.G. HIGH MU DETECTOR AND ECONOMY POWER PENTODE VALVES

This new Lissen "SKYSCRAPER" Kit Set is the only one on the market that you can build yourself employing a Metallised Screened Grid Valve, High Mu Detector, and Economy Power Pentode. Around these three valves Lissen have designed a home constructor's kit the equal of which there has never been before. Why be satisfied with whispering foreign stations when you can BUILD WITH YOUR OWN HANDS this Lissen "SKYSCRAPER" that will bring in loudly and clearly distant stations in a profusion that will add largely to your enjoyment of radio?

CONSTRUCTIONAL CHART FREE!

Lissen have published a 1/- Constructional Chart, giving the most detailed instructions ever printed for the building of a wireless set. You can't go wrong—every part, every wire, every terminal is identified by photographs.

Everybody, without any technical knowledge or skill, can safely and with COMPLETE CERTAINTY OF SUCCESS undertake to build this most modern of radio receivers from the instructions given and the parts Lissen have supplied. You can get the Lissen "Skyscraper" Chart FREE from any radio dealer, or by posting the COUPON below direct to factory.

YOURS *for* ONLY 8/6 DOWN

To-day you can buy the LISSEN "SKYSCRAPER" KIT on Gradual Payment Terms. "Skyscraper" Chassis Kit, complete with Valves. CASH PRICE 89/6. Or 8/6 down and twelve monthly payments of 7/6.

"Skyscraper" Kit complete with Walnut Cabinet and in-built Loud-speaker as illustrated, £6 5s. Cash. Or 11/6 down and twelve monthly payments of 10/6.

POST COUPON BELOW

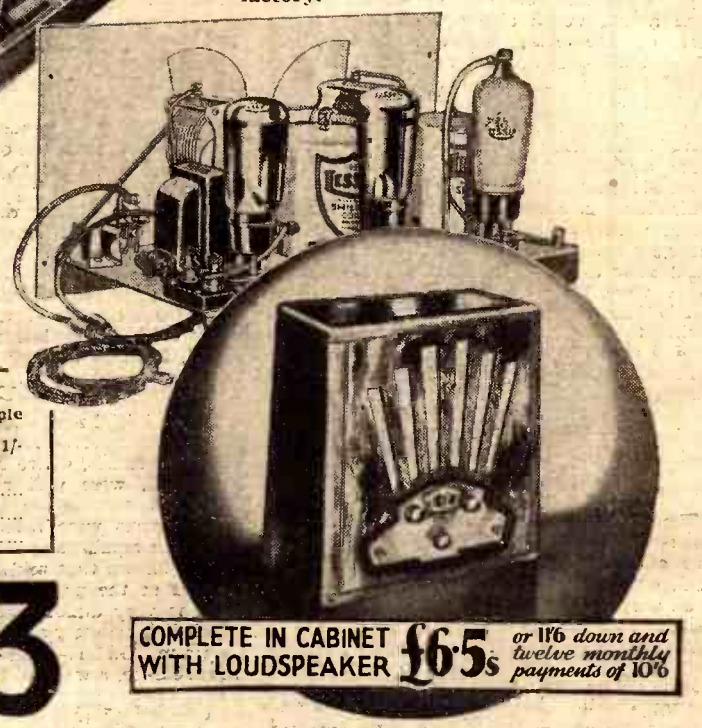
COUPON

To LISSEN, Ltd., Dept. A.W.33, Worple Road, Isleworth, Middlesex.
Please send me FREE copy of your 1/- "Skyscraper" Chart.

Name.....

Address.....

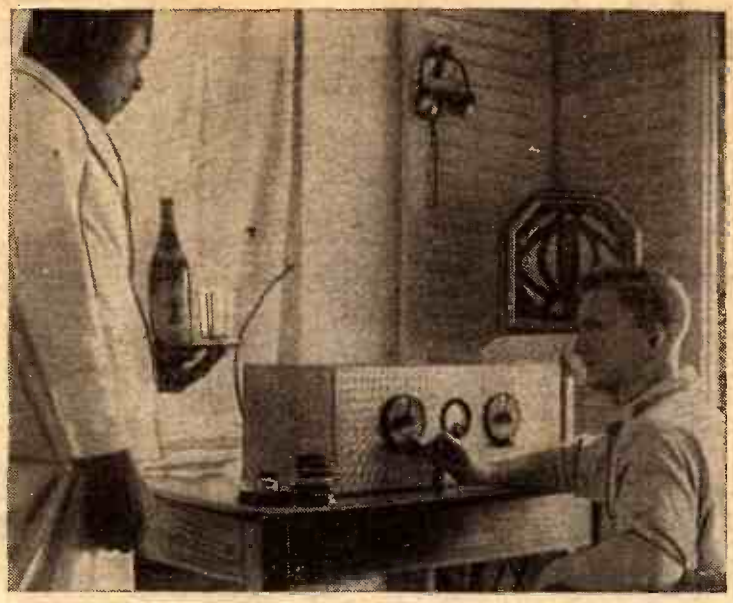
.....



COMPLETE IN CABINET WITH LOUDSPEAKER **£6·5s** *or 11/6 down and twelve monthly payments of 10/6*

LISSEN "SKYSCRAPER" KIT 3

Don't Forget to Say That You Saw it in "A.W."



HOW THE EMPIRE TRANSMISSIONS ARE BEING RECEIVED

REPORTS of reception of the Empire Broadcasting Station have now been analysed and collated by the B.B.C. The reports so far received consist of some three hundred cables and 1,500 letters, and cover the period since the first tests were made in November last.

AUSTRALASIAN ZONE

In the original tests, using GSD, definitely good reception was the report from New Zealand, while that from Australia (Sydney and Melbourne) was fair to good, November 19 being the best day. Favourable reports were received also from Hong Kong. During these tests, good or excellent reception was reported from Ceara, Brazil; Las Palmas, Canaries; and Barbados—all of which are roughly within the beam transmitted by the directive aerial used for this zone when transmitting in a westerly direction from Daventry. It was decided to continue transmission to this zone in a westerly direction when the service opened on December 19, and in addition, to use GSC (9,585 kilocycles), transmitting on the Indian Zone aerial, which also covers the western part of the Australasian Zone. Reports received since December 19 from this zone indicate that for the first few days rather poor conditions obtained, and from other zones that these poor conditions were rather general. It was also interesting to note that reports from those equipped for directional reception in Australia showed that, although GSD always transmitted in a westerly direction (over the longer path to Australia), yet reception was generally better from the west (over the short path) after about 11 a.m., G.M.T. Arrangements were, therefore, made to change over GSD's direction of transmission at this time during the Australasian Zone programme as from January 2, 1933, onwards.

The Christmas Day broadcast, including the King's message, was well received in Australia, both from the Empire Station using GSE on the Indian aerial array, as well as over the Post Office Telephone Service.

INDIAN ZONE

The initial tests were very well received in this zone, GSE receiving about eighty favourable cabled reports and none unfavourable. GSG, on the other hand, was scarcely heard at all within the zone, and accordingly, it was decided to open the service with GSC (9,585 kilocycles) in place of GSG. Outside the zone good reception was reported from GSE in Western Australia, Madeira, Mauritius, Egypt and West Africa, and from GSC in the Azores, Egypt, West Africa, Cape Colony, Kenya, Ontario and Mauritius: *i.e.*, generally where the transmission was over an all-daylight path.

Tests to both the Indian and African Zones showed that a definite benefit was obtained by using a directional, as opposed to an omni-directional, aerial for a given wavelength. The benefit was proportionately more marked as the observer was situated towards the centre line of the beam.

AFRICAN ZONE

In the initial tests the zone appeared to be fairly well covered by the two waves, GSA on 6,050 kilocycles, and GSC on 9,585 kilocycles. As was expected, GSA was generally better in the nearer parts, whereas, GSC was better in the more distant parts, particularly in South Africa. Some forty cables reported good to excellent reception of GSC. Outside the zone GSA was very well heard in many European countries.

The Christmas Day broadcast took place at a time when the normal African Zone waves were not likely to be suitable, and GSF (15,140 kilocycles), working on an omni-directional aerial, was chosen as likely to be the best compromise for this zone, the West African and Canadian Zones. Reports to hand from the African Zone show that GSF was well received in Durban, Cape Town and Salisbury, Rhodesia.

WEST AFRICAN ZONE

Both GSA and GSB (9,510 kilocycles) were well received in this zone during the initial tests, but as there was some interference reported on GSB, subsequent transmissions have been made on the other frequency in this band—namely, GSC (9,585 kilocycles). Outside the zone good reports were received on both frequencies from the West Indies and on GSB from South America (Buenos Aires). Since the service opened on December 19, GSA has been badly interfered with by atmospherics in parts of the zone, while HBL (League of Nations station—Prangins) has interfered with GSC. This latter interference, it is hoped, has now been cleared.

CANADIAN ZONE

In the initial test, about ninety per cent. of the reports received from this zone came from the West Indies, where both frequencies, GSA and GSB, were well received. Within the zone, but outside the Empire, a number of good reports were received from the South American republics.

It is known that midwinter transmission to Canada at the present phase of the sunspot cycle is very difficult at the time of day at which it is necessary to transmit: *i.e.*, 1 a.m. to 3 a.m., G.M.T.—and in fact, if there were a free choice, a wave of the order of 70 metres would probably prove the best. The longest broadcasting band available in the short waves is 50 metres, and therefore, GSA is used. It is to be expected, however, that conditions will improve at this time of day as midwinter conditions pass. Test transmissions at other times of the day have been well received in Canada, and on two occasions have been relayed by local stations. There is, however, a relative lack of reports, and it may be that there are not many short-wave receivers in this part of the zone, which is, of course, comparatively well served by medium-wave broadcasting stations.

Taking the reports received as a whole, it is apparent that the initial results are distinctly encouraging and show great enthusiasm among Empire short-wave listeners. It must be equally apparent that the interests of these listeners can best be served by a continuation of the co-operation they have already offered to the B.B.C.

"ARE LARGE TRANSFORMERS NECESSARY?"

(*Continued from page* 94)

will be remembered that some of these curves show quite a considerable drop in volts between no load and full load, while others give very little change even with large currents. It must also be remembered that passage of current through the resistance of the windings generates heat which is a further waste of energy and a transformer with a high-resistance winding is therefore less efficient than one with a low resistance.

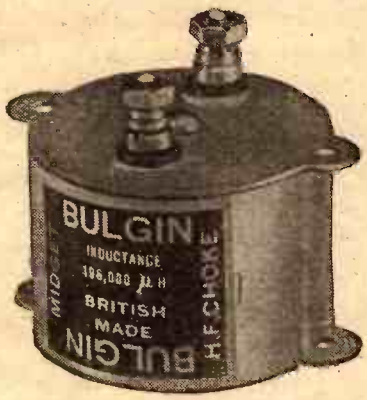
The designer, therefore, has to make up his mind what resistance he can afford in his windings. He then designs the size of the iron core so that with the winding he has chosen, the iron circuit is working within the limits already specified and the iron loss is kept down to a reasonable proportion. It is here that the difference in size comes in. If the circuit is such that we can afford a fairly large resistance, i.e., if the variation of voltage with load is not of primary importance, then we use a large number of turns and a fairly small iron circuit which gives us a compact transformer. If, on the other hand, it is important that the voltage shall not vary much between no load and full load (and for experimental purposes this is a very desirable feature), then we have to keep the resistance of the winding small, use a small number of turns, and increase the size of the iron core, which results in an appreciably larger transformer.

Both transformers are equally satisfactory for their own particular purpose; from an ideal point of view, the larger transformer is the better, but it naturally costs more money and if a low resistance and consequent good regulation are not essential, there is little point in spending the extra money. The principal requirement in both cases is that the iron circuit shall not be saturated and we can easily check this up by measuring the extent of the iron loss. This loss remains constant irrespective of the load in the transformer.

A weekly review of new components and tests of apparatus conducted by J. H. Reyner, B.Sc., A.M.I.E.E.

BULGIN SCREENED CHOKE

H.F. CHOKES have been a speciality of Messrs. H. F. Bulgin & Co. for some time, and we have evidence of further activities on their part in the introduction of a range of screened H.F. chokes. These chokes are interesting in that an iron core is used and the screening is not of the usual aluminium or copper but of special sheet iron which has



A neat shielded H.F. choke by Bulgin

the effect of completing the magnetic circuit.

The sheet metal is finished with an aluminium matt spray and a small identification plate is riveted on the side, the whole forming a very neat job. There are three chokes of this type, the Midget, Standard and the Super-het, the inductance and performance increasing at each stage.

We had the opportunity of testing the Midget choke recently and found the performance excellent. The inductance was 230,000 microhenries as against a rated value of 198,000, while the performance factor measured in our customary manner gave a high and uniform choking effect over the whole of the broadcast band.

Considering that this choke sells for a price of 2s. only, it constitutes excellent value for money. Its small size—1⅜ ins. diameter by 1 in. high—renders it very suitable for inclusion in compact sets.

CLIX INSULATED SOCKET

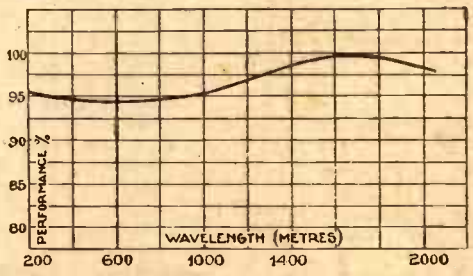
READERS may have experienced difficulty with metal panels in obtaining proper insulation of any sockets which they wish to mount thereon. To overcome this difficulty the Clix people have just introduced an insulated socket. This consists of a threaded bakelite bush in the centre of which is the socket. It is only necessary to drill a ⅜in. hole in the panel, insert the bush and hold it in position with a nut on the other side. If the bush is insulated the metal socket in the centre is not in contact with the panel at all. The connection with the bush itself is made by another nut right at the back.

The device sells at 2½d. and will be found useful in many instances.

HELLESEN WET ELECTROLYTIC CONDENSER

THE new Hellesen factory at Wimbledon is getting well into its stride. In addition to the production over here of the well-known Hellesen batteries, the firm is manufacturing a number of other components which will interest the constructor. Among these one may mention the electrolytic condenser.

While the firm makes both wet and dry types they are only releasing the wet type



This curve shows the performance of the Bulgin screened choke tested

for the time being. This is because of the well-known self-sealing properties of the wet electrolytic condenser so that if it is inadvertently connected the wrong way round it will not be irreparably damaged.

The sample we tested was of conventional form consisting of an aluminium can which constituted the negative electrode. This can was threaded at the bottom and provided with a large diameter nut and shakeproof washer, while running through the centre with an insulated bushing was the positive terminal connected to the positive electrode inside.

The firm would appear to be generous with their microfarads because our measurements showed a capacity of slightly over 11 microfarads as against a rated figure of 8. The peak voltage of the condenser was 435 and it withstood this quite satisfactorily. Exceeding this voltage of course caused a momentary breakdown which lasted as long as the overload was applied. As soon as the voltage was reduced below the peak value the breakdown ceases and the condenser is quite satisfactory for use once more. This

A new wet electrolytic condenser—the Hellesen

feature is of course the principal advantage of the wet type.

MICROPHONE DISTORTION

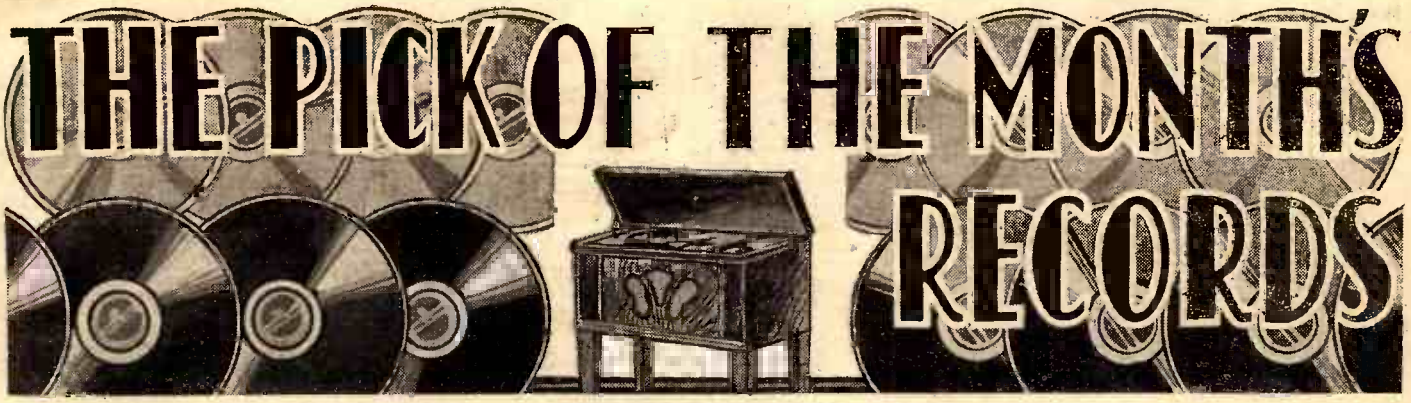
ONE troublesome defect in any microphone is due to the size of the diaphragm, which is found to diffract or bend the sound waves falling on it, thus causing a slight though definite amount of distortion. Theoretically, it would appear necessary to reduce the size of the diaphragm to one-tenth of an inch to get rid of the effect entirely. This is, of course, not practicable, but experiments made with a Wente condenser microphone—of the type now used by the B.B.C.—show that the distortion becomes negligible with a diaphragm roughly half an inch in diameter.

B. A. R.

It should be noted that the address of Messrs. A. Taylor, makers of "Taylex" wet batteries, was incorrectly given in "A.W." for January 14. The correct address is 57 Studley Road, Stockwell, London.

From October to March, "Services for the People" are held in Colston Hall, Bristol, on Sunday evenings at 7 o'clock, and on January 29 a relay for the Western Region will be taken from 8 to 8.45 p.m. of this service.

THE PICK OF THE MONTH'S RECORDS



The records reviewed below are a careful selection of the best of the recent issues. It will be noted that criticism is chiefly devoted to the treatment of the music and quality of recording rather than the actual composition

ORCHESTRAL

1812 (Tschaikowsky), 12s. **H.M.V. DB1663-4**
This piece has many devotees and, whilst I am not one of them, I must pay tribute to the way in which the Philadelphia Orchestra "put it over" (they fairly revel in the Moscow "whoopee" at the end). Very impressive, but the Philadelphians always are.

The Black Domino (Auber), 4s. **H.M.V. DA1264**
A very scintillating affair. Highbrows sniff at Auber, and whilst much of his music (like "The Bronze Horse") is not very inspired, this overture is good to listen to. The L.S.O. performance is *brilliant*; hear it.

Pomp and Circumstance (March No. 1 in D Major and March No. 2 in A Minor), 6s. **H.M.V. DB1801**
More grandiloquence. Elgar (the composer) with the B.B.C. Symphony Orchestra. The compositions are too well known to need further words, but the B.B.C. new orchestra really is magnificent. If it goes on as it has started it will soon be one of the finest three in Europe.

Hansel and Gretel Overture, 6s. **H.M.V. DB1758**
By the same orchestra. A great performance of Humperdinck's well-liked piece.

Wedding of the Rose and **A Sailor's Adventure**, 1s. 6d. **WIN 5513**
Excellent performances of each by the Commodore Orchestra.

Waltz Viennese and **Perfection**, 1s. 6d. **WIN 5514**
Commodore again. The first is a very tuneful number and the second a most skilful trumpet solo (chiefly) by Albert Coupe. An excellent record of its kind.

Rienzi Overture and **Prelude to Act 3** ("Lohengrin"), 7s. **DECCA-POLYDOR LY6049-50**
This is a very good rendering by the Berlin Philharmonic. There is plenty of fine playing and tonal colour. The recording is just a shade "hard" here and there, but not unduly so.

Emperor Waltz (J. Strauss), 3s. 6d. **DECCA-POLYDOR LY6052**
Who could mistake it! Right down the well-known lines, played with dash by the Berlin Philharmonic. Perhaps a shade too much brass in places, but good, undoubtedly.

Pan and the Wood Goblins and **Dwarf's Patrol**, 2s. 6d. **H.M.V. B4043**
Pleasant tea-time music, very capably played by Otto Kermbach and orchestra.

Chinese Fairy Tales and **From the Temple of the Bells**, 4s. **H.M.V. C2464**
Here is characteristic *Chinese* music by Yoshitomo (apparently *Japanese*), with enough Western idiom to make it suitable for our consumption—and very digestible Marek Weber's Orchestra makes it. Really, a very entertaining and novel record; you will enjoy it immensely.

From Gluck to Wagner, 4s. **H.M.V. C2467**
By the Berlin State Opera Orchestra. The excerpts are arranged in chronological order, which adds to the interest. The playing is of a very high order and, even as a sampler, this record should be heard.

Otello Suite, 5s. **H.M.V. B4273-4**
By the New Symphony Orchestra under Sargent. Coleridge-Taylor offers something for all tastes here. A funeral march (side 3) follows the "Children's Intermezzo." This latter, with the exquisite "Willow Song," are the gems of the suite. The playing is bright and clean throughout, but you must hear the records for yourselves. Some of it you'll like immensely.

In a Tea House with 100 Steps and **Indian Temple Dance**, 2s. 6d. **H.M.V. B4254**
The first (a Japanese reminiscence) is very good in its class. You can tell just where you pay your bill and trip off down those 100 steps! Really! The second is very fair, but doesn't suggest an Indian temple a bit. Ferdy Kaufmann's Orchestra are the players. Entertaining trifles.

BAND

Bradford and **Rimington**, 1s. 6d. **ZONO 6261**
When hymn tunes are wanted, hear this very pleasing performance by the band of Foden's Motor Works.

Dot and Carrie and **Whistling Mose**, 1s. 6d. **WIN 5522**
The best of brass bands—the Black Dyke. Whilst neither shows the band at its best, the cornet duet of the first is very well done.

Under Freedom's Flag and **Silver Stars**, 1s. 6d. **BRDCST 3257**
By the Welsh Guards Band. Not outstanding, but up to standard. The second is a xylophone solo.

William Tell Overture, 2s. 6d. **STERNO 1054-5**
These two records are by the band of the "Blues." The piece is, on the whole, well done, especially side 2. It is commendably lacking in blare.

The Passing of the Regiments, 2s. 6d. **H.M.V. B4275**
By the band of H.M. Coldstream Guards. All very martially reminiscent and stirring. Hear it.

DANCE

Let's Put Out the Lights and **We're a Couple of Soldiers, My Baby and Me**, 1s. 6d. **ZONO 6249**
A first-class effort by Syd Lipton's Band.

Linger a Little Longer in the Twilight and **When Morning Rolls Around**, 1s. 6d. **ZONO 6215**
Another by the same band—very good, too.

The Old Kitchen Kettle and **When We Danced at the Mardi-Gras**, 1s. 6d. **ZONO 6247**
The Blue Lyres Band in best "wireless" form.

Cheer-i-eer-i-o and **We all Went Back to the Jug and Bottle**, 1s. 6d. **ZONO 6245**
Blue Lyres again. Two attractively infectious novelty numbers.

Let's All Dance the Polka and **How Are You?** 1s. 3d. **IMP 2781**
Jay Wilbur's Band. The first is especially good. The band has improved tremendously.

Farolito de mi Barro and **La Cumparsita**, 2s. 6d. **BRUNS 1375**
Two good tangos, exceedingly well played by Carlos Molina's Tango Orchestra.

Marching Along Together and **Song of the Bells**, 2s. 6d. **H.M.V. B6249**
The first is an excellent "six-eight" and makes the record worth while.

VOCAL

Negro Spiritual Medley, 4s. **COL DX418**
A very careful selection of the best spirituals are here sung by Layton and Johnstone. Of course, their singing and understanding of these verses is quite unique. If you like spirituals, get this record.

Song of the Volga Boatmen and **The Mighty Deep**, 4s. **COL DX417**
By Malcolm MacEachern (Jetsam). I say quite seriously that, despite the great ones' renderings of this song, I like this best of all. It is in English, for one thing, and the unobtrusive chorus makes it all—great. The second song just doesn't matter: the "Volga Boatmen" is worth all the money.

La Danza (Pepoli-Rossini) and **Dream Song** (Manon), 2s. 6d. **COL DB961**
Heddle Nash, first in Italian, then in English. Diction perfect; singing delightful, as usual. A *very* cheap record—very!

Silent Night, Holy Night and **Sleep, My Saviour, Sleep**, 2s. 6d. **COL DB976**

Just a year since I reviewed Tauber's remarkable singing of the first. Now you have it in English, by Isobel Baillie, Muriel Brunskill, Heddle Nash, and Norman Allin. The second is best. A record to have, for the delightful melody of each.

Star of My Soul and **In the Shade of the Palm**, 2s. 6d. **COL DB972**

Old favourites, vividly sung by Dennis Noble. I wish he could have sung something less hackneyed, though.

Vesti La Giubba and **M'Appari**, 6s. **H.M.V. DB1802**

Here is a record that marks an epoch. Caruso is resuscitated with modernised orchestral accompaniment. The result is literally amazing. I tried it against my old acoustical recording (an old one-sider) ! and so realise what a triumph has been won. Hear this and see what the microphone has done. The interpolation of the new orchestral accompaniment is uncanny, whilst the voice has become more vivid than ever. One can only write in exclamation marks !

My Ships and **Danny Boy**, 1s. 6d. **WIN 5518**

Gladys Knight, contralto, sings these with considerable richness and good phrasing. There are some "plummy" passages, however, and diction could be rubbed up a little.

Epiphany (Wolf) and **Ständchen** (Strauss), 4s. **DECCA-POLYDOR CA8109**

Pity about the words of the first, which are not in the best of taste, for the music is so good. And whatever made Schlusnus choose the second, heaven alone knows. The first is in his style, the serenade is very definitely *not* !

In an Old-fashioned Town and **When You Come Home**, 1s. 3d. **IMP 2787**

The first may be called a "song scena," and very well done it is. John Thorne is the singer, with a chorus of some ability. The second has no "play-acting," but is pleasingly sung.

Tell Me To-night and **Only My Song**, 4s. **H.M.V. DA1284**

If you want to hear these very slender trifles *sung*, hear Richard Crooks on this record. That's all one can really say.

INSTRUMENTAL

There's an Organ Playing in My Dreams and **Underneath the Arches**, 1s. 6d. **WIN 5517**

Two organ solos of popular tunes played with Harry Davidson's usual artistry. Tone is admirable.

MISCELLANEOUS

Baked Potato Man and **Let's All Sing at the Top of Our Voices**, 1s. 6d. **ZONO 6254**

Leonard Henry in good form.

A Day's Outing, 1s. 6d. **ZONO 6255**

One of those dry "Lancasheer" sketches by Fred Walmsley. Quite good.

Cinderella—A Pantomime, 3s. **ZONO 6258-9**

A pair for the juveniles. A very effective piece of compression with many bright spots.

Blue Danube and **Bells of St. Mary**, 1s. **BRDCST 910**

The choir of canaries which "stars" in this record are amazingly accomplished songsters. If they are *really* canaries, it is very wonderful and very entertaining, too.

All-Star Non-stop Variety Show, 1s. 6d. **BRDCST 3252**

A very good show, too, with real talent and atmosphere.

Still More Scenes of Domestic Bliss, 1s. 6d. **BRDCST 3253**

That very funny pair, Billy Caryll and Hilda Mundy, squabble again. The sketch, "Soaked," is extremely amusing.

"RECORDER."

THE "MELODY RANGER"

Next Week:—

Full details of "A.W.'s" sensational new set.

The Rugby Male Voice Choir's annual concert is being relayed from Rugby by Midland Regional on February 9.

The "Colour Symphony" of Arthur Bliss first produced at the Three Choirs Festival at Gloucester, eleven years ago, is the chief feature of the symphony concert by the City of Birmingham Orchestra on February 11.

Disappointed by the cancellation of the broadcast of the Theatre Royal pantomime from Birmingham, Midland listeners are looking forward to hearing the Leon Salberg pantomime from the Alexandra on February 11. This is *Red Riding Hood*, with Jennie Hartley as principal boy.

What Our Readers Think

The Editor does not necessarily agree with the views expressed by readers and does not accept responsibility for the letters published. Letters cannot be published which do not bear the sender's full name and address

That Costly Flash

SIR,—Here's the tale of three valves, screen-grid, detector, and pentode, whose filaments disappeared in a *flash*. The accumulator ran down whilst listening in, the eliminator was switched off and the accumulator disconnected. The low-tension leads were allowed to fall on the case of E. A small flash—no, just a little spark seemed to appear as the terminals touched the case of E. On connecting fresh accumulator there was nothing doing. Valves were tested, found that filaments had gone; disconnected eliminator; took cover off and tested out with prods and voltmeter. In this well-known and expensive eliminator I found hedgehog type of transformer and choke. The core-iron wires had been bent back over the winding and tied down with string and had trapped the A.C. leads, also one side of the H.T. lead. The rubber insulation of the A.C. leads had stretched under the pressure and the wire had touched one of the core wires. Although the eliminator was switched off, it was on the earth side that the switch had been put in, so the other side had made circuit to earth via filaments and L.T. leads. Rubber solution, systo-flex, and a soldering iron soon put that right, but alas, my poor screen-grid, detector and pentode.

H. O. (Mitcham.)

A Poser

SIR,—A short time ago I built a mains-driven two-valve amplifier complete in a cabinet with B.T.H. pick-up, Garrard induction motor and Ormond loud-speaker. The queer thing was we could sometimes hear radio programmes through the loud-speaker, although there were no tuning condenser or coil fitted, and the programmes we heard were not the local (12 miles distant). The pick-up arm was earthed, but as the outer casing on the pick-up has no electrical connection to the pick-up arm, the pick-up would be shielded but not earthed.

The only reason I can give for our mysterious signals is that the pick-up must have been inductively coupled to the loud-speaker winding or L.F. transformer of the next-door neighbour's set, which was only three yards away (through the wall, of course).

I now have converted the set into a band-pass tuning three-valve set with variable-mu valve, which works quite O.K. and I never get the same phenomenon as I did before, but, of course, the grid circuit of the detector valve is always tuned to some wavelength and the set is more likely to pick up signals via the aerial while being used on gram.

J. K. B. (Sunderland).

Cut-price Components

SIR,—Having read A.B.'s (Southampton) letter under the heading of "Cut-price Components," it reminded me of an experience which befell me. Nearly four years ago I bought three valve holders for myself at 9d. each. These I bought locally, and are still in use to this very day.

Later a friend of mine wanted me to make him a cheap radio set and for me to get the parts just when he could afford to spare the money. One day I had need to go to Liverpool, so I took a look round the wireless shops. Most of these are "cut-price" shops, and in one of these I saw the same make of valve holder for which I paid 9d. for locally being sold for 6d. I immediately thought of doing my friend a good turn by getting him three. I screwed them down on the baseboard, wired them up. Not one valve would go down into the sockets. The valve holders were useless, for the sockets of the grid and plate were 3/16 in. too far apart. I had thrown 1s. 6d. away, and my friend had to buy three more of another make locally for 1s. each. Of course, we had paid 4s. 6d. altogether just for three valve holders.

You can take it from me, I finished with "cut-price" shops after that. Cheap things usually cost too much in the end.

T. M. D. (Chester).

The "Baby Three"

SIR—It is with extreme pleasure I write to inform you of the wonderful results I am getting from one of your very fine but seldom mentioned circuits—the "Baby Three." This was published in January, 1932. I frankly admit that when I decided to build it, it was with the idea of being a novelty, and never expected to get anything more than perhaps Bombay (about 800 miles away), my nearest station. The set is now no longer a novelty, but a real little wonder for pulling in long-distance stations; so much so that it is the centre of admiration by all who see and hear it. I am working it off a Climax H.T. eliminator in conjunction with an output filter, as it was essentially a battery-operated set in the first place. I give below a few of the stations I pick up at full loud-speaker strength with an inverted L aerial, 45 feet high, 55 feet long, pointing north-south:

Medium waves.—Goteborg, 321.9 metres; Breslau, 323.3 metres; Brussels, 338.2 metres; Bombay, 357 metres; Muhlacker, 360.1 metres; Lwow, 381 metres; Bucharest, 394 metres; Rome, 441.2 metres; Vienna, 516.5 metres; Budapest, 550 metres.

Long waves.—Leningrad, 1,000 metres; Oslo, 1,071 metres; Tashkent, 1,171 metres; Moscow, 1,304 metres; Warsaw, 1,411.8 metres; Lahti, 1,796 metres.

G. R. C. (Kalka, India).

The Editor invites letters from readers on all interesting radio subjects. For the most interesting letter published each week a general-purpose valve or other component to the same value will be given.

Worth-while Stations

SIR,—With reference to your article on "Worth-while Foreigners You Can Easily Log," why has 300 metres been chosen?

Personally, I can obtain wonderful reception of the following stations: (1) Trieste, (2) Horby, (3) Frankfurt, (4) Heilsberg, (5) Nurnberg, and on occasions Turin and Bratislava. This makes at least seven stations below North National. Very little fading and probably no more than on some of the stations your correspondent mentions. In addition to his log suggested, what price Goteborg, Brno and Strasbourg? An extraordinary trio, particularly after dark. All on moving-coil speaker at that! I am putting these stations forward as a regular reception.

W. D. A. K. (Sheffield).

Hilversum's Chimes

SIR,—I read with interest Thermion's paragraph in "A.W." for December 17. I am a regular listener to Hilversum's programme, and I hear the announcement, then the midnight chimes, and lastly the national anthem at the close of each day's programme nearly every night. I have heard several different chimes from this station. Some very sweet and others much boomier. But the chimes "Thermion" refers to were different to any I have heard from this station before or since. As "Thermion" remarks, the hour strokes were much boomier. I noticed the pauses between each stroke were longer than any I have heard, with the exception of Big Ben. If these were not the chimes of Big Ben, then it must have been Big Ben's brother.

I have also noticed since the beginning of this month that Hilversum closes down on most weekdays at 11.30 p.m. (Dutch time) or 11.10 p.m. G.M.T. Is this due to the change with Huizen?

R. E. W. (Liverpool).

"PRACTICAL POWER SUPPLY IDEAS"

(*Continued from page* 80)

and note the rating of the low-tension output. Ordinary mains valves take roughly 1 ampere each on the heaters, and if a high output transformer is used to supply a two- or three-valve set, the valves may be very much overrun if the regulation is bad.

The converse is the case with large sets (multi-valve super-hets, and so on) where poor performance can often be traced to insufficient low-tension output, so that the valves are not running at the proper temperature. Although the voltage is low in the L.T. circuit, the current is considerable.

In the average set a low-tension circuit handles a current of three or four amperes. The wiring must therefore be done in just as solid a fashion as ordinary 5-ampere house wiring. If there are any faulty joints, the actual voltage on the heaters will be very seriously reduced.

Hum can sometimes be cut down by reversing the heater connections to just one of the valves, generally the detector.

Don't forget that it is quite simple to charge an L.T. battery, even from an A.C. supply. An L.T. charger could very easily be made up with a transformer, single-wave L.T. rectifier and limiting resistance. The average L.T. metal rectifier for battery charging gives an output of 6 volts or so which is more than enough for charging L.T. batteries. A limiting resistance to control the charging current should have a value of about 7 ohms.

The regulation of charging current should be done with this resistance, and not with the tappings on the primary of the mains transformer.

A standard rectifier will give a charging rate of about ½ ampere at 6 volts, while on a 2-volt accumulator, the charging will rise to about 1 ampere.

GRID BIAS

Automatic grid bias can be obtained even with a battery set.

Not only does it dispense with the need for a separate bias battery, but it means that the bias value varies with the high-tension current, which is as it should be.

As there are so many battery sets using pentodes these days, and as in a small set this is the only stage for which bias is necessary, it is worth while knowing how to incorporate automatic bias in a battery-driven pentode set.

THE "MELODY RANGER"
Next Week:—Full details of "A.W.'s" sensational new set.

The connections for the bias resistance and shunt condenser are shown by Fig. 4A. The dropping resistance is connected, of course, in the usual place between the grid circuit and H.T. negative, and a value of 500 ohms is suitable with the average pentode. The shunt condenser to prevent motor-boating has a value of 50 microfarads, and this, of course, must be an electrolytic condenser.

Incidentally, when economising in power supply by changing over (in a battery set) from triode to pentode output, you may find that the tone is changed, and that you will need the filter circuit in the speaker output—shown by Fig. 4—to correct for the excessive treble response.

When working variable-mu valves in a battery set, the fine control of grid bias needed must be obtained by means of a potentiometer. It is not satisfactory merely to rely on the fixed tapping of a 16-volt bias battery. The potentiometer should be connected across the whole battery, with a switch to cut it out of circuit when the set is not in use. A 50,000-ohm potentiometer will do, and the current passed, with a 16-volt battery, is negligible. The connections are shown by Fig. 5. It will be seen that a 2-microfarad condenser is shunted between a tapping point and the positive (low-tension negative) side of the bias battery.

PILOT KITS

It should be noted in Messrs. Peto-Scott's advertisement, on page 35 of last week's issue, a slight error arose in describing one of the items. Where the "2 Guinea Family Three" was described, the Pilot "Structakit" for 5s. appearing immediately beneath obviously refers to this set and not to the "2 Guinea Two" as worded in the advertisement.

Birmingham's City Organist, Mr. G. D. Cunningham, gives two recitals for Midland listeners on January 25.

THE NEW SCULPTURE AT BROADCASTING HOUSE

By WHITAKER-WILSON

An interview with Eric Gill

Photo: Howard Coster

The original model of the Prospero and Ariel statue in the sculptor's workshop

I SPENT a pleasant half-hour with Eric Gill, the sculptor, a few days ago and paid my respects to *Prospero* and *Ariel* at the same time. To reach their lair it is necessary to climb the ladder leading to a temporary closed-in platform, the floor of which is just above the entrance to Broadcasting House.

There I found Mr. Gill finishing for the day, surveying what he had done and making up his mind what he was going to do next.

"The statue is about eleven-foot-six in height," he said in response to my question. "It weighs about five tons As a matter of fact it weighed a good deal more than that originally but we have chipped away something like three tons. There are three stones in all."

I asked him whether he began from a square block of stone. "No," he said. "I got the masons to cut the corners off before the stone was delivered to me. They cut it the wrong way, unfortunately, he added. "I have had to alter the figures a little in consequence."

I said I thought the subject of Prospero and Ariel excellent for the purpose. Mr. Gill agreed. "Yes; Prospero represents the B.B.C., in a sense. Ariel represents broadcasting."

"He is the sprite, of course?"

"Well, yes; but the joke of it is that you will remember Ariel in Shakespeare's *Tempest* was rather unwilling to serve Prospero, and was always striving for his freedom."

"That looks as though the B.B.C. is a taskmaster to those who broadcast."

"It does look a bit like that," said Mr. Gill. He seemed amused at the thought. "Still," he added, "I doubt whether you could find a *better* symbol for Broadcasting House."

"Local" Effect

Mr. Gill told me he did nearly all the early work on the statue in his workshop at his home near High Wycombe. The statue was then removed by lorry and set up in the niche provided for it on the front of Broadcasting House, the platform being closed in so that the sculptor should not be distracted by an admiring crowd.

The "walls" of the platform are so arranged that the light falls from above. The reason for the work being finished there and not at Mr. Gill's home is because having it in the niche gives him an opportunity of seeing it "lighted" as it will be when finished. When I found him he was solemnly regarding it in the rain!

We climbed down the ladder and went inside where it was a trifle warmer. "Ought I to know any more of your work in London—other than *The Sower*, that is?" I looked at the latter as I asked the question.

"You know Westminster Cathedral?"

"Quite well. I am interested in Byzantine architecture."

"Well, then; I did the *Stations of the Cross*."

I recalled them perfectly, having recently studied them when wandering round the cathedral.

Rather an amusing incident occurred when Mr. Gill was carving those figures. A young lady called up to him while he was at work. "What style are these figures in?" she asked. That was more than Mr. Gill was prepared to answer. He played for safety first. "I don't know?" he said. "They are very ugly, aren't they?" observed the Young Thing. To this Mr. Gill had positively no reply, and was perhaps relieved that the interview terminated at that point.

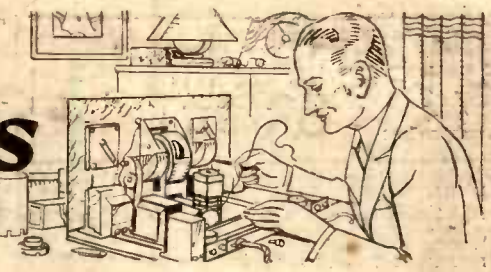
That question is one asked frequently. The reply is that the figures are in Mr. Gill's style. They are not a copy of some bygone style as taught in an art school. Mr. Gill was not commissioned to cut the figures at Broadcasting House in any particular style. He was engaged because his style of sculpture was considered suitable for a building like Broadcasting House. In a few weeks' time we shall probably be able to publish a picture of the finished Prospero and Ariel.

The Swansea Borough Police Band will give a concert for West Regional listeners on January 31.

The second talk in the West Regional series, "Wales from Without," will be given on February 1. The speaker will be Mr. C. P. Williams, and he will tell of "Welsh Industrialism from Abroad."

Clarion and "Clarion-Voice."—In our issue dated December 24 we described a two-valve receiver under the title of the "Clarion Voice Two." The British Clarion Co., Ltd., have suggested to us that a set so named might be supposed to have some association with them and we, therefore, should like to make it clear that, as all our readers will already know, our set is a home-constructor set for which the British Clarion Co., Ltd., are in no way responsible. We are sorry it should be thought that there should be even the risk of confusion.

In My Wireless Den



Weekly Notes: Theoretical and Practical

REDUCING H.T.

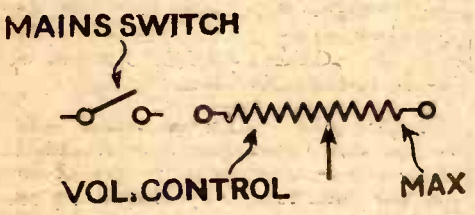
MOST users of batteries try to reduce the high-tension current to as low a value as possible, and in this connection it is interesting to note that the type of volume control used may affect the value of the current.

With a grid-bias controlled variable-mu high-frequency stage, for instance, the anode current passed is much less when the control is operated to reduce the amplification as when receiving strong signals. A set having this form of control may, therefore, well be more economical than another set having an aerial circuit volume control or some other form which does not vary the current.

VOLUME AND SWITCHING

MAINS sets are often fitted with a combined volume control and on-off switch arranged as in the sketch. This, I think, is a very convenient fitting. It is logical to reduce the volume and at the end of the movement to turn the set off.

The switch and the volume control



These are the connections for the combined volume-control and on-off switch

resistance or potentiometer are two separate parts, electrically, the mechanical arrangement being such, that one shaft to which the knob is attached carries the moving contact across the resistance and at the end of its travel engages with the top of the switch.

The switch is connected to the mains side of the set as indicated and the volume control is usually part of a grid-bias or screen-grid circuit.

COMBINING THE CONTROLS

IT is a great convenience to have a single volume control for wireless and the gramophone. Normally the controls themselves are separate units, but are coupled or ganged and are controlled by the single knob.

The usual volume control on the gramophone side is a potentiometer connected across the pick-up, by means of which the input to the amplifier can be adjusted.

A resistance or a potentiometer may be used as the adjustable element on the radio side as well, but as it is normally connected in a different part of the circuit to the gramophone control, the same unit cannot be used. Sometimes the two potentiometers or resistances may be fitted upon a common shaft, the shaft being connected to negative.

As a rule, however, a common shaft electrically connected may not be used and it is necessary to couple the two shafts by a piece of insulating material. Other forms of dual volume controls have an insulated common shaft.

Do not, therefore, fit a pair of potentiometers together without first making sure that they will suit the circuit of the set.

BIAS FOR VARIABLE-MU'S

A GRID-BIAS battery fitted in a set having a variable-mu screen-grid valve will probably not have so long a life as when this type of valve is not used.

This is because it is usual to connect a potentiometer across the grid battery for the purpose of obtaining the adjustable grid bias needed for the variable-mu valve. The potentiometer passes a little current during the time the set is being used and the discharge may shorten the life of the battery as compared with its normal life when no current is taken from the battery.

As a rule a switch is connected to the potentiometer for the purpose of breaking the circuit when the set is "off." This means that the grid battery is discharging only when the set is being used.

In practice a 50,000-ohms potentiometer may be joined to a 16-volt grid battery. The current is then only one-third of a milliampere, which is very small. The point should be remembered, however, that the battery has a light load and it should be tested at intervals, such as when the high-tension battery is changed.

WHEN SUBMITTING QUERIES

Please write concisely, giving essential particulars. **A Fee of One Shilling** (postal order), a stamped addressed envelope, and the coupon on the last page must accompany all letters. The following points should be noted.

Not more than two questions should be sent with any one letter.

The designing of apparatus or receivers cannot be undertaken.

Modifications of a straightforward nature can be made to blueprints, but we reserve to ourselves the right to determine the extent of an alteration to come within the scope of a query. Modifications to proprietary receivers and designs published by contemporary journals cannot be undertaken.

Readers' sets and components cannot be tested at this office. Readers desiring specific information upon any problem should not ask for it to be published in a forthcoming issue, as only queries of general interest are published and these only at our discretion. Queries cannot be answered by telephone or personally.

Readers ordering blueprints and requiring technical information in addition, should address a separate letter to the Query Department and conform with the rules.

THE PATENT POSITION

Sweeping Changes Made By the Recent New Act

By a Legal Correspondent

THE subject of patents is a particularly "live" one in wireless circles. On the one hand, there is the manufacturer who finds himself compelled to pay tribute in the form of royalties, and on the other is the ordinary listener who in the long run has to foot the bill. Then some knowledge of recent patents is essential to the student who wishes to keep in close touch with modern developments. And, finally, there are quite a fair number of inventors—both amateur and professional—who are either patentees already or hope to be one day.

Amongst these not a few must sometimes have wondered how certain patents ever came into existence. There are patents, for instance, which seem to serve no useful purpose, whilst others are either obviously old—or else are based upon some small improvement, so trifling as to leave one guessing where the "invention" comes in. Finally there are a few so far removed from the accepted principles of radio science that one can only class them as "fantastic."

Good and Bad Patents

All this merely emphasises the fact—which is not so generally known as it should be—that it is one thing for an inventor to go to the Patent Office and secure a grant, and quite another thing for him to persuade a court of law to accept his patent as a valid document.

In common law, before a patent can be enforced against the public, it must fulfil certain conditions. In the first place, there must be real invention. That is, the improvement must show some definite degree of ingenuity. The law does not intend that a patent should be given as a reward for showing ordinary intelligence, because we are all entitled to exercise what might be called common-sense ingenuity without having to pay somebody else a royalty for doing so. Just exactly how much ingenuity is necessary is often a difficult matter to decide; but some, at least, must be present to support a patent.

Again, the patent must cover a *new* invention. If the improvement for which protection is sought has already been in use, or if it has previously been published, then the patent, even when granted, is not worth the paper it is printed on.

Finally, the invention must have utility; that is to say, it must serve some definitely useful purpose. If it is based on what might be called a pious hope—something which it is not possible to carry out in actual practice—then, again, the law will declare it void.

The grant of a patent is made by the Patent Office after the invention has been subjected to an examination in certain definite respects. The invention, for instance, must be clearly described and must be different from any previous British patent issued during the last fifty years. If it succeeds in passing these, and certain other tests, the inventor gets his patent.

Lawrence Tibbett in front of a New York "mike" and dressed for the part! He was singing at the Metropolitan Opera House just before the broadcast and there was no time to change his costume

Patent Risks

But there is an obvious gap between what must be done to satisfy the Patent Office and what the law demands from an inventor before it will enforce his patent in the Courts and award him damages for infringement.

Up to the present, the inventor has had to shoulder this risk, and stand the chance of seeing his patent declared void, for one or other of the reasons mentioned above, should he decide to start an action to recover royalties. On the other hand, possession is nine points of the law, and manufacturers have been known, when threatened with proceedings for infringement, to take the line of least resistance and to pay royalties rather than to go to the expense of testing the validity of a patent in the High Court.

New Patents Act

On November 1, 1932 a new Patent Act came into force designed to lessen the margin of risk now borne by the inventor. It also contains certain important provisions which are intended to protect the public against the exploitation of spurious patents.

In the first place, the new Act introduces the principle of extending the official search, as regards novelty, so that it will ultimately cover not only British, but Foreign Patent Specifications as well—together with all relevant technical papers and periodicals. This is, of course, such a tremendous undertaking that it will probably take several years before it can

(*Continued on opposite page*)

be brought fully into operation, but preparations are already under way, and a start is to be made at once.

A small extra charge of £1 is now made for this service, payable when filing the complete specification. The cost of a provisional specification remains, as before, at £1, and the other usual stamp fees are left unaltered.

The ordinary time allowed for following up a provisional with a complete specification was nine months, but it is now extended to a year. The time for acceptance is similarly increased from fifteen to eighteen months, whilst twenty-one months is allowed between the date on which an application is first filed, and the final issue of the sealed Letters Patent.

Protecting the Public

To protect the public, it is laid down that a patent may be revoked if it can be shown, amongst other things :—

That the invention is not useful.

That it is obvious and does not involve any real inventive step.

That the patent specification does not clearly set out the scope of the monopoly claimed.

That the patent specification does not describe the best method of carrying out the invention known to the inventor at the time when he filed his application at the Patent Office.

In addition, the Comptroller of the Patent Office is given power to refuse to grant a patent if he finds that the alleged invention has already been described elsewhere, or if it is so obviously contrary to accepted scientific facts as to be merely frivolous. This may seem, at first sight, to be a perfectly obvious proceeding; but, as a matter of fact, it has not previously been possible to prevent the issue of such patents.

Improper Threats

The existing law is also strengthened against any patentee who threatens to sue another person for royalties when he has, in fact, no proper grounds for taking legal action.

Finally, the new Act makes provision for the setting up of a Special Appeal Tribunal to hear appeals and decide disputes between the inventor and the Comptroller of the Patent Office when these arise. The tribunal is to consist of a judge of the High Court, who is to be nominated by the Lord Chancellor, and will have power to call and examine witnesses on oath, and to award costs when necessary.

"Amateur Wireless and Radiovision." Price Threepence. Published on Wednesdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to "Bernard Jones Publications, Ltd."

General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets. **Contributions** are always welcome, will be promptly considered, and if used will be paid for. **Communications** should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," 58-61, Fetter Lane, London, E.C.4.

BROADCASTING STATIONS

Broadcasting Stations classified in order of wavelengths. For the purpose of better comparison, the power indicated is that of the carrier wave.

Metres	Kilocycles	Station and Call Sign	Power (Kw.)
13.97	21,470	Daventry (GSH)	15.0
16.88	17,770	Daventry (GSG)	15.0
19.737	15,200	Zeesen (DJB)	8.0
19.82	15,140	Daventry (GSF)	15.0
25.28	11,865	Daventry (GSE)	20.0
25.4	11,810	Rome (2RO)	15.0
25.53	11,750	Daventry (GSD)	20.0
31.25	9,598	Lisbon (CTIAA)	2.0
31.3	9,585	Daventry (GSC)	20.0
31.31	9,580	Radio Nations	20.0
31.38	9,560	Zeesen (DJA)	8.0
31.51	9,520	Skamleback	0.5
31.55	9,510	Daventry (GSB)	20.0
32.26	9,300	Rabat	0.5
40.3	7,464	Radio Nations	20.0
43.75	6,865	Vitus/Paris	0.3
46.6	6,438	Moscow	12.0
48.2	6,202	Rome (tests)	15.0
49.4	6,070	Vienna (UOR2)	2.0
49.59	6,050	Daventry (GSA)	20.0
50.0	6,000	Moscow	20.0
58	5,172	Prague	0.5
206	1,460	Antwerp	0.4
207.3	1,447	Seraing	0.2
207.5	1,445	Pecz	3.0
209.7	1,430	Magyarovar	3.0
211.3	1,420	Newcastle	1.0
214.3	1,400	Aberdeen	1.0
214.3	1,400	Warsaw (2)	1.9
215.4	1,392.5	Brussels (Conf.)	.025
216	1,389	Chatelineau (EL)	2.0
217.1	1,382	Konigsberg	0.9
218	1,373	Salzburg	0.5
219.9	1,364	Beziers	0.5
224.4	1,337	Cork (6CK)	1.2
252.2	1,331.7	Fecamp	10.0
227.4	1,319	Flensburg	0.5
230.6	1,301	Malmo	1.2
232.2	1,293	Kiel	0.25
233.4	1,285	Lodz	2.2
236	1,270.9	Kristianssand	0.5
236.2	1,270	Bordeaux (S.O.)	2.0
237.8	1,260.9	Nimes	0.6
238.9	1,256	Nurnberg	2.0
240.1	1,249	Stavanger	0.5
241.3	1,243	Liege	0.3
242	1,238	Belfast	1.0
244.1	1,229	Basle	0.5
245.9	1,220	Berne	0.5
245.9	1,220	Cassel	0.25
245.9	1,220	Linz	0.5
245.9	1,220	Swansea	0.12
247.7	1,211	Trieste	10.0
249	1,205	Prague (Strasnice)	5.0
249.5	1,202.6	Juan-les-Pins	1.0
250	1,200	Radio Schaerbeek	0.3
250.4	1,198.1	Barcelona (EAJ15)	6.0
253.4	1,184	Gleiwitz	5.0
255	1,175	Toulouse (PTT)	1.0
256.7	1,168	Horby	10.0
259	1,157	Frankfurt-a-M.	17.0
261.6	1,147	London National	50.0
263.8	1,137	Moravska-Ostrava	11.0
265.4	1,130	Lille (PTT)	1.3
267.1	1,123	Valencia	8.0
267.8	1,120	Nyiregyhaza	6.0
268.3	1,118	Bremen	0.3
269.4	1,112	Bari	20.0
270	1,112	Salonica	1.0
271.4	1,105	Rennes	1.3
271.9	1,103	Cointe-Leige	0.3
273.7	1,096	Turin (Torino)	7.0
276.5	1,085	Heilsberg	60.0
279.7	1,072.4	Bratislava	14.0
281	1,067	Copenhagen	0.75
282.2	1,063	Lisbon (CTIAA)	2.0
283	1,058	Innsbruck	0.5
283	1,058	Berlin (E)	0.5
283	1,058	Magdeburg	0.5
283	1,058	Stettin	0.5
284.7	1,053	Radio Lyons	1.0
286	1,049	Montpellier	0.8
288.5	1,040	Bournemouth	1.0
288.5	1,040	Plymouth	0.12
288.5	1,040	Scottish National	50.0
291	1,031	Viipuri	13.0
293	1,022	Kosice	2.5
293.7	1,021.5	Limoges (PTT)	1.0
296.1	1,013	Huizen	20.0
298.8	1,004	Tallin	11.0
301.5	995	North National	50.0
304.9	984	Bordeaux (PTT)	130
307	977	Zagreb (Agram)	0.75
307.5	975.8	Falun	0.5
308.1	973.4	Vitus-Paris	1.0
309.9	968	Cardiff	1.0
212.8	959	Cracow	1.5
313.9	955.6	Genoa (Genova)	10.0
315	952.5	Marseilles	1.6
318.8	941	Naples (Napoli)	1.5
318.8	941	Sofia (Rodno Radio)	1.0
319.7	936	Dresden	0.25
321.9	932	Goteborg	10.0
325	923	Breslau	60.0
328.2	914	Poste Parisien	60.0
331.4	906	Milan	50.0
334.8	897	Poznan	1.9
338.2	887	Brussels (No. 2)	15.0
341.7	878	Brunn (Brno)	35.0
345.2	869	Strasbourg (PTT)	11.5
348.2	861.5	Leningrad (RV7O)	15.0
348.6	860.5	Barcelona (EAJI)	8.0
352.1	852	Graz	7.0
355.8	843	London Regional	50.0
357.9	838	Tiraspol	10.0
360.5	832	Muhlacker	60.0
363.4	825.5	Algiers (PTT)	16.0
365.5	820.7	Bergen	1.0
366.2	819.4	Fredriksstad	0.7
368.1	815	Bolzano	1.0
368.1	815	Helsinki	13.2
368.3	813	Seville (EAJ5)	1.5
369.3	812.1	Radio LL (Paris)	1.0
372.2	806	Hamburg	1.5
376.4	797	Scottish Regional	50.0
380.7	788	Lvov	16.0
385	779	Radio Toulouse	60.0
385	779	Stalino (RV26)	10.0
389.6	770	Leipzig	75.0
392	768	Archangel	10.0
394	761	Bucharest	12.0
398.9	752	Midland Regional	25.0
403	743	Sottens	25.0
408	734	Katowice	12.0
413.8	725	Athlone	80.0
416.4	720.5	Radio Maroc (Rabat)	6.0
419.5	715	Berlin	1.5
425.5	705	Madrid (Espan.)	2.0
425.5	705	Madrid (EAJ7)	3.0
430.4	697	Belgrade	2.8
431	696	Parede (CTIGL)	1.5
435.4	689	Stockholm	55.0
441.2	680	Rome (Roma)	60.0
447.1	671	Paris (PTT)	7.0
449.7	667	Danzig	0.5
450	666.5	Odessa (RW37)	20.0
453.2	662	Klagenfurt	0.5
455.9	658	San Sebastian (EAJ8)	3.0
459	653	Beromuenster	60.0
465.8	644	Lyons (PTT)	1.6
472.4	635	Langenberg	60.0
480	625	North Regional	50.0
483	621.1	Ivanovo-Vosnesensk	20.0
488.6	614	Prague	120.0
495.9	604.9	Trondheim	1.2
500.8	599	Madona	35.0
501.7	598	Florence	20.0
509	590	Brussels (No. 1)	15.0
509	590	Astrakhan (RV35)	10.0
511.8	586	Tartu	0.5
518.6	578.5	Vienna	15.0
525.3	571.1	Riga	15.0
532.9	563	Munich	60.0
537.6	557.9	Palermo	3.0
542	554	Sundsvall	10.0
550	545	Budapest (1)	18.5
559.7	536	Kaiserslautern	1.5
559.7	536	Augsburg	0.3
559.7	536	Tampere	1.0
563	533	Wilno	16.0
566	530	Hanover	0.3
572.4	524	Grenoble (PTT)	2.0
574.7	522	Ljubljana	5.2
575.2	521.4	Freiburg	0.25
680	442	Lausanne	0.6
720	416.6	Moscow (RV2)	20.0
742.6	404	Novosibizsk	6.0
748	401	Ostersund	0.6
759.5	395	Geneva	1.25
779.2	385	Petrozavodsk (RV29)	20.0
825	363.6	Sverdlovsk	36.0
833	360.1	Heston Airport	5.0
845	355	Budapest (2)	3.0
848.7	353.4	Rostov (RV12)	20.0
857.1	350	Leningrad	100.0
882	340	Saratov (RV3)	20.0
937.5	320	Kharkov (RV4)	20.0
967.9	310	Alma Ata (RV60)	10.0
1,000	300	Moscow (Old Kom.)	100.0
1,034.5	290	Kiev (RV9)	100.0
1,071.4	280	Tiflis (RV7)	100.0
1,071.4	280	Scheveningen-Haven	10.0
1,083	277	Oslo	60.0
1,106	271.2	Minsk (RV10)	35.0
1,153.8	260	Kalundborg	7.5
1,168	257	Taschkent (RV11)	25.0
1,191	252	Luxemburg	100.0
1,200	250	Istanbul	5.0
1,200	250	Reyjavik	16.0
1,229.5	244	Boden	0.6
1,237	242.5	Vienna Exp.	3.0
1,260.5	238	Bakou	35.0
1,304	230	Moscow (T.U.)	100.0
1,348	222.5	Motala	30.0
1,380	217.4	Novosibirsk (RV6)	100.0
1,411.8	212.5	Warsaw	120.0
1,445.7	207.5	Eiffel Tower	13.5
1,481.5	202.5	Moscow (RV1)	500.0
1,538	195	Ankara	7.0
1,554.4	193	Daventry (Nat.)	30.0
1,600	187.5	Irkutsk (RV14)	10.0
1,620	185	Norddeich (KVA)	10.0
1,634.9	183.5	Zeesen	60.0
1,675	179	Kharkov	25.0
1,725	174	Radio Paris	75.0
1,796	167	Lahti	54.0
1,875	160	Hilversum	8.5
1,935	155	Kaunas	7.0
2,000	150	Craciunelu	1.0
2,625	119	Konigswuster-Hausen (press)	20.0
2,650	113	Eiffel Tower	15.0
2,900	103.5	Konigswuster-Hausen (press)	15.0

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Webb "Variables"

IT always pays to have good variable condensers in a set, and the usual difficulty is to choose the right type. I advise set constructors to get a copy of the new Wavemaster booklet. The Webb Condenser Co., Ltd., have just sent me this new production, and it certainly simplifies the choice of variable condensers for tuning, reaction, or any other radio job. Full details of capacities, sizes, and methods of connection are given. **927**

Mains Unit Kits

Have you ever tried making your own mains unit? There's really nothing difficult about it, and in the new Heayberd booklet (copies free through my Catalogue Service) there are circuits and details of unassembled kits of parts for mains unit construction. Heayberd make transformers, chokes, and other components for mains units and full details of these are also given in the new booklet. **928**

Batteries—And a Log

A station log is included in the new book of Ediswan batteries. The book explains how to choose and use high-tension batteries and the log will be found extremely useful in connection with any set capable of getting more than the local station. **929**

Climax Mains Units

A.C. and D.C. mains units take pride of place in the new Climax folder, and details are also included of L.F. transformers, smoothing chokes, potential dividers, H.F. chokes, and, of course, the popular Climax earth tube.

If you are interested in any of these components then write for a free copy of the Climax folder through my Catalogue Service. **930**

The Philomel Transportable

If you are interested in an ultra-modern style of set, finished in either black, green, or scarlet, with chromium plated decoration, then get details of the new Philomel outfits. The receiver inside these modern-style cabinets is all-mains operated and has an integral frame aerial. The set chassis is provided with pentode output and with provision for working a gramophone pick-up. OBSERVER. **931**

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.....(make). Please quote me allowance for it on purchase of a new.....(make).

I desire to pay balance by cash instalments.

NAME.....

ADDRESS.....

..... A.W. 21/1/33.

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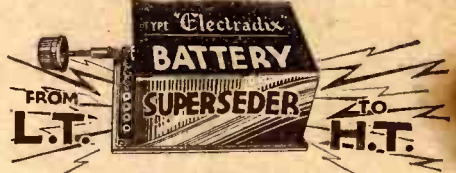

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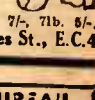

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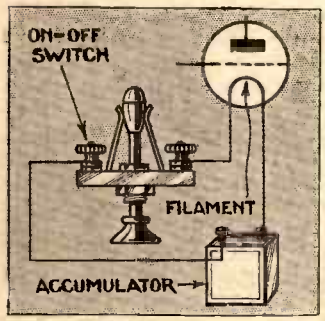
WIRELESS MADE EASY

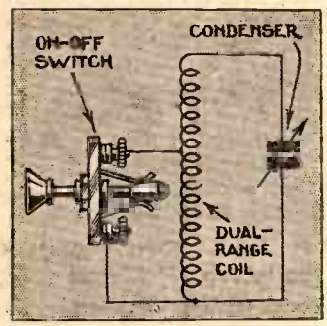
The A.B.C. of Switching

IN every wireless set there is at least one switch, and often there are two or three. It is quite easy to understand how switches work if you know what they are used for.

In brief, there are two distinct types of switching. We will explain each to you, starting with the simpler type, which consists of two contacts brought together or separated at will.



For switching on and off a battery set a two-point make-and-break switch is employed, and is wired up as in the above diagram



When wave-changing a two-point switch of the make-and-break type is used, so that the larger part of the coil is either shorted or brought into series with the smaller part of the coil

We usually call this type of switch an *on-off* switch, although more strictly it should be called a *two-point make-and-break switch*. Such a switch is used in parts of the set where we need to make or break a circuit.

For example, there is the filament supply of a battery-operated set, which needs to be brought into action when the set is wanted and cut out when the set is not wanted.

The complete circuit consists of the accumulator and the filaments of the valves. As these filaments are connected "in parallel"—one across the other, so to speak, we can understand the switch action by taking just one filament.

When the set is working we want the circuit from the accumulator to the filament to be completed and without a switch we could do this simply by joining up the accumulator to the terminals on the set marked L.T. Then when we wanted the set out of action we could simply disconnect one of the accumulator leads.

Switch for Convenience

All this, though quite simple, is obviously not very convenient, and can be done much better with a simple two-point switch. We insert this switch in one of the leads, usually the negative lead between the terminal on the set and the actual filament.

The switch, as the picture shows, is so designed that when the little knob is pushed in the two metal contacts going to the two switch terminals are isolated from one another. When the knob is pulled out, the metal part of the rod moved by this knob makes contact with both the metal contactors.

If, therefore, we connect one side of a broken circuit to one contactor and the other side of the broken circuit to the other contactor, we shall be able, by means of the switch knob, to make or break the circuit.

This is, in fact, just what we do with the filament circuit. We break it at the negative side and insert the two-point switch as shown by the diagram.

For Waveband Changing

A similar switching scheme is adopted when we want to change over from medium-wave tuning to the long waves.

The two-point switch is used not for making and breaking a circuit but for short-circuiting part of the coil. As the diagram shows, the switch is connected so that one contact is at the end of the coil and the other contact some way up the winding.

When the switch is closed, by pulling out the switch knob, the larger part of the tuning coil is shorted, and then the tuning condenser, although across the whole winding, is really connected to the smaller part of the coil, and as a result the medium waves are tuned.

When the switch is opened, by pushing in the switch knob, the shorting action is obviated, and the whole coil comes into action across the tuning condenser, so that the long waves are then tuned.

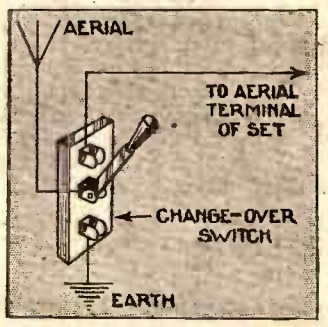
The Change-over Switch

We now come to the slightly more complicated type of switch. It is not difficult to understand this second type if you consider what the switch is doing. The switch in question is a change-over switch.

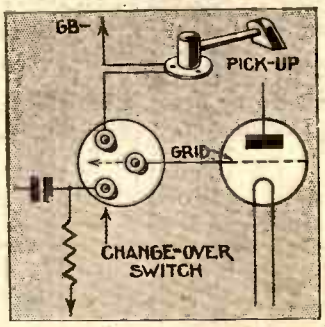
From the very name you gather the general idea is to use the switch to change over one part of the circuit from one function to another.

Let us take one of the very simplest applications of the change-over switch. This is a single-pole change-over switch, which means that there is only one point to be changed from one circuit to another.

As the diagram shows, the aerial lead can be connected to the centre pole of this switch.



One of the simplest applications of the single-pole change-over switch is shown above, where the aerial lead is switched over from the aerial terminal of the set to earth



For gramo-radio work a single-pole change-over type of switch is used, with the grid of the detector valve as the centre pole

Then one of the contacts can be connected to earth and the other taken to the aerial terminal of the set.

The aerial is then in the position of being readily switched or changed over from the earth, as when the set is not in use, to the aerial terminal of the set, when the set is wanted. The earth connection would also go to the earth terminal of the set.

(Continued on page Six)

PERCY W. HARRIS'S "BUILD AS YOU LEARN"

This week PERCY W. HARRIS gives you practical hints on changing over from a normal type of screen-grid valve to the variable-mu type, which, as he explains, provides a very smooth control of the volume output

Showing how the potentiometer is fitted to the panel for the control of the grid bias of the variable-mu valve

IN our last lesson the general principles of the screen-grid valve were briefly touched upon, and we saw by experiments with other types of volume control wherein the special merits of the variable-mu valve lay. This week our experiments will be almost entirely devoted to this valve, but before we commence actual work I would like to say a little more about the valve itself.

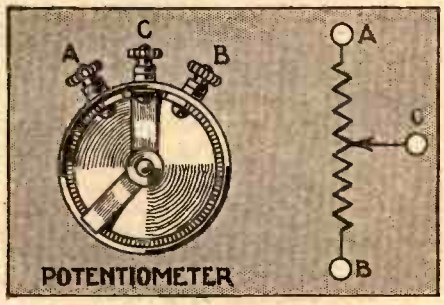
When a new device comes into the radio field there is nearly always a tendency to claim for it virtues which it does not possess. You should not run away with the idea that fitting a variable-mu valve to your set will immediately increase its efficiency and enable you to get more stations. *It will do nothing of the kind.*

When to Fit a Variable-mu

Its maximum amplification is no greater than that given by the ordinary screen-grid valve. In fact it is often slightly less. If you intend using your set all the time at the maximum high-frequency magnification without grid bias, then you will gain virtually nothing by fitting a variable-mu valve.

If, however, you desire to have a distortionless volume control and generally to avoid those troubles which come from an overloaded high-frequency valve, the variable-mu valve will give you distinct advantages.

In last week's supplement I explained that with about 9 volts for a single variable-mu valve, or about 15 to 18 for two of them, magnification can be cut down to a very small figure. In case this statement has set you wondering why a different amount of grid bias is used when you are using *two* variable-mu valves, I should explain that while the reduction of magnification brought about by the application of 9 volts of grid bias to the variable-mu valve is sufficient with only one high-frequency stage to bring your signals down to as weak a point as you will probably desire, there is still some magnification left, and if the remaining signal is further magnified by a second screen-grid valve, the reduction of overall magnification given by 9 volts will be insufficient.



A typical potentiometer construction, showing how the slider is arranged to move round the resistance strip. Note the three terminals, one for each end of the winding and the third for the slider

For this purpose it is customary to recommend 15 to 18 volts as the maximum grid bias when two stages of variable-mu valve magnification are used and, of course, there is no reason whatever why you should not use 18 volts on the single valve if you wish, as you can then reduce the volume down to zero.

The ordinary screen-grid valve is generally worked without any grid bias, but 1½ volts may sometimes be used with slight advantage and, indeed, some of the earlier designs using screen-grid valves incorporated such a battery.

In practice, however, it is rarely found that with ordinary S.G. valves the advantage gained is sufficient to outweigh the disadvantage of the additional cell, but if we *do* want to use it the battery can be inserted in the position shown in Fig. 2. You can compare this with Fig. 1, which shows normal connections without any grid bias.

Increasing the grid bias on the grid of a variable-mu valve decreases the magnification. We could, if we wanted, insert let us say a 9-volt grid-bias battery in the position of the single cell shown in Fig. 2 and change our magnification by altering the plug.

Smooth Control—How?

This would be a very clumsy and inconvenient way, and furthermore we should not be able to have that smooth continuous control which is so desirable. How can we obtain this?

The answer to this question is given in Fig. 3A (again drawn in the conventional manner), where we see a 9-volt grid-bias battery shunted by a 50,000-ohms potentiometer.

In case you are not acquainted with the principles of a potentiometer or potential divider (which is the better name) I may say that it consists of a high resistance shunted right across the battery so that a continuous current from the battery flows through this resistance.

What the "Arrow" Means

In our conventional drawing the resistance is shown as a zig-zag line with an arrow pointer above it, and we must assume that this arrow pointer can be moved backwards and forwards as we like.

We know from the fundamental laws of electricity that it takes a voltage to send the current through a resistance, and as the resistance in this case is across the whole battery, the voltage across the end of the resistance is whatever happens to be the voltage of the battery—in this case 9 volts.

The voltage across half the resistance will be only 4½ volts and across a quarter of it 2¼, so if we make our

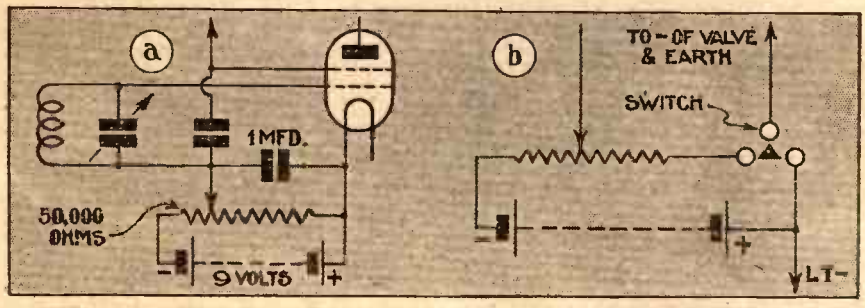


Fig. 3.—At A we show how the 50,000-ohm potentiometer is connected across the grid-bias battery to give the variable bias for the grid of the variable-mu. At B is shown how a three-point switch prevents the grid-bias battery current being wasted as explained on the next page

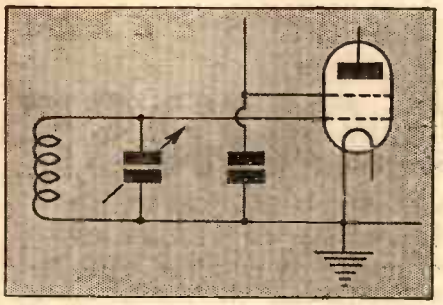


Fig. 1.—Normal connections for a screen-grid valve without any negative bias

slider to run smoothly from one end to the other, the voltage of the point on which it touches will depend on how far this point is from the end, so we get in this case a means of varying our voltage from zero (when the slider is over on the right-hand side) up to 9 volts, when the slider is fully to the left.

If you examine the diagram you will see the path from the grid of the screen-grid valve goes through the coil and from there through the slider and the resistance back to filament. As this path is also traversed by high-frequency currents which we do not wish to waste, it is inadvisable that these should go through the resistance, and so we insert a 1-microfarad condenser between one end of the slider and filament in the position shown.

The Condenser Acts As Barrier

This is a very easy path for high-frequency currents and has for them a negligible resistance and, therefore, the high-frequency currents scarcely go at all through the potentiometer. The condenser is, however, a complete barrier to a direct current and voltage, so that it neither short-circuits the battery nor interferes in any way with the application of grid bias to the grid of the valve.

We must arrange to place the potentiometer at some convenient point on the panel, and we can quite well place this where the wave-change switch is at present fitted, lowering the wave-change switch so as to balance up the on-and-off switch on the opposite side.

There is, however, one point which must not be overlooked; that is that the resistance of the potentiometer is constantly across the grid-bias battery and if left there without switching off will run it down. We might also consider whether we can avoid having a separate grid-bias battery, as we already have one in any case for the low-frequency valve.

Our difficulties can be easily overcome by substituting for the two-point switch now used for on-and-off a three-point switch to serve a double purpose. One side of this switch can be joined to low-tension negative (in place of the low-tension positive arrangement we have used up to the present) and to low-tension negative, of course, the positive of the grid-bias battery is already joined.

Of the other two points of the switch one can be joined to the filament of the valves and earth, while the other can be joined to the positive end of the potentiometer. This is clearly shown diagrammatically in Fig. 3B. From this you will notice that when the switch is open not only are the valve filaments disconnected but the potentiometer is disconnected from the grid-bias battery, while when the three points are closed everything is connected up as we want.

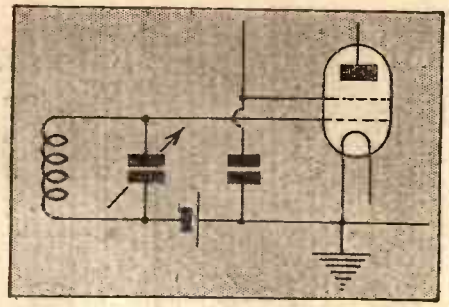


Fig. 2.—How the connections for a screen grid are modified when negative grid bias is inserted

Important Wiring Changes

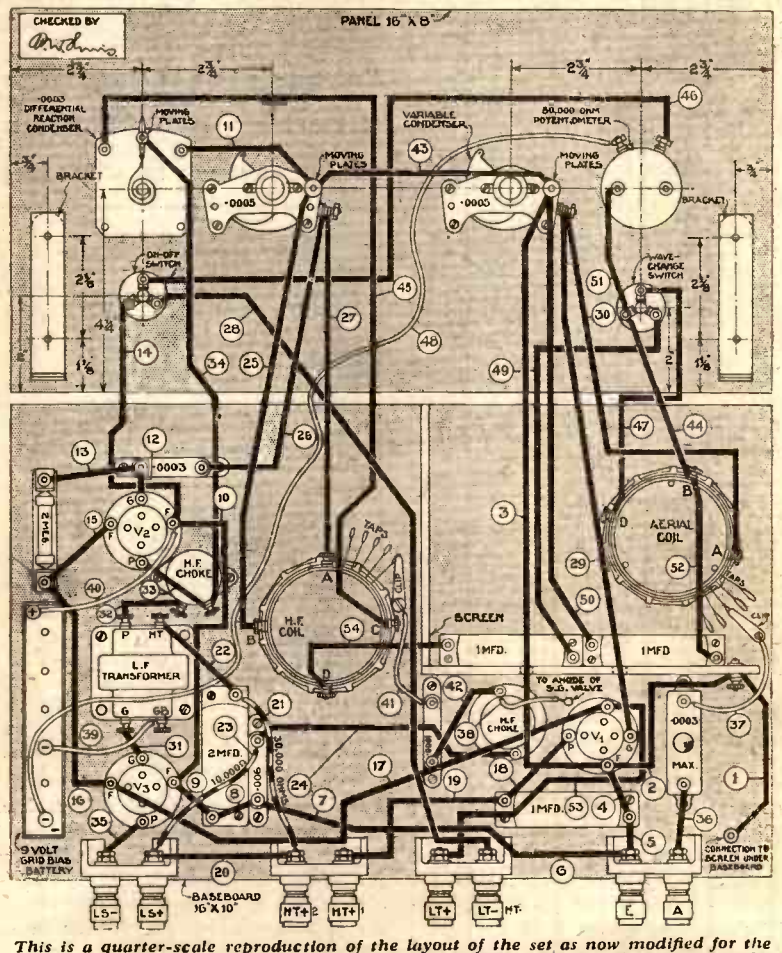
We must now make one or two small but important wiring changes. Up to the present the on-off switch has been in the positive lead, the negative low-tension terminal being joined straight to earth and filaments.

In order to use our new switching scheme we must disconnect the wire going from the low-tension negative terminal to filament and earth and also the lead going from low-tension positive to the switch and from the switch to the positive side of the valves.

Look at the new wiring chart and you will see that a new lead goes from low-tension negative to the switch and from the switch to the negative side of the valve filaments, which are also connected to earth. The positive low-tension terminal goes to the valves.

The potentiometer is connected to the switch as well, and the one grid-bias battery is used, the negative lead going to the full 9 volts negative.

"But why," you ask, "the new 1-microfarad condenser joined in the switch lead to the second coil, and why are the new connections not quite as in Fig. 3A?" I will tell you next week, but meanwhile try and puzzle it out for yourself. But let me warn you now. *Don't try joining up the set without the 1-microfarad condenser in the switch lead or there will be trouble!*



This is a quarter-scale reproduction of the layout of the set as now modified for the variable-mu type of screen-grid valve. Note the addition of the potentiometer, the three-point battery switch and the change over of the filament switch connections

When you tap a thin plate with your knuckle the plate will give out a characteristic ring because the whole plate will vibrate at what we call its resonant frequency. In the same way a diaphragm of iron or other material has a resonant frequency. The older types of loud-speaker are not perfect reproducers because they accentuate one frequency or band of frequencies and so cause distortion

ELEMENTARY WIRELESS COURSE FOR BEGINNERS

In this instalment of the complete course on wireless, specially prepared for beginners by J. H. REYNER and the "AMATEUR WIRELESS" STAFF, the underlying principles of loud-speaker construction are explained. The simple horn-type of speaker of the early days is compared with the later development of the reed-type cone. The merits of the very latest type—the moving-coil—are also carefully explained

Which is the best loud-speaker to buy?

That depends upon your personal taste and the extent of your purse. I will run over the different types of loud-speaker so that you can judge for yourself which is likely to suit you best.

There are all sorts of fancy types, aren't there?

Yes. The simplest form of loud-speaker is simply an enlarged telephone earpiece. You remember that in a telephone there is a flexible diaphragm of special iron which is placed just over an electro-magnet. The speech currents flow through the electro-magnet and attract the diaphragm so that it vibrates in keeping with the current and, therefore, produces air waves which we hear as sound.

The sound produced by an ordinary telephone is obviously limited. If we want to make more noise we have to move a larger volume of air or move it through a greater distance.

I don't quite follow that.

Sound waves are produced by expansion and contraction of the air. If the movement of the air is large then we have a loud sound, and it will be clear that we can either move a large volume of air or else increase the actual movement of the air during the expansion and contraction. Either or both of these effects will cause an increase in the sound.

How do we use this fact?

The earlier forms of loud-speaker obtained the effect by collecting the air round about and concentrating it upon the diaphragm by using a horn of some suitable material. This gave considerable amplification of the sound, and for a time this type of speaker was used practically entirely.

Why is it not used now?

Because it was found that the method was not effective for the low notes, which have a low vibration frequency. Here the concentrating action of the horn seems to break down, so that although the current may be supplied to the instrument, it does not produce the correct volume of sound.

Do you mean that it makes no noise at all?

Some sound of the required frequency *is* produced, but it is not amplified in the same way as the higher frequencies are, so that it is not heard in the true proportion. We say that the reproduction is lacking in bass.

How can the bass be improved?

One solution is to increase the length of the horn. It is found that the "cut-off" or the frequency below which the horn does not reproduce properly is dependent on the length, and if we increase the length we can reproduce the lower frequencies quite satisfactorily.

To be really effective the horn requires to be at least five or six feet long, and its design has to be carried out very carefully or the very rapid air vibrations due to the upper frequencies are liable to get lost in travelling up the horn, particularly as it is usual to curve the horn back on itself in order to economise space.

Surely such a loud-speaker is useless for broadcast reception?

Yes. Speakers of this kind are used for talkie equipment, but they are altogether too large for the ordinary home use, and other methods had to be adopted. The alternative is to increase the size of the diaphragm from a comparatively small diameter up to something approaching a foot or more.

Instead of making this diaphragm of iron we make it of special paper and couple it to the driving mechanism. This is similar to the telephone earpiece, but in place of the diaphragm it contains a small armature, i.e., a piece of soft iron free to move under the influence of the currents passed round the coils.

Giving more sound because of the larger diaphragm?

Yes. Moreover, we can also arrange to move the diaphragm more because the driving mechanism can be so constructed as to allow quite an appreciable vibration, whereas on the ordinary telephone earpiece the movement of the diaphragm is only a few thousandths of an inch. Therefore we allow movement of the operating mechanism to be as large as possible, particularly in the bass.

Why in the bass?

If we want to radiate the same energy in the low frequencies as we do in the upper frequencies we must increase the movement of the diaphragm in proportion. If a movement of one thousandth of an inch backwards and forwards at a frequency of 2,500 cycles per second produces a certain amount of energy, then we require a movement of ten thousandths of an inch—i.e., $\frac{1}{100}$ in.—to give the same energy at a frequency of 250.

Now 256 is the vibration rate corresponding to middle C on the piano, so that it is really still quite a high frequency, and if we want to get down to the lowest note on the piano, which is 26 vibrations per second, we require movement of one-tenth of an inch to give the same radiation as a movement of one-thousandth of an inch at 2,500 cycles.

Does that require special construction?

Yes, and various designs of loud-speaker unit have been evolved from time to time to obtain as free a movement as possible for the driving mechanism. The most successful form of movement, however, is that known as the "moving-coil."

NEXT WEEK:

WHAT QUALITY REALLY MEANS

In this informative instalment of our Complete Course in Wireless, J. H. Reyner and the "Amateur Wireless" Staff explain how the high and the low notes of the musical range have to be faithfully dealt with by the set to ensure good quality of reproduction.

How Your Loud-speaker Works

In this system the speech currents are not applied to an electro-magnet, but are passed round a coil fixed on to the end of the diaphragm. This coil is located in a small circular gap between two steel magnets, and it is found that a current through the coil in one direction tries to suck it into the magnet system while a current in the opposite direction tries to throw it out.

Consequently, if we have speech currents through the coil, both it and the diaphragm attached are kept in a state of continual vibration due to the oscillations of the current through the coil.

You will see that such a system is very free indeed, and can move a quarter of an inch or more without difficulty. The diaphragm itself is suspended at the edges with a flexible surround to allow this freedom of movement unhindered.

Is that the best system?

It is, but unfortunately this system is more expensive than the simpler mechanism. The prices are now much less than they used to be, and we may see still further reductions in the future. There is also a special form of the ordinary "moving-iron" mechanism in which a very large movement like this is obtained, and this is certainly easier to construct and has achieved considerable popularity. It is known as the "inductor" type.

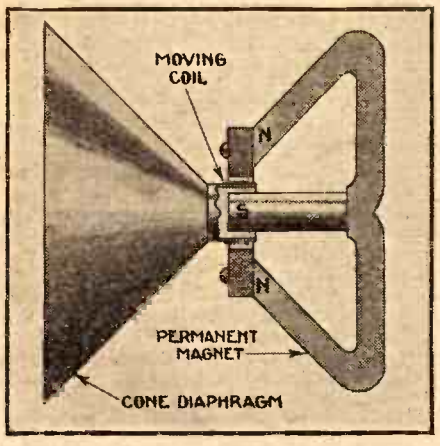
I cannot say more about this now, but we will take the opportunity some day to discuss the numerous types of speaker in greater detail. Just now I want to mention one or two other points concerning speakers in general. Firstly there is the question of resonance.

What do you mean by resonance?

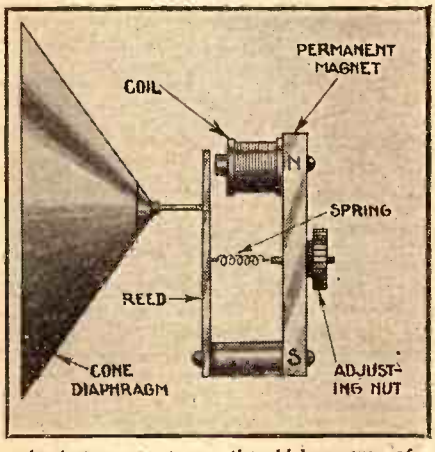
So far we have assumed that the movement of the diaphragm was directly proportional to the current passing through the speaker. There are always certain frequencies at which the diaphragm will vibrate more easily than at others.

For instance, if you hold up a thin plate and tap it with your knuckle it will give out a characteristic ring which is due to the whole plate vibrating at that particular frequency. In the same way a diaphragm has a natural resonance and various parts of the mechanism have their own resonances, so that there are several frequencies in the musical scale at which one part or other of the whole mechanism vibrates more easily.

At such points the vibration produced by a given strength of current is obviously much greater than it would otherwise be and, therefore, the sound produced is increased. This naturally introduces distortion into the reproduction. In a severe case there will be a screech or boom every time that particular note is played.



Here is the moving-coil, the latest type of loud-speaker, shown in the simplest possible diagramatic form. As explained in the article, the moving-coil provides the most perfect reproduction and is markedly superior to other types in the reproduction of the bass notes. The diaphragm is a cone as for the reed type, but to this cone is attached a small coil, which actually moves backwards and forwards as current is sent through it



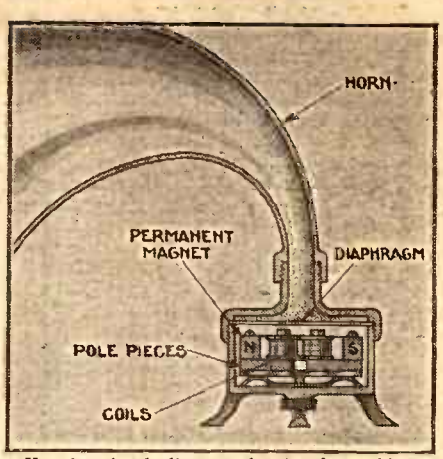
An improvement over the old horn type of loud-speaker is this reed-driven cone. The cone is the diaphragm and is sufficiently large to set enough air in motion to give loud-speaker results without the use of a horn. For simplicity we have shown the simplest reed arrangement, though there is now a greatly improved version of this principle known as the balanced-armature unit

Is this resonance effect difficult to overcome?

It requires care, but it can be checked. One method is to design the equipment so that the resonances occur at frequencies where they will not trouble us, i.e., very high or very low, while a second method is to provide buffers of rubber or some similar mechanism to prevent excessive vibration of any part of the mechanism.

I thought we wanted a large movement?

Only when the driving force is large. We have to design the *damping* so that it does not seriously impede the movement when the current through the coil is large, but prevents the mechanism from building up an oscillation of its own. It is a fairly difficult process requiring some skill, and the differences between individual speakers are largely dependent upon the success of this process.



Here is a simple diagram showing the working principle of the old horn-type of loud-speaker, now seldom used except for specialised work where a large concentration of sound is wanted. Here the mechanism causing the sound waves is nothing more than an enlarged telephone, as explained in the article

Finally I want to refer to the use of a baffle—a device to improve still further the radiation of the lower frequencies. Even with the mechanism we have just been considering it is found that the bass is not properly reproduced. Investigation showed that although the diaphragm was really moving through the proper distance to produce the necessary air wave, yet the effect on the ear was not sufficient.

It was found that this was due to interference between the two sides of the diaphragm. If the diaphragm moves outwards it pushes the air away from the front, leaving a partial vacuum at the back. This is immediately filled by the air displaced from the front. The air pressure never travels out into the room in the form of a sound wave, but simply oscillates backwards and forwards round the diaphragm.

Does that always happen?

Only at comparatively low frequencies and to check it we erect a large piece of wood which we call a *baffle* all round the diaphragm. This prevents the air displaced from the front of the diaphragm from moving round to the back until it has travelled out into the room. Consequently we hear the bass reproduction quite well. Such a baffle should be employed on any form of speaker using a large diaphragm.

Why hasn't my speaker a baffle like this?

It has to some extent, because it is mounted in a box and this acts in much the same way. You will notice that the back of your set is cut away, leaving large holes covered with gauze, so that you have practically an open back. Thus your cabinet acts in the same way as a baffle.

More "Wireless Jargon" Explained

BAND-PASS TUNING

WHEN talking of aerial tuning you are bound to come up against the expression "band-pass" because it is now a system that is accepted as one of the most satisfactory solutions to the selectivity problem, as it affects aerial tuning.

In brief, the expression is quite descriptive—which cannot be said of all the expressions in the wireless man's jargon! *Band-pass tuning means the passing through the circuit of one band of frequencies, to the total exclusion of adjacent stations' frequencies.*

WAVELENGTH AND FREQUENCY

YOU probably know that every station whose *wavelength* you see in a broadcasting list has a corresponding figure called the *frequency*.

What you may not fully appreciate is that in addition to this fundamental or carrier frequency each broadcast signal you receive on your set there are innumerable frequencies on each side of the carrier.

These are set up by the impression of the speech or music at the transmitting end on the carrier frequency. When you tune in a station it is most important that you should be able to tune in not only the carrier but also the associated frequencies, often referred to as the *side-bands*.

If you make the aerial tuning circuit so selective that it cuts out all trace of adjacent stations, you also tend to cut out some of these side-bands from the station you want.

That is with straightforward aerial tuning, comprising a single coil and a condenser. But with two coils and two condensers, arranged as a gang control you can pass through the whole of the side-bands and cut off very sharply on each side so that the adjacent stations are not heard.

In brief, then, band-pass tuning enables you to obtain very selective tuning without losing any of the musical content of the signal to which you are tuned.

OVERLOADING

THIS is a *very* common word in the wireless man's jargon. It can refer to any part of the set that is given too much work to do!

For example, the power valve of small battery sets is frequently overloaded, with the result that very distorted reproduction is obtained.

Loud-speakers can be overloaded. The result is just as distressing as with an overloaded valve, as the speaker then rattles, especially if it is of the moving-iron type.

A.C. AND D.C.

WHEN speaking of mains-operated sets, wireless men are often heard comparing the merits of "A.C." and "D.C." mains supplies. *A.C. stands for alternating current.* This is the type of supply that, under the new electricity scheme known as "The Grid," is slowly spreading throughout the country.

Meanwhile, there are many districts that are on *D.C., which stands for direct current.*

There is a fundamental difference between the two supplies. Both can be used for such things as lighting bulbs and domestic electric appliances without the user noticing very much difference, but when we come to try to use the electric supply for running the wireless set we at once appreciate the difference.

Whereas the A.C. can be stepped up and down in voltage to suit our requirements, simply by the insertion of a transformer between the mains and our output, the D.C. must be used at the mains voltage.

On the other hand A.C., even when stepped up or down in voltage, is unsuitable for the high-tension supply, and has to be *rectified*, which quite simply means that it has to be made into a one-way current. This is the type of current we get in the first place from D.C.

Even then we are not finished. Both A.C. and D.C. have this in common—they both need "smoothing" before the set can be run from them.

METAL CHASSIS

MOST modern sets out of the factory employ what is termed a metal chassis. This expression has been "lifted," it would seem, from the motor-car industry! It has not quite the same meaning, though.

The chassis of a car is usually a *running model* stripped of the bodywork and accessories. The wireless set chassis consists of everything except the loud-speaker. It is not, strictly speaking, a working model.

The metal consists, as a rule, of aluminium or cadmium-plated steel. This saves a great deal of wiring, as all the earthed parts are connected to the nearest point on the metal, instead of being connected to each other by means of perhaps lengthy runs of wire.

The need for metal in the modern chassis is brought about by the great sensitivity of valves, which make it imperative that all the circuits should be well screened.

The metal of the chassis takes part in this screening, which is augmented by metal cans round the coils, and often by metal sections round the separate parts of the gang tuning condenser.

LOUD-SPEAKER CUT-OFF

CUT-OFF in loud-speakers is very commonly discussed by wireless men. It refers to the point in the frequency scale above or below which the speaker will not materially respond.

High-note cut-off, for example, occurs with most speakers in the region of 5,000 cycles. This is not because the very high frequencies above that point are worthless but because if we make a speaker respond to anything higher *we get considerable interference from background noises.*

Avoiding Needle Scratch

Similarly, with gramophone reproduction, if we make the speaker or amplifier respond much above 4,500 cycles we get an annoying amount of needle scratch, which is itself of a frequency around this point.

At the other end of the scale we often refer to *low-note cut-off*. Few speakers, even so-called good moving-coils, respond fully below about 75 cycles.

For reasons that cannot be discussed here it costs a great deal to increase the frequency response below this point. Even if the speaker would respond to frequencies much lower than 100 cycles it would need an expensive amplifier to do it justice.

Fortunately, the ear is very accommodating, and we soon grow accustomed to the "cut-offs" imposed on us by conditions—to a loss of the very high notes and the very low notes. The main aim of moderate-priced sets is to *avoid undue accentuation* of any frequency in the range that is covered—not greatly to extend the range itself.

NEXT WEEK'S SPECIAL FEATURES

KEEPING YOUR SET UP TO CONCERT PITCH!

'IN SERIES' AND 'IN PARALLEL'

These articles and our usual supplement features will be found in a special "WIRELESS MADE EASY" SECTION

THE A.B.C. OF SWITCHING

(Continued from page One)

Inside the set we also make use of a change-over switch, as in gramo-radio working. Here the centre point is the grid of the detector valve, which we desire to switch from the grid condenser and leak, as used for the radio function, to one side of the pick-up, as used for the gramophone function.

Single-pole Change-over

A three-point switch, or rather a single-pole change-over switch, of a different pattern but of the same basic principle of construction as for the aerial switch, is used as shown by the diagram.

When the centre pole is moved to one side it engages with a metal contact to which is connected the one side of the pick-up. The grid is then disconnected from the grid condenser and connected to the pick-up, this grid getting negative bias through the pick-up winding.

When the switch is moved over to the other side it engages with a contact that is connected to the one side of the grid condenser and leak. The pick-up is then out of circuit and the radio function of the set comes into action.

Beginners are often puzzled in switching because they fail to take the job piecemeal. The first thing to ask yourself when inserting a switch or trying to understand the action of an existing switch is: what does the switch actually do?

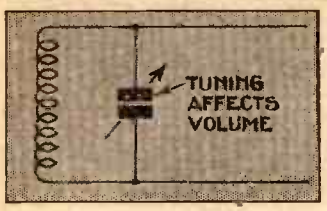
A gramo-radio switch changes the grid connection from the grid condenser to the pick-up. The grid is therefore the common point and is therefore the connection that goes to the centre pole of the switch.

Similarly, the aerial in the previous example is the common point, its alternative connections being the set and earth.

There are, of course, other variations of switching in wireless sets, but we have explained the types you are most likely to come across.

How The Volume Is Varied

WHEN you turn a knob to alter the volume of sound coming from the loud-speaker do you realise exactly what is happening inside the set? Probably



When you "de-tune," the volume from the station previously in tune will be reduced. This is now considered a bad way of altering volume

not, if you are a beginner, but we can explain to you quite simply the chief methods of controlling volume.

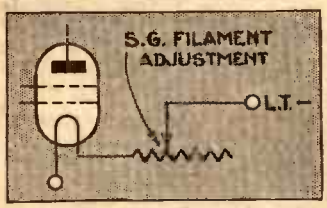
No doubt the easiest way to alter the volume is to alter the tuning knob. You know that the maximum signal strength from any given station is obtained only when your set is tuned exactly to that station's wavelength. It is not difficult to understand that as you go farther and farther away from the correct tuning point the signal will get weaker and weaker.

Why De-tuning Is Bad

We call this process of going away from the tuning point "de-tuning." It is a practice that cannot be too strongly condemned under present conditions.

The difficulty to-day is that when you de-tune from the wanted station, in order to decrease the volume, you almost certainly begin to run into another station, that is, into the station on the adjacent wavelength to the wanted station.

The price you then pay for reduced volume is increased interference, which is not very satisfactory, is it? For reasons we need not here explain, the de-tuning will spoil the quality of the reproduction. So on many counts de-tuning as a



One of the easiest ways of controlling the volume of a screen-grid valve is to alter the filament supply with a rheostat in the negative filament lead

means of altering volume is bad.

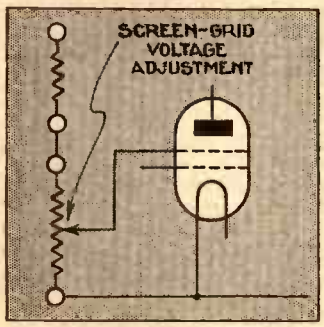
Fortunately, there are many good ways of cutting down the volume of a strong signal, or of increasing the volume of a weak signal.

The first way that occurs to us is the use of some form of aerial-coupling device. This enables the amount of energy arriving at the aerial to be controlled in its passage to the set.

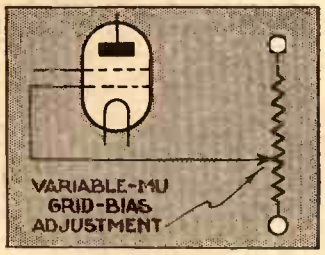
A pre-set type of condenser, which is a variable condenser having fairly narrow limits of capacity variation, will serve very well as an input control.

The smaller the capacity the greater will be the impedance or resistance to wireless waves, and so the less will be the energy actually reaching the set.

This is not the ideal form of volume control, because for one thing it is not wide enough in its range. In these days we are dealing with signals of very



One of the best ways of altering the volume is to alter the amplification of the screen-grid valve. Here it is done by altering the voltage on the screening grid



With a variable-mu type of valve the amplification of the valve is controlled by altering the grid bias. This method is now considered to be the best possible volume control

widely differing signal strengths —a B.B.C. regional and a distant foreigner—and we must, therefore, make arrangements to deal faithfully with all these different strengths.

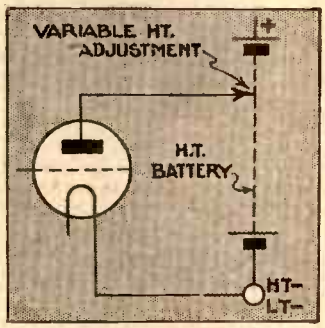
The pre-set is useful in cutting down very strong signals to moderate volume, but suffers from the disadvantage, judged simply as a volume control, that it also affects other characteristics of the set, such as the tuning and the selectivity and the reaction.

For this and other reasons the modern tendency is to alter the *amplifying* properties of the set. We have, for example, the very simple method of reaction, which enables a weak signal to be built up in strength.

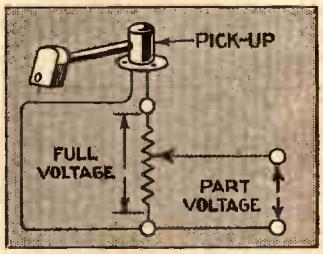
This method is not a true volume control because, although it certainly is very effective in increasing the strength of weak signals, it is useless in cutting down the strength of stations that are initially too strong.

The next method is to vary the amplification of a screen-grid valve. This used to be done by altering the filament emission by inserting a variable resistance in the negative filament lead.

With valves of robust filaments this method worked quite well, though with the latest low consumption types there is the disadvantage of a "time-lag" between the movement of the resistance knob and the change in the volume produced.



In very simple sets the volume can, to some extent, be controlled by altering the high-tension positive tappings. The best tapping to alter is the one going to the detector



The output volume from a pick-up can easily and effectively be varied with a potentiometer by altering the amount of pick-up voltage handed on to the grid of the first valve

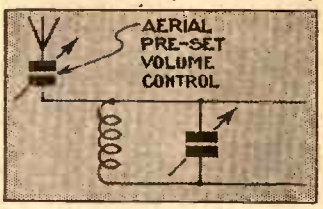
A much better method is to vary the screen volts of the screen-grid valve.

This is done by means of a potentiometer connected across the high-tension supply. As the slider, which is connected to the screen grid of the valve, is moved towards the negative end the voltage on the grid is decreased and so, therefore, is the amplification of the valve.

For some time this method has held sway, but now, owing to the introduction of the variable-mu type of screen-grid valve, it looks like giving way to a rival method.

This new method consists in varying the grid bias of the valve, again by means of a potentiometer, but this time it is connected across a grid-bias battery. As the bias is made more negative the amplification of the valve is decreased.

The advantage of this method of decreasing the amplification is that when the volume is at a low level, corresponding to the valve at small amplifying point, the quality of the reproduction is not affected.



A condenser in the aerial lead will, to a certain extent, control the volume from the loud-speaker, as it alters the signal energy impressed on the grid of the first valve

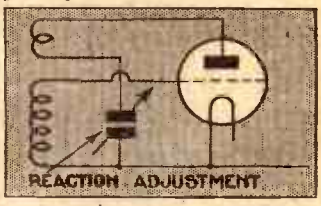
It is applicable only to sets with the variable-mu type of valve and sets with the old type of screen grid have still to vary the screen volts and put up with some mutilation of the quality when the volume is very greatly reduced on a strong signal.

Altering The High-tension

In very simple sets the volume is sometimes controlled by altering the voltage on the anode of the valve. This means reducing the voltage tapping on the high-tension battery and results in reduced amplification.

Unfortunately this method usually means loss of quality, because the detector and power valves are then very easily overloaded. The method is not absolutely condemned and may be of use in simple sets provided with separate high-tension tappings, for then the detector can be reduced to a low value and the power valve left at the maximum.

In sets used for both radio and gramophone reproduction the volume control for the "gramo" side takes the form of a potentiometer connected across the pick-up.



In many sets the only way the volume can be varied is by altering the reaction control. This is satisfactory for increasing weak signals, but not for decreasing strong signals

In this method the voltage output of the pick-up is stepped down between one end of the winding and the slider, which latter goes to the grid of the amplifying valve.

It's Easy to Build a Wireless Set!

As a beginner who knows very little about wireless, can I honestly tackle the construction of a set?

Of course you can! The range of AMATEUR WIRELESS blueprints, specially produced for constructors, covers every type of set. You are sure to find one among them that will not only suit your reception requirements but that will be within your capabilities to build.

Why is the blueprint so helpful?

For *many* reasons! The blueprint is a *full-size* diagram or layout, as we call it, of the complete set. In other words, when you buy an AMATEUR WIRELESS blueprint you buy a working drawing. All you have to do is the work!

Ah, that's what worries me, you know. The trouble is I am not really what you would call a "handyman." I know nothing about handling tools.

That does not matter in the least! If you can hang up a picture on the wall you can build one of our sets—the number of tools is very unpretentious.

What tools do you actually need?

Well, you must have some sort of drill, unless you buy a ready-drilled panel, and then even that tool is unnecessary.

Next you must have a pair of pliers and a screw-driver. These are the chief tools and even you will admit that there is nothing very difficult about handling them.

Agreed! Now supposing I admit that I could handle the tools needed to build one of your sets, what is the exact procedure? I mean, how does one start to materialise your set from the component parts you specify?

That is where the blueprint comes in! As a beginner you simply *must* have this constructional guide. *We insist on that!*

Let us see where you make a start. Take a look at the print, will you? You see that the baseboard and panel are laid out flat, though, of course, in reality the artist who made the original of the print had before him a set with the panel at right angles to the baseboard.

You are shown the plan view of the baseboard and a back view of the panel, laid out in the same plane.

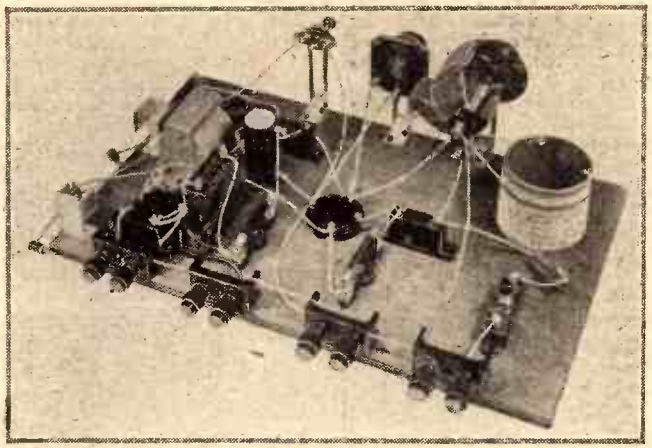
It seems a bit complicated to me.

That is because you are looking at a picture of the completed set. The steps in the construction are actually very simple.

You start by taking note of the positions on the baseboard of the components. If you are using alternative parts you fit them as closely to the original components' positions as possible.

Then you mount the panel components on the panel and then you can fit the panel to the baseboard.

As a beginner, therefore, you would be well advised to follow the specified list of parts exactly. This will certainly make your task very much simpler.



This is a view of the simple three-valver described by Percy W. Harris in the "Build As You Learn" feature of the supplement. It consists of a detector and two low-frequency-amplifying valves, with reaction applied to the detector. It is a very easy set to make

I think I could do all that if I took plenty of time. But what really worries me is the wiring—does the blueprint help me there?

We should say it does! In fact, to many of our "old-hand" readers the blueprint is the infallible guide to the wiring up of the set.

Your job of wiring is very greatly simplified by the method we adopt of numbering each of the connecting leads. *All you have to do is to follow out the sequence until the last number is reached.*

If you cross out each wire marked on the blueprint as you actually make it in the set there is no chance of missing any wires, even if you leave the job and come back to it.

I see. It seems a fine idea to me! What about the wiring process itself—is that easy?

Very! We usually use bare tinned-copper wire, stretched before being cut into lengths, and we cover this with insulated sleeving.

What *you* do is to measure off the length of sleeving representing the distance between the two terminal connections you are joining together. Then you cut off a piece of the wire an inch or so longer than this length of sleeving to allow for the looping round the terminals.

You have certainly convinced me that making a set is quite an easy job. Which set would you advise me to start with?

You could hardly do better than to build up one of the "Build as You Learn" sets, as described week by week in this supplement by Percy W. Harris.

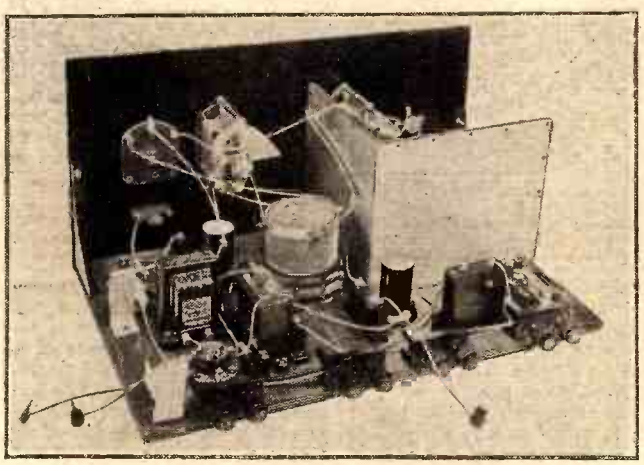
There are now two blueprints available. One is AW366, a simple three-valver with detector and two low-frequency stages. The other is AW372, the latest type of screen-grid three-valver.

Either would serve admirably as a start for your constructional adventures, as both sets are thoroughly reliable and are backed by a fund of information as given in the back issues of this supplement, which are still available.

If you live in or near London, or are coming up to Town soon, you might drop in to the Selfridge store in Oxford Street. On the fourth floor, among other interesting wireless exhibits, you can see these sets for yourself. This show closes on January 21, so make the most of this unique chance to see some "A.W." sets "in the flesh."

Later on, when you have become thoroughly used to the idea of building wireless sets, you will find great interest in following the AMATEUR WIRELESS designs as they come out week by week.

There are so many variations of sets that once you have caught the spirit of the home constructor, which is to improve and adapt the receiving end to embody all the latest developments, there is literally no end to the possibilities of this fascinating hobby.



Here is the latest "Build As Your Learn" set, consisting of an up-to-date three-valve circuit, with a screen-grid high-frequency valve, detector, and transformer-coupled low-frequency valve. Although more advanced in design than the simple three-valver shown at the top of the page, it is quite simple to build

Remember that the blueprint is full-size and therefore indicates the *exact* positions of the baseboard and panel components.

"A.W." Blueprints Make Set Building Easy!

Why not change YOUR SPEAKER?

—and change to 99 PM!

Like most wireless enthusiasts you probably make improvements on your receiver from time to time—little additions and alterations to bring it up to date, to make it more selective.

But don't forget that whatever you do, the ultimate pleasure you receive from your set depends on the loud-speaker, and if your speaker is anything less than perfect you will never get first class results. Your speaker *MUST* be up-to-date.

If you scrap your present speaker and get a Blue Spot 99 P.M., you can be *sure* of perfect results, because you will have a speaker that is the last word in moving-coil performance. The scientific precision of its design and construction ensure that every note in the musical scale is given full value. Intricate passages of music are crystal clear; voices, both singing and speaking are absolutely natural with every word distinct. Ask your dealer for a demonstration. Write for Catalogue No. A.W.62.S.

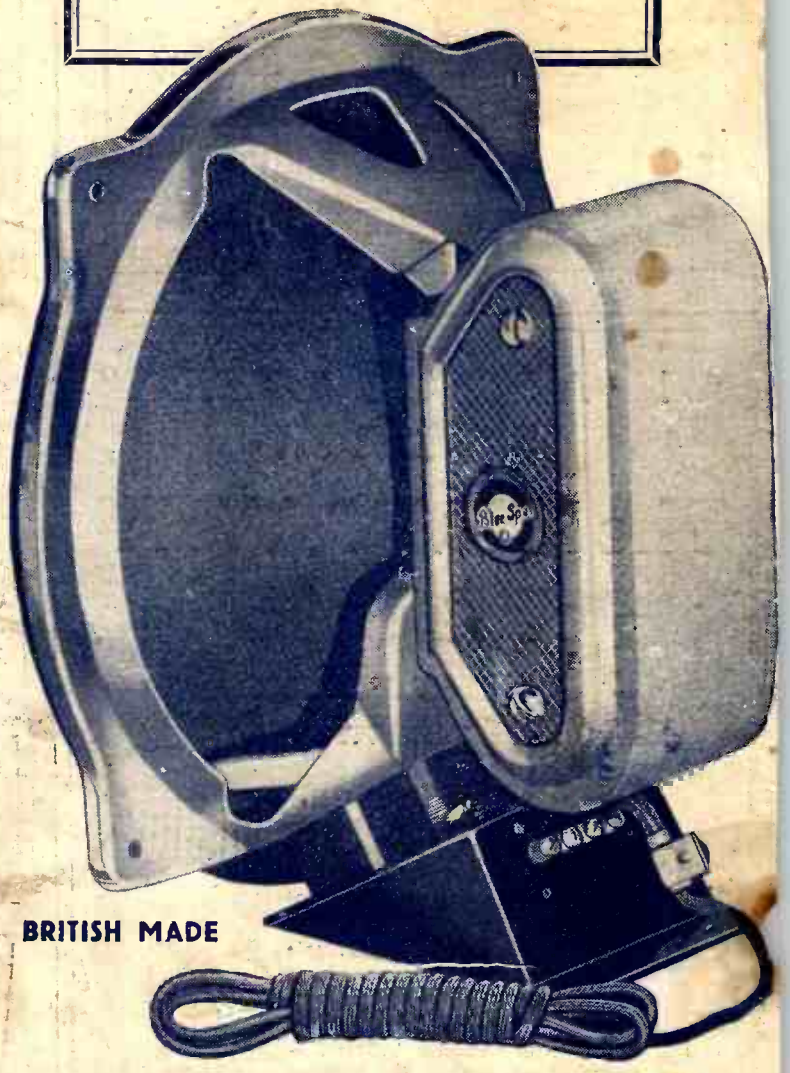
99 PM PRICE 59/6

32 P.M. This cabinet de luxe makes a delightful home for a speaker as good as 99 P.M. It is beautifully constructed from fine walnut. **Price 87/6**

WHAT VALUE for 31/6!

You cannot fail to be astonished that a complete cabinet speaker of the quality embodied in Blue Spot 31K can be sold for so low a price. Yet this wonder has been achieved, and in 31K you have a speaker that will give unending pleasure because of its pure clear tone and freedom from rattle or distortion. The unit employed is the world famous 66K. The cabinet is of fine quality oak, dimensioned to suit the needs of the unit and to ensure perfect results at all times. Price complete 31/6.
66K unit alone, Price 15/-.
66KC unit 66K mounted on suitable chassis 19/9.

31K



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