GETTING THE BEST FROM A SCREEN-GRID SET (SEE PAGE 660)

MAINS SNAGS—AND HOW TO AVOID THEM

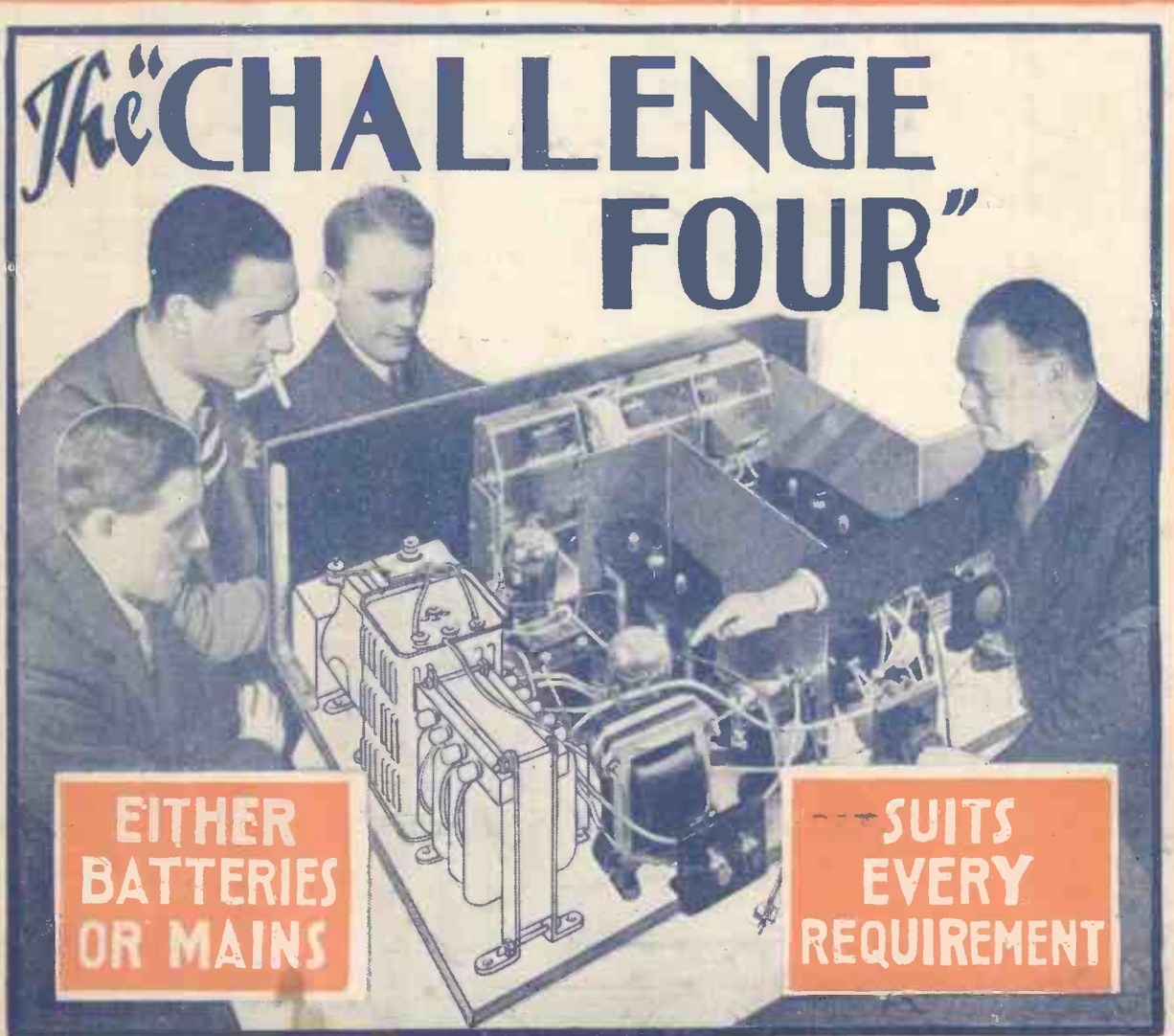
Amateur Wireless

and Radiovision

Every Thursday 3d.

Vol. XVII. No. 438 Saturday, November 1, 1930

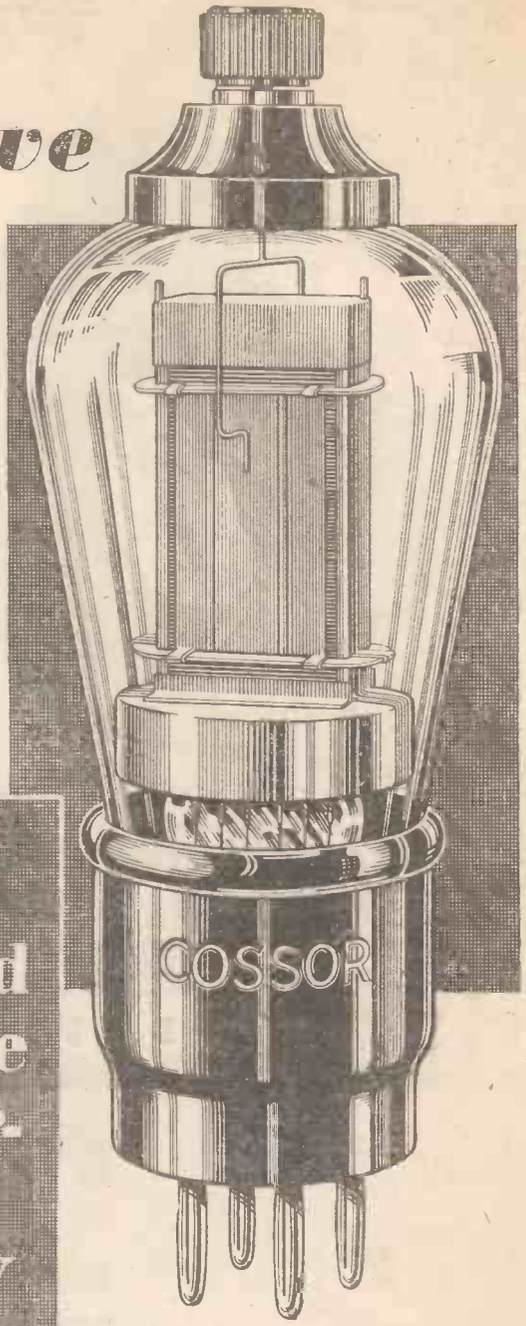
The "CHALLENGE FOUR"



Registered at the G.P.O. as a Newspaper

You'll get highest *effective* amplification *with this new Valve*

Greater *effective* amplification is definitely ensured by the New Cossor Screened Grid Valve. This is due to its minute inter-electrode capacity which has been reduced to the order of ·001 micro microfarads — lower than that of any other Screened Grid Valve on the market. Because of this and because grid current has been eliminated the use of this new Cossor Valve will considerably increase the efficiency of your Receiver.



The Screened Grid valve with the lowest inter-electrode capacity

Cossor 215 S.G. 2 volts, ·15 amp. Impedance 300,000 Amplification Factor 330. Mutual Conductance 1·1 m.a./v. Normal working Anode Volts 120. Positive Voltage on Screen 60-80 Price . . . **20/-**

Write for fully descriptive folder No. L35 A.W. on "How to increase the range of your Receiver."

THE NEW

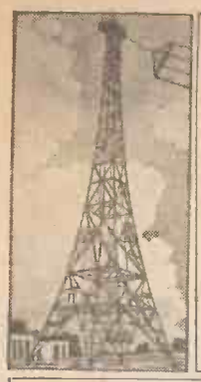
COSSOR 215 S.G.

GREATEST *EFFECTIVE* STAGE GAIN

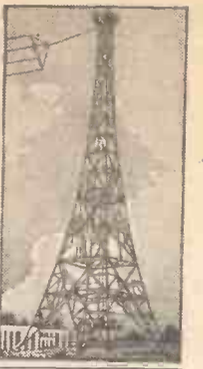
A. C. Cossor Ltd., Highbury Grove, London, N.5.

♡ 6446

No. 433. Vol. XVII. NOVEMBER 1, 1930



Amateur Wireless and Radiovision



EDITOR: BERNARD E. JONES.
TECHNICAL EDITOR: J.H. REYNER, B.Sc., A.M.I.E.E.
THE LEADING RADIO WEEKLY FOR THE CONSTRUCTOR, LISTENER & EXPERIMENTER.
RESEARCH CONSULTANT: W. JAMES.
ASSISTANT EDITOR: H. CORBISHLEY.

NEWS · & · GOSSIP · OF THE · WEEK

MENIN GATE RELAY

ON November the Eleventh the Last Post and Reveille will be relayed by the B.B.C. "This broadcast has been made possible by the co-operation of the Belgian broadcasting authorities" we learn from Savoy Hill. "The bugle calls will be transmitted by land-line to the cable station at Lapanne, whence it will be relayed by submarine cable to England."

AIR TO SEA—VIA LAND

A "STUNT" short-wave communication was established recently between an aeroplane and the S.S. *Majestic*. The message was picked up by Buenos Aires and re-transmitted to Madrid. From Madrid it was cabled to Rugby and there relayed to the *Majestic*. Will someone claim this as a record, please?

FOR STATISTICS FIENDS

THOSE with a zest for unusual statistics will be interested in the following details of the "total transmitting power" of the various European countries. All the German Stations together consume a power of 535 kilowatts. England comes next with 470 kilowatts and Russia, Sweden and Czechoslovakia follow with 222, 120 and 107 kilowatts respectively. France consumes only 64 kilowatts. As 746 watts equal 1 horse-power, the German stations together consume 717 horse-power of electricity!

RADIO CHARITY

LISTENERS should tune in to Midland Regional on November 6, to hear the fun at the Midland Radio Circle Hospital Dance which is being held at Tony's Ballroom. Jack Kerr and his band will supply the music. Most of the staff of the Birmingham Station will be present together with many radio artistes, who will be familiar to listeners. Already about £850 has been raised towards another "Wireless" Cot. Each cot costs £1,000 and before the end of the year, it is hoped the sum will have been obtained.

BRITISH STATIONS HETERODYNED

COMPLAINTS have been received of Daventry 5XX, the National 261-metre station, and the Regional 356-metre station, are all suffering from heterodyne interference from foreign stations. This trouble always crops up when, as the long evenings arrive, the strength of foreign stations increases. We understand that Tatsfield and Brussels are both on the track of the wayward stations. Angora is thought to have caused the interference on the Daventry wavelength.

Television personalities in Berlin. In the centre is Dr. Nipkow, the inventor of the spiral-hole disc system which forms the basis of the Baird Television system, and many others. On the left is Dr. P. Goerz, and on the right is Mr. Sydney Moseley, an official of the Baird Television Co., and a popular contributor to "A.W."

PRINCIPAL CONTENTS

A "BRAIN CENTRE"

EITHER the B.B.C. has been indulging in a little publicity for itself, or else a daily pressman — in lieu of something better to write about—has gone crazy about the new Broadcasting House in process of construction. Last week a national "daily" devoted two columns to an article which started: "Will the new £500,000 broadcasting house that is in course of construction at Portland-place prove to be the greatest brain centre of the modern world? Will it become the most potent educational factor since Caxton first introduced his printing press into England?"

A TIRELESS LARYNX!

LATER on the inspired writer says: "Here will be the new tireless larynx of London, talking all day, and perhaps all night, to listening millions. Here will be a tower that is always deaf, but never dumb. It will be the modern counterpart to the Tower of Babel, ready to speak every tongue. . . .!" It sounds too good to be true!

"CANNED" MUSIC

THE programme people at Savoy Hill have gone the whole hog in adopting the suggestion that complete programmes should be given with gramophone records.

NEXT WEEK: A WORTHY SUCCESSOR to THE "CHALLENGE FOUR"—THE "CHALLENGE THREE"

NEWS & GOSSIP OF THE WEEK —*Continued*

Mechanical vaudeville programmes are to be broadcast on November 3 and 8, the complete performances—artistes and incidental music—consisting of gramophone records, all the announcements being made by the same means. The first programme will include eminent American and Continental artistes, such as Maurice Chevalier, Frank Crummitt, Tito Schippa, Jack Smith, Segovia, Sacha Guitry, and Yvonne Printemps. The second programme will be devoted to British artistes, Sir Harry Lauder, Gracie Fields, Gertrude Lawrence, Henry Ainley, Sidney Howard, and others.

FOR THE CRUSADERS!

WHEN Lord Beaverbrook first suggested broadcasting a talk on Empire trade, the B.B.C. thought the subject so controversial that the leading political parties were approached, with the idea of presenting a comprehensive variety of views. But so far the parties have not shown any anxiety to express their views on the tariff question before the microphone. Patience at Savoy Hill is proverbial, but the programme department cannot wait for ever, so on November 26 Lord Beaverbrook will give listeners his long-awaited talk. Parties will be given a chance to reply when they have heard what Lord Beaverbrook has to say!

MOORSIDE EDGE AGAIN

THE Northern Regional will, according to latest B.B.C. statements, be testing at the end of the year. By March, 1931, the engineers hope to have *both* wavelengths in operation. It is fairly certain that all the northern relays will then be closed down, with the exception of Hull, Liverpool and Newcastle. We hear that they are assembling the Diesel oil engines and that one transmitter has already been delivered. They are now wiring it up—without the help of an "A.W." blueprint! The masts are within 10 or 20 ft. of the top. There are three of them, each 500 ft. high, carrying the two regional aerials.

SCOTLAND STILL WAITING

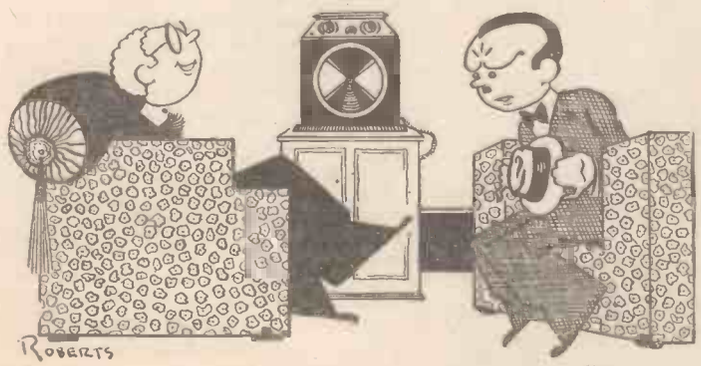
WHILE cheering news of rapid progress at the Northern Regional centre comes to hand every week, nothing seems to be moving with regard to the Scottish Regional location. The B.B.C.'s contractors are prepared to start work the moment the final documents are sealed, signed, and delivered. It is fairly obvious that Falkirk is to be the location. In the West we hear that the B.B.C. engineers have departed from the Quantocks for a region nearer the coast.

CONDENSER "MIKES"

FOR talks and big orchestral programmes the B.B.C. is using condenser microphones quite extensively. We hear the engineers are engaged on tests of all kinds of condenser microphones, which are extensively used in America. An engineer pointed out that this type of microphone is useless in outside broadcasting work. The reason given is that the main amplifier has to be connected as near as possible to the actual microphone, inside which is a small resistance-capacity-coupled amplifier. "Condenser microphones may give very fine quality and freedom from background hissing, but they are very delicate in adjustment and they need attention all the time," says an engineer.

A new invention? Baron von Ardenne, the well-known German scientist, is now at work on an invention which will have somewhat the same effect as the Stenode Radiostat, and will enable more stations to be crowded into a small wavelength channel

"My new set's tone,
No doubt you've heard,
Is like the trill
Of a carefree bird."



His neighbour muttered
With a scowl,
"The bird that you mean
Is an 'owl!"

THOSE CHILDREN'S HOURS

IN answer to those who would scrap the Children's Hour feature in B.B.C. programmes, Savoy Hill has issued some interesting figures relating to membership of the various radio circles organised at B.B.C. centres. London, for example, has a radio circle membership of 36,735, while the Northern area has 8,449. In the Midlands the circle embraces 7,115 members; in the West, 2,518; and in Scotland, 2,538. In connection with Children's Hours we are interested in the start of a series of talks entitled "Here and There" by Commander Stephen King-Hall, rather on the lines of Vernon Bartlett's talks on "The Way of the World."

DIVERSIONS ONCE MORE

FULL of ingenuity after an interval of some months, the "O.B." department of the B.B.C. is again preparing a series of Diversions. The first of the new Diversions will be given on October 31. Up to the time of writing nobody knows what the Diversion will consist of. Much depends upon where the wandering microphone decides to rest for a while.

"THE WRECKER" CANCELLED

IN place of "The Wrecker," by Robert Louis Stevenson, which was to have been broadcast by the B.B.C. on November 25 and November 27, we shall hear "Dr. Jekyll and Mr. Hyde." This novel has already been turned into a play, and a film has been made of it. It will be interesting to see how the radio version compares with them.

A YPRES ECHO

AS already announced, the Ypres bugles will sound the Last Post and the Reveille through B.B.C. stations on November 11. It is rather curious to relate that the Belgian buglers did not know the Reveille call, so four printed copies of all British bugle calls have now been sent to them. These buglers nightly sound the Last Post outside the Menin Gate, from which the B.B.C.'s broadcast will be made.

INCREASE YOUR RANGE AND SELECTIVITY BY ADDING THE OHMIC-COUPLED "DX" UNIT

AT this time of year many people get dissatisfied with their reception. No doubt you saw the latest gadgets at Olympia and are wondering whether or not you will rebuild your receiver, the results from which you realise are not so good as can be obtained with 1931 equipment, and perhaps on the score of £ s. d. you have already decided that the old set must do for another season. Well, if that is the case, here is a cheap way out of the difficulty.

The DX Unit coupled to a receiver

Why not add to your existing set a simple unit embodying a screen-grid H.F. valve? With this, as you know, you can improve the reaching-out properties of your existing set, and at the same time you can sharpen up tuning. A screen-grid valve can be added to most sets, even to those already having one high-frequency stage, but in this, of course, the need for the addition should not be so apparent.

The unit described and illustrated here will make its biggest appeal to users of two- and three-valvers, which have not a high-frequency stage and which, therefore, in most cases will be suffering from lack of range and flatness of tuning.

The AMATEUR WIRELESS Technical Staff has designed this unit so that it is quite stable and can be connected up to an existing set just as easily as you would connect up an additional low-frequency stage. In fact the addition of this unit is easier, because an extra low-frequency stage may need more high tension than can be spared, whereas this unit will not increase the high-tension consumption by an appreciable amount.

The unit is efficiently screened and you will not find that it is tricky to adjust. It is much better to add a complete unit than it is partly to re-wire a set, because there is so much in lay-out and design that can cause bad results if the parts are not properly arranged. It must not be supposed that the addition of a screen-grid stage automatically sharpens up the tuning.

As a general rule, the greater magnification given by a screen-grid valve results in somewhat flatter tuning, because so many more stations can be brought in that greater jamming is inevitable. In this unit the new Ohmic-coupling principle developed by our Technical Editor has been used because this gives extraordinarily sharp band-pass tuning and at the same time enables the full DX results to be obtained from the screen-grid valve without cutting down its magnification.

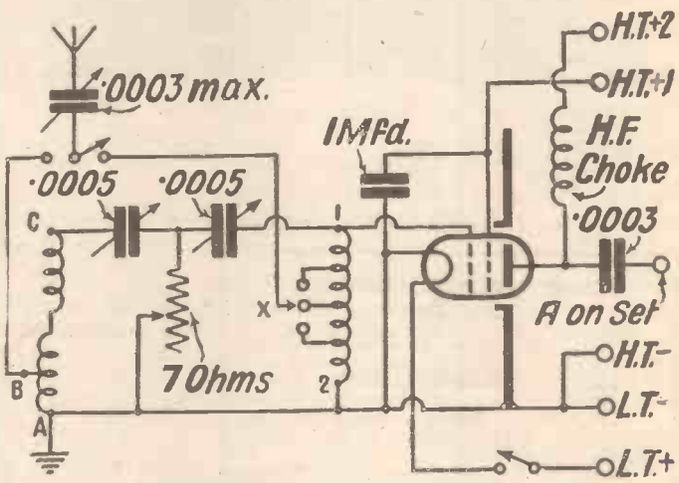
A rear view of the DX Unit

A little deviation from the original Ohmic-coupling layout is made in this unit, for ganged condensers are not employed.

The general arrangement is most readily seen from the theoretical circuit diagram. You will see that provision has been made for working both on the medium and long wavelengths although, of course, the Ohmic-coupling band-pass effect takes place only on the medium waves where it is most needed. For long-wave reception, however, the band-pass circuit is cut out by a switch and a very selective tuning arrangement is used for above 1,000 metres reception.

A .0003 pre-set condenser is in the aerial lead both when the Ohmic-coupling arrangement is in and out of circuit and a tapping is made to an intermediate point on both coils. A rapid-movement change-over switch enables the aerial to be taken (through the pre-set condenser) to either one coil or the other according to whether the band-pass arrangement is used or not.

Tuning is carried out with both condensers when the band-pass circuit is in use and, of course, with only one when long-wave reception is being carried out. The coupling resistance should on no account have a greater value than 7 ohms and it is advisable to adhere to the component specified. The Ohmic-coupling circuit really does give efficient band-pass tuning and the control provided by the rheostat will be appreciated.



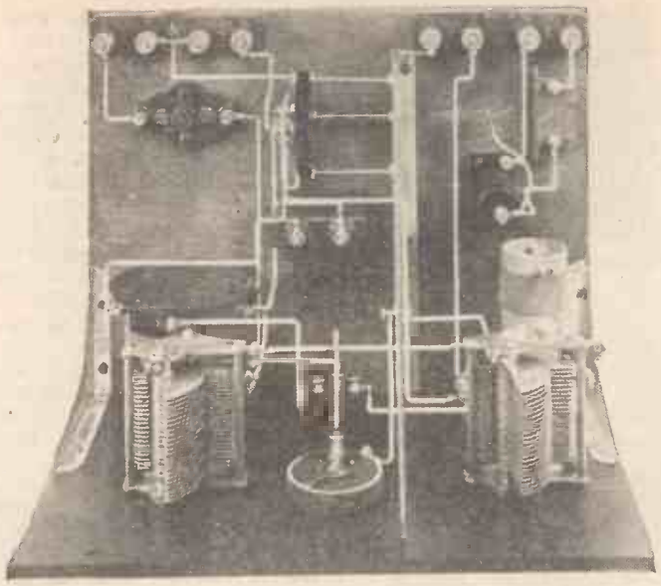
The circuit of the Ohmic-coupled unit

The rest of the screen-grid valve circuit is arranged in the conventional way, and the coupling to the following valve (that is the first valve of your set) is by means of a .0003 fixed condenser, H.T. to the screen-grid valve passing through a high-frequency choke. The screen of the screen-grid valve is stabilised by means of a by-pass condenser between the screen terminal and earth.

The accompanying panel shows the parts that you will need for the construction of this unit. A blueprint can be obtained which gives the layout and wiring of this unit in full size. The price of the print is one shilling and it can be obtained from the Blueprint Department, AMATEUR

WIRELESS, 58-61 Fetter Lane, London, E.C.4. A small reproduction is given here.

You will see from the photographs and layout diagram that the dual-range coil is fitted on the panel with the auxiliary band-pass coil mounted behind it on its small ebonite supports. No screening is really needed between these two coils because the fields are at right angles. The screening between the tuning condensers is essential,



for coupling between one and the other upsets the band-pass effect.

The two-way switch for putting the band-pass circuit in and out of action is mounted on the panel, and the leads to it should be

Components Required for DX Unit

Ebonite panel, 12 in. by 8 in. (Trelleborg, Becol, Lissen).
Baseboard, 12 in. by 9 in. (Clarion, Cameo, Pickett).
Two .0005-mfd. variable condensers, (Burton, Lissen, J.B., Formo, Igranic, Dubilier, Lotus, Polar).
7-ohm panel-mounting resistance (Lissen, Varley, Sovereign, R.I., Igranic).
Dual-range coil (Bulgin type A, Tunewell, Sovereign).
Band-pass coil (Wearite).
Single-pole change-over switch, rotary type (Bulgin, Benjamin, Readi-Rad, Lotus).
High-frequency choke (Readi-Rad, Lewcos, Varley, Wearite, Sovereign, R.I., Tunewell, H. & B.).
On-off filament switch (Benjamin, Bulgin, Lissen, Lotus, Sovereign, Igranic).
Panel brackets (Lissen, Bulgin, I. & B., Readi-Rad).
1-mfd. fixed condenser (T.C.C., Dubilier, Lissen, Igranic).
.0003-mfd. fixed condenser (Telsen, Dubilier, T.C.C., Igranic, Graham-Farish, Watmel).
Pre-set condenser .00003 to .00027 mfd. (Igranic, Formo, Polar, Sovereign, Lissen, R.I.).
Partition screen, 8 in. by 7 in., with valve holder for S.G. valve mounted (H. & B.).
Four terminal blocks (Lissen, Belling-Lee, Junit).
Connecting wire (Glazite).
Two slow-motion dials (Igranic "Minor," Brownie).

carefully arranged as shown. The second switch on the panel is in the screen-grid valve filament circuit. We do not recommend that you make any modifications to the layout, particularly so far as the band-pass components are concerned.

When you add the unit to your set just make sure that the filament connections are in order—that is that negative high tension is connected to negative low tension as in the unit and not to positive low tension as is the case with some sets.

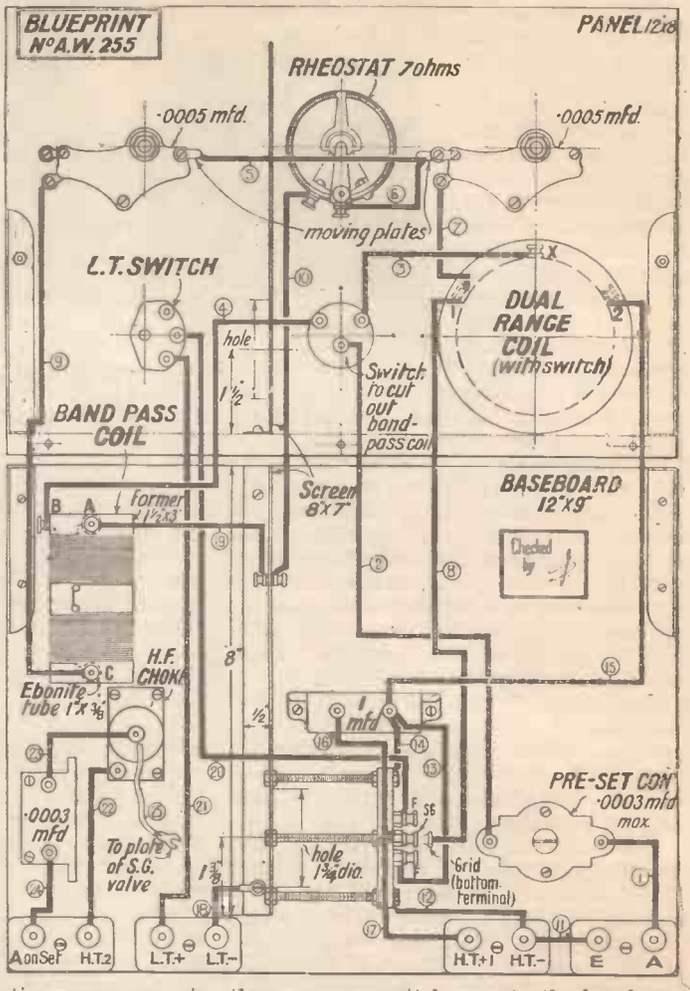
If you find that the negative to positive connection exists in your set then it is advisable to alter it to the more conventional negative to negative arrangement. If the unit with the negative to negative wiring is connected to a set with negative high tension connected to positive low tension then the low-tension supply will be short-circuited. The high tension for the unit is taken, of course, from existing batteries.

A voltage of 120 or so is needed for the anode of the screen-grid valve and the screen-grid should be taken to a tapping point of between 70 and 90 volts. This value is comparatively critical and you may need to experiment a little here in order to get good results. You will, of course, use a screen-grid valve which has the same filament voltage as the other valves in the set. Any standard screen-grid valve is suitable.

For an initial test connect the unit up to the receiver, and if there is a pre-set condenser in the aerial circuit of the set itself set this at its maximum value or, alternatively, short circuit it. Set the band-pass resistance at maximum (that is making a direct short-circuit) and try the receiver out without the band-pass arrangement. You will, of course, need to adjust the tuning condenser of the unit step by step with the main tuning condenser of your set. Reaction should be set at zero and you should tune in two or three of the local stations to get the "hang" of the controls before you attempt to receive foreign stations.

When a few condenser settings are known, and when you feel fairly well acquainted with the controls of the set, then you can switch over to the band-pass circuit and make use of the additional selectivity. You will then need to keep the band-pass condensers also approximately in step.

Do not forget to switch off the unit, by means of the filament control, when the main set is switched off.



Compare the plan view above with the wiring diagram and layout on the right. A full-size blueprint of the latter is available, price 1/-

When Asking Technical Queries

PLEASE write briefly

A Fee of One Shilling (postal order or postage stamps) must accompany each question and also a stamped addressed envelope and the coupon which will be found on the last page. Rough sketches and circuit diagrams can be provided for the usual query fee. Any drawings submitted should be sent on a separate sheet of paper. Wiring plans and layouts cannot be supplied.

Queries cannot be answered personally or by telephone.

The MAKING OF A RADIO PLAY

Of the many thousands of people who regularly listen to the programmes, it is probable that the vast majority are quite unaware of the highly technical organisation which has to be employed in order to produce a radio play. Below is some first-hand information by one who has been responsible for many productions

A NEW ART : MULTI STUDIOS : THE DRAMATIC CONTROL PANEL : "FLICKING"

THOSE responsible for the production of radio drama are faced with one very important problem—the problem of conveying a definite impression without the invaluable aid of sight.

How often one notices a gesture, an expression, an almost indefinable movement used by an actor or actress on the stage which may, perhaps, entirely alter the meaning of the spoken word; but with the radio play, the whole point must be conveyed by voice intonation alone.

Tommy Handley (extreme right) leads a rehearsal of a studio revue called "How's That!"

And so a new type of actor and actress came into being—the B.B.C. have a repertory company of them now—performers who have carefully studied this new form of histrionic accomplishment.

In the old days, if we may use the term—for the radio play is as yet still only in its infancy—these productions were done from *one* studio only. You would see as many as a dozen principals, a chorus, a crowd, an orchestra, an effects man, complete with "gadgets," producer, announcers and so on, all crowded together in one large studio at Savoy Hill endeavouring to give a radio representation of Shaw's *St. Joan*, Shakespeare's *Twelfth Night*, or something equally ambitious; and, needless to say, the conditions were terribly difficult.

When one remembers the sensitivity of the microphone, the task of the engineers in collecting all the sounds will be appreciated.

And so as time went on the B.B.C. experts decided that things must be improved and about three years ago, a weird and wonderful contraption was produced, which, now that it has been modified, and generally perfected, is known by the imposing title of the Dramatic Control Panel.

To look at, this D.C.P. as we might as well call it, is very much like an ordinary enlarged wireless set. It measures about four feet long by two feet high and has a series of knobs on its face, each marked with the number of a studio, and fitted in addition with a pointer which records on a finely marked dial let into the panel itself, the degree of plus or minus in use at the time. Now the main function of the D.C.P. is this. It was found inconvenient to crowd everyone into one studio and a successful experiment was made which consisted of separating each section—that is, by putting the actors in one studio, the orchestra for the incidental music in another, the effects in a third studio and so on and knitting all the various microphones together by means of this control panel, the knobs being used to vary the volume of sound during the "knitting" process, before the final effect is sent through the transmitting station by ordinary "land" line.

As soon as the success of the D.C.P. had been established, engineers and producers got together and started further experiments.

One of the most outstanding discoveries was the process known at Savoy Hill as "fading."

Suppose, for example, that the two principal characters in a play are sitting talking in a garden and on a cue the producer wants to give the impression of a change of scene—we will suppose that Scene II is in a popular restaurant.

There is no need for the actors to move. Their voices in the garden are coming down to the D.C.P. via the microphone in the studio and when they have finished Scene I they remain just where they are until they get the signal to commence Scene II, which signal is given to them by the producer flashing a red light suspended in a prominent position just over the microphone. Each studio has one of these flash signals operated by a series of numbered switches situated just by the dramatic control panel.

"Flicking"

Now what is happening to convey the change of scene to the listener?

As soon as Scene I is over, the producer signals the effects studio—they call it "flicking," and just as soon as the effects expert gets this "flick" he starts off with his restaurant noises—conversation, the rattle of plates, the clinking of glasses, etc., and in the same way via his microphone the sounds are conveyed to the D.C.P., and the volume of them controlled by the producer by means of the knob labelled "Effects."

In the same manner the orchestra in another studio is "flicked" to commence, and the producer gradually "fades in" the ensemble to just the right volume so that the actors' voices are most prominent and the background of restaurant noises and orchestra just sufficiently subdued not to interfere with the dialogue.

Of course, on the wall opposite the panel is a loud-speaker through which all the microphones in use reproduce simultaneously, so that the producer can hear for himself if he has got his "fades" correctly and adjust them where necessary.

Apart from anything else, the D.C.P. is

invaluable at rehearsals, because suspended over it is a microphone connected to loud-speakers in every studio in use, so that the producer can "talk back" to everyone concerned, issuing instructions, altering lines and so on. (This microphone is, of course, disconnected during the actual transmission.)

Recently gramophone records have been

playing an increasingly important part in the production of radio plays.

Effects from Records

It was found that however exact a reproduction by artificial means of a certain sound was, it never sounded really like the actual thing after it had reached the listener; but it was also discovered that a gramophone became considerably "sweetened" through the same process, the needle scratch being almost eliminated and sounds of birds, tube lifts, music, steamer syrens and so on, when recorded and sent out through an electric "pick-up" were almost indistinguishable from the real thing.

And so the Effects Department set out to make a set of records of actual sounds which could be used in radio plays and for the past two years this work has been going on.

During this time an almost unique collection of records has been accumulated, amounting to some two or three thousand, none of which, of course, will ever be issued to the public and which embrace such widely separated subjects as ribald laughter, thrush in full song, a steamer leaving dock, restaurant chatter, an aeroplane crash, a running motor car engine, and so on, most of which have been recorded from real life.

Some of the difficulties attendant on such recordings can be well imagined and the Zoo has proved invaluable for the animal sound records.

On one occasion last year the B.B.C. officials, together with the gramophone recording experts, spent nine hours on end at Oxford Circus tube station obtaining records of tube lifts and underground trains for a play which when produced only lasted an hour altogether.

Of course, like everything else highly technical, the engineers have evolved abbreviations for most things connected with broadcasting, but nowhere in the great building at Savoy Hill is there such an imposing list of these abbreviations as there is in the Dramatic Control Panel room.

Here is a typical set of instructions issued to all concerned by a producer, which in its abbreviated form looks more like a secret code than a perfectly ordinary requisition for the requirements of a play:

"29/5/30 Reh. Squirrel's Cage. 14. D. C. L. S. 97. L.S. Studios. 2. 2E. 2G. 4. 8. echo 4."

Which being interpreted means that on the 29th of May, 1930, there will be a rehearsal of a play called *The Squirrel's Cage*; that there are fourteen people in the cast; that the dramatic control panel will be required with a loud-speaker in the room and that loud-speakers will be wanted in all the studios concerned. Further, that the following studios are to be connected to the panel: No. 2 probably for the use of the artistes concerned; No. 2E (E stands for effects), No. 2G (G is the gramophone studio); No. 4, where the orchestra will probably be; No. 8 where perhaps a piano or celeste will be situated. "Echo 4" is interesting.

Echo Effects

One of the scenes in the play may be supposed to take place in a village hall, or perhaps a church, and to get the effect, the voices must be made to echo a little, thus indicating the situation.

To get this effect the microphone in No. 4 studio is, in addition to being connected to the D.C.P. as usual, also connected to a loud-speaker situated in an empty room with a stone floor.

The leaders of "Winners" before the microphone, and (right) fierce action in the studio in the course of the radio play "Grey Ash"

Exactly opposite this loud-speaker is another microphone which "takes in" the sound of the loud-speaker and also the little bit of echo produced by the stone floor, and in its turn conveys the result to the producer at the D.C.P. who in his turn modifies or increases it or even cuts it out altogether (when the scene changes again), before "relaying" the result to the listener.

(To be continued next week)

THE MEANING OF "MU"

"AMP. factors" and "mu's" are two of the mysterious things which a valve user has to face, when attempting to find out how a valve works.

The amplification factor of a valve may be defined as the theoretical maximum signal amplification of which the valve is capable. Under practical conditions this maximum can never be attained, but the factor serves as a useful guide by which to compare valves of similar impedance.

Obviously, the higher the amplification factor the better the valve, other things being equal, except in the case of three-electrode output valves which, generally speaking, do not require a high amplification factor because sufficient signal amplification is obtained in the previous stages.

The mutual conductance is a measure of the mutual effect of the impedance and amplification factor of the valve. Numerically it is equal to the amplification factor divided by the impedance and multiplied by 1,000, and is expressed in "milliamperes per volt."

The main point to consider in choosing a valve is to select one having an impedance suitable for the position in which it is to be used. Of several valves having approximately the correct impedance, those with the highest mutual conductance are the better, and of two or more valves of suitable impedance and with approximately equal mutual conductance, that having the highest amplification factor is the best.

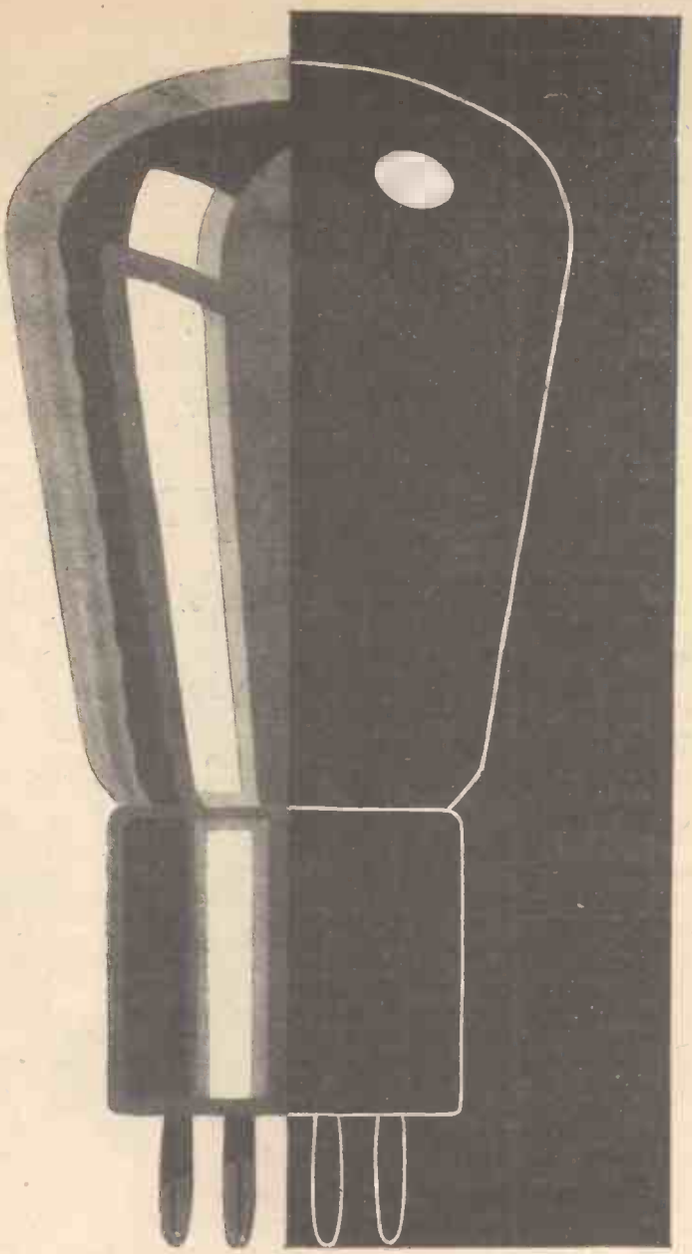
K. U.

A NEW STATION FOR FINLAND

THE new high-power Finnish station has an aerial power of 13.2 kilowatts, at 80 per cent. modulation. The transmitter is of similar design to the new Trieste station in Italy, but there is one important difference in the frequency control of the Finnish station, which will incorporate an oscillating crystal.

An oscillating crystal enclosed in a thermostatically-controlled heat-insulated box will be fitted to provide the drive frequency.

The station will be situated at Viipuri, and arrangements have been made for land-line and speech-control equipment for simultaneous broadcast transmissions from Viipuri and the existing Finnish station at Helsingfors.



A SUPER-SENSITIVE DETECTOR

Modern broadcasting conditions demand modern detector valves —valves capable of giving the maximum strength from weak signals yet able to handle without distortion the larger signal voltages obtained in receivers embodying one or more efficient high frequency stages.

The Mullard P.M. series of sensitive detectors, by virtue of their high amplification factors and other efficient electrical characteristics, amply fulfil these requirements and make excellent transformer-coupled detectors. Their use is, however, not confined to the detector stage, for they may also be employed with success as transformer-coupled low frequency amplifiers.

The correct valves to use are:—

2-volt: **P.M. 2DX;** *4-volt:* **P.M. 4DX;** *6-volt:* **P.M. 6D.**

P.M. 2DX CHARACTERISTICS.

Max. Filament Voltage	2.0 volts	*Anode Impedance	10,700 ohms
Filament Current	0.2 amp.	*Amplification Factor	13.5
Max. Anode Voltage	150 volts	*Mutual Conductance	1.25 mA/v.

**At Anode volts 100; Grid volts zero.*

PRICE 8/6

Mullard

THE · MASTER · VALVE

On Your Wavelength!

A BAG OF NUTS?

DON'T you think I deserve it? A week or two ago I prophesied that there would be a sudden marked improvement, both in all-round signal strength and in the number of stations receivable after the middle of October. If you remember, things were not too good when I wrote, one of those temporary setbacks having occurred that we all know so well. My prophecy came true, sure enough, for the improvement in conditions duly occurred in the form of quite a big jump just after the middle day of the month. Stations are now coming in remarkably well on both the broadcast and the long wavebands. If you haven't done any foreign listening of late, now is the time to get down to it once more. You can pick up on most nights a dozen or more stations whose programmes come in so well that they provide genuine alternatives to those of the Regional and National stations. Luckily, too, most of the best stations are rare sufferers from heterodyne and other interference.

LOUD-SPEAKERS FOR SOFT SPEAKERS

MOST law courts seem specially designed for bad acoustic qualities and most witnesses appear to be unable to speak in anything above a whisper. The problem of making the inaudible witness audible has been solved by means of the ever-useful wireless valve in South Africa. At the front of the witness box in one South African court a microphone, complete with amplifier, has been installed. Placed, so that the court usher can reach it conveniently from his seat, is the knob of a volume control. Whenever a muttering or mumbling witness goes into the box the usher simply turns him on to the required strength by moving this knob in a clockwise direction until everybody is satisfied. A splendid idea, I think. It is a pity that nobody can invent a minifying apparatus to reduce the volume of noisy orators who roar and ramp until one's ears rattle.

I WONDER WHY?

OFTEN I wonder why more use is not made of the pick-up and the wireless set for the playing of gramophone records. Of course, there are thousands upon thousands of pick-ups in general use, but it is surprising to find how often a man who possesses a first-rate wireless set and an ancient gramophone never thinks of using his note-magnifying valves and his loud-speaker instead of the dilapidated sound-box and horn of the gramophone. A case in point arose the other day, when a daughter of a house at which I was staying turned on the gramophone because none of us much cared about what was coming through on the wireless. She apologised for the quality, explaining that the gramophone was a bit out of date. It certainly was. Now, the set is a beauty, and on its panel is a pair of pick-up terminals and the necessary switch. I asked why they didn't use a pick-up, and nobody seemed to know the answer. I happened to have with me one of the latest type that I had bought when passing through London on my way down. Running up to my room, I collected it and had it working in two or three minutes. The difference in the quality was perfectly astonishing and paterfamilias was ordered to provide a pick-up at the earliest possible moment.

A MOOT POINT

TALKING of pick-ups, I find that opinions differ quite a lot with regard to the best place for the volume control. Some people like to have it straight across the pick-up, whilst others apply it to the output valve. To my mind, there is no doubt at all where the pick-up should be. If you put it across the grid circuit of the output valve you can cut down the strength right enough, but you cannot make absolutely certain of good quality, for the preceding valve may be suffering from overloading. I plump every time for wiring the volume control across the pick-up terminals. You can then regulate to a nicety the size of the voltage swings applied to the grid of the first valve and prevent overloading from taking place. In a well-designed set, so long as the first valve is working well within itself, the others will not be receiving more than they can cope with properly. It is quite easy with the pick-up in this position to find the best adjustment, for all that you have to do is to reduce the volume a little and to see whether this improves the quality. If it does, then overloading was previously taking place.

WILL IT COME?

THE weak point of radio up to the present is undoubtedly the loud-speaker. I don't mean to say that loud-speakers are not good. They most certainly are, and the best of them can reproduce both speech and music naturally and without a trace of distortion. What I am driving at is that for a close approach to perfection in reproduction the loud-speaker requires the dickens of a lot of juice. I suppose that if you want pretty big strength you must think about giving the output valve at least a couple of hundred volts. It is still better to use a pair of output valves in push-pull, and this means that you must allow for a pretty useful number of milliamperes. To be at its best, a full-size moving-coil speaker probably needs from 10 to 20 watts, which is really an awful lot. The trouble is that such a very small proportion of the power supplied by the output valve can be diverted into doing really useful work. Most of it—about 99.9 per cent., I believe—is frittered away in doing completely useless jobs, such as heating up the windings and so on. Some day, I suppose, we shall have a really efficient loud-speaker which will give first-rate quality with big volume for quite a tiny wattage. There is a fortune awaiting the man who can solve this problem.

FAMILY PARTIES

I MUST say I like the way in which many of the American broadcasting stations let the listening public know who the announcers are and all about them. This gives a family party atmosphere, which is just what is wanted to keep a circle of listeners together. In this funny country of ours the announcers are merely voices, cultured, but completely impersonal. To the public at large they are just like so many disembodied spirits, which exist only when the wireless set is switched on. There is a big difference over on the other side of the Pond. Tune in to an American station and it won't be long before you hear the announcer tell you who he is, thus establishing friendly contact at once. In the bright little weekly paper published by WLW you find not only the station programmes, but also quite a lot of amusing gossip about the announcers and the rest of the studio staff. If one of them starts growing whiskers, or buys a horse, or falls off it, or puts on weight or loses it as a result of the eighteen-day diet, you are told about it by a witty gossip writer. An excellent idea, I think, and certainly one that I would like to see adopted—in modified form, at any rate—in our own country.

NOT DEAD YET

ONE still comes across quite a few people, both talkers and writers, who continue to give rules about wireless which have long ago been proved completely fallacious. One of these accepted notions that still sometimes sees the light of day is that if you have a "T" aerial you must take the down-lead from the exact electrical centre or there will be a big loss of efficiency, since one arm of the aerial will be tuned to one wavelength and t'other to another. It is some years now since this belief was blown sky high and by a series of experiments it was shown that it did not matter two hoots where the down-lead came from so long as it was properly attached to the roof portion. In any case, I should rather like to see one of those who still urge beginners to find the exact electrical centre engaged himself in doing the job. He might find it rather a pretty problem in some cases. As a matter of fact, we listeners will need to worry ourselves less and less about aerial problems, for with the growth of high-powered stations and the increasing efficiency of receiving sets, the outdoor aerial will probably be as much a back number as the penny-farthing bicycle in a few years time.

WHAT'S BEST INDOORS?

THERE are all kinds of indoor aerials and there probably is no universal best type. Some kinds seem to do best in some houses and other kinds in others. The great difficulty with any kind of suspended indoor aerial is to keep the capacity reasonably low. It is surprising, in fact, how big the capacity of an indoor aerial can be. The other day I compared a

On Your Wavelength! (continued)

simple type with an outdoor aerial. The indoor arrangement consisted of a single length of No. 20 d.c.c. slung round three sides of a large landing, the down-lead coming straight down the well of the staircase and being taken into the living-room through an insulating tube let into the wall. Its capacity turned out to be very considerably higher than that of a 25-ft. high outdoor aerial consisting of a single length of 7/22. I am not at all sure that the most effective indoor collector—at any rate, in houses situated on fairly high ground—is not the earthed frame. If you earth a frame it loses nearly all its directional properties, but my own experiments show that in my house, at any rate, it is more effective than any kind of suspended wire. Wind the frame with Litz and you can produce something of remarkably low high-frequency resistance. Since though, the directional properties are lost, you must rely for selectivity upon the circuits of your set alone.

A QUEER POINT

A FRIEND of mine uses nothing more ambitious than a two-valve set, whilst I have two first-rate H.F. stages in front of my detector and a single note-magnifier. He uses a good outdoor aerial; mine is an indoor. His house, though not more than half a mile away from mine, stands about 150 ft. higher. Owing probably to the remarkably smooth reaction control of his set, he is able to receive a very respectable number of foreign stations at good loud-speaker strength; though I can, of course, bring in more, thanks to my H.F. amplification. Now, here is something very queer. Stations such as Rome, Stockholm, and Turin we both receive with ease, but Budapest has not for a long time been much more than a moderate signal for me. My friend gets him on good nights at terrific loud-speaker strength. in fact, this station comes in more powerfully on his set than the three already mentioned. It is all the more curious since Budapest comes in almost at the top of his medium-wave condenser dial readings; that is to say, with nearly the whole of .0005 microfarad in parallel with the grid coil. Wireless is full of strange things, but this is one of the queerest that I have come across for a long time.

BAND-PASS SUPER-HETS

BAND-PASS filters are very much to the fore these days, and I am tempted to wonder, as I have often done before, whether a band-pass super-heterodyne will make its appearance. I remember discussing this point with Captain Round, of the Marconi Company, a long time ago, and he suggested that this system should possess many advantages over the usual. The idea is, of course, that the intermediate stages should be constructed on a band-pass principle, so that they accepted just the band width of 10 kilocycles required and cut off very sharply on either side. The only difficulty, of course, is that of expense, because the units would have to be matched up very accurately, not only as regards each individual unit, but the whole series used in the intermediate stages, and this would probably result in considerable expense.

ANOTHER SYSTEM

THERE is another possibility of obtaining the selectivity which is required to-day without the use of band-pass filters and without the loss of quality, namely, by the use of the new Hyperdyne principle, which our Technical Editor is describing in *Wireless Magazine*. I was over at Elstree the other day, and had an opportunity of testing the actual receiver which has just been completed, and I must say that I was both pleased and surprised with the result. It is a long time since we had anything really new in wireless, and this certainly seems to have several novel features which may make the system one of the most popular which we have seen for some time.

I believe that I have said something about this set on a previous occasion. I know that I saw it when it was strung up on the bench, occupying the greater part of one side of the laboratory, but it has now been condensed into a very respectable little gadget only 21 in. long, and even then it is not by any means unduly condensed, so that it appears to have proved quite practical in actual operation. I must not say any more about it at the moment, but I certainly recommend those who are keen on DX, to look out for this receiver when it appears.

RAILWAY BROADCASTING

IN Canada, as you probably know, broadcasting is conducted mainly by the National Railways, which run a chain of big stations. None of them yet has achieved super power, but I believe that plans for big increases are on the way. Though the railways are so largely responsible for it, broadcasting in Canada is exceedingly well done and listeners are assured of a first-rate service. I was particularly interested in a pamphlet sent to me recently showing the arrangements which are being made for the Sunday programmes. As readers know, I have always maintained that the Sunday programmes should be amongst the best of the week, and I have had occasion to criticise our own people on this score. The C.N.R. stations put out first-rate programmes on Sundays. An excellent concert is always arranged and only the best artistes need apply to make use of the microphone.

UP-TO-DATE DETECTORS

AT last we have valves specially designed to function as detectors in the wireless receiving set. The designers have at length realised that the only valve in the set usually liable to be a nuisance through microphonic tendencies is the detector. In the ordinary set you can tap the H.F. valves and the output valve as much as you like, and the loud-speaker, like Brer Rabbit, will lie low and say nuffin'. But the lightest touch of the detector will produce a ringing response. Now, microphonic tendencies are due entirely to vibrations of the filament.

FIVE-POINT SUSPENSION

THE obvious solution is to suspend the filament at so many points that either it cannot vibrate at all or, if it does so, it will vibrate at something above audio-frequency. This has been done in the very latest detectors whose filaments have five-point suspension. I have just been trying one of them out, and I can assure you that it really is non-microphonic. If you have been troubled with the old nuisances bound up with microphonic valves, fit one of these and get rid of them for good and all. The characteristics of this new detector are excellent, for it combines moderate impedance with very high amplification, and naturally an excellent mutual-conductance figure. Follow it by the resistance-feed circuit and you will obtain both big magnification and first-rate quality.

WORTH NOTING

IT is well worth noting that the queer goings on of a receiving set worked direct from the mains may sometimes be due to loosely fitting lamps. The other day a friend of mine installed a first-rate mains set which, in conjunction with the excellent loud-speaker used, gave reception of splendid quality. Every now and then, though, an outburst of cracklings occurred to mar reproduction of the programme. We went over everything with the utmost care, but could find nothing amiss in the apparatus itself. We noticed that, though rapping the table or the cabinet of the set did not give rise to crackles, the noise at once occurred if either of us walked heavily across the room. This was illuminated by three electric lamps. Now, I went to each in turn and rocked it a little in its holder. Nothing happened when the first two were so treated, but when I got to the third we found that even touching this bulb caused the loud-speaker to have a mild fit. The holder was old and worn, so that the lamp in it could be moved quite considerably. Next day a new holder was fitted and the trouble ceased. I am told, though I have had no personal experience of this, that if electric bells in a house are worked from the mains by means of a transformer the bell circuits can cause a good deal of noisiness if there is any defect in them. Probably, also, dirty or loose electric-light switches may do their little bit in the way of unwanted broadcasting.

THERMION.

MAIN'S SNAGS and— HOW TO AVOID THEM

In this article W. JAMES shows how to avoid the many little difficulties associated with operating a set from the mains

IF you take a mains unit and simply connect it to a set in place of a high-tension battery, it is possible that you may not obtain satisfactory results.

This will depend partly upon the arrangement of the mains unit and the set. Some sets, for example, have the high-frequency and power valves connected to the same point. Others, with two low-frequency stages, have the first and second L.F. stages connected to the single high tension.

Most sets have a separate tapping for the detector and one for the screen of screen-grid valves and some sets have a separate tap for each valve.

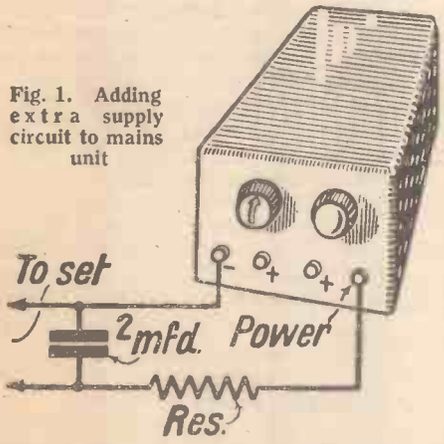


Fig. 1. Adding extra supply circuit to mains unit

The essential point to remember when about to use a mains unit is, that the more the circuits are separated, the better the results are likely to be.

If each circuit is fed through its own filter circuit, comprising a resistance for lowering the voltage and a by-pass condenser, then there can hardly be trouble of any description. If the circuits are isolated, motor-boating cannot occur and hum will not be heard unless, of course, the smoothing choke included in the mains unit is of too small a size or smoothing condensers of too little capacity are used.

If then the set has divided circuits and each can be fed from the mains unit, all that remains is to adjust the voltage of the supply to the different valves and perhaps to alter the grid-bias values to suit the new voltages.

There should be no difficulty here, although the screen voltage regulator ought to be handled with care. It is a good plan to start off with a rather low screen voltage, and to increase it whilst tuning, for too great a voltage may harm the valve.

You will not, of course, rely too much upon a voltmeter test unless the voltmeter has a very high resistance and the resistances included in the mains unit are relatively low.

Coupling Effects

When two or more circuits are joined together and so are supplied from a single high tension, a coupling effect may occur which will spoil the quality or actually produce motor-boating. In this instance, it is necessary to divide the circuits, taking separate supplies to them.

This may not be possible without first adding to the mains unit. A resistance and condenser may easily be added to the "power" tap, however, as indicated in Fig. 1. An adjustable resistance might be an advantage in some instances, but usually a fixed resistance will be just as good if of the right value.

The value may be worked out. Knowing the current passed by the valve and the difference between the voltage of the "power" tap and that needed on the actual circuit, divide the voltage by the current. Multiply the result by 1,000, when the current was expressed in milliamperes and the pressure in volts.

Thus, if the current is three milliamperes and the voltage difference is thirty, a resistance of 10,000 ohms will be needed. The condenser used with the resistance for filtering may be of two microfarads.

Motor-boating

Motor-boating may occur if too low a value of resistance or capacity is used. When the value of the resistance is decided by the voltage needed, we must be sure the capacity of the by-pass condenser is sufficient, increasing it to 4 microfarads if necessary.

Detector circuits are particularly difficult. A slight variation in the supply to this stage may be so magnified by the low-frequency part of the set that hum and noise are heard. In the detector stage a 4-microfarad condenser may well be essential when a low resistance is used, but there are, of course, numerous instances of the more usual value of 2 or even 1 microfarad being perfectly satisfactory.

Not much trouble is experienced, as a rule, with high-frequency stages. These are usually choke fed in the set, or a transformer coupling is employed. Hum seldom starts in high-frequency circuits and all that you must do is to regulate the voltage to the valves.

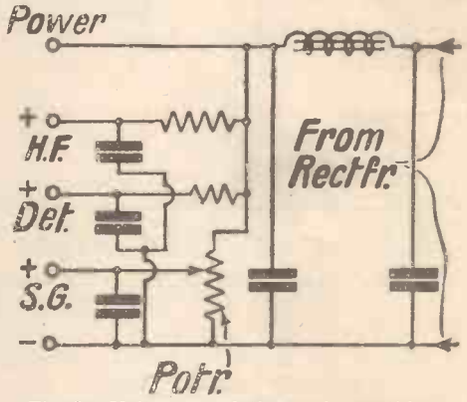


Fig. 2. Voltage regulating and smoothing circuit of mains unit

The essential points to note are, therefore, first, that the voltages are suitable; secondly, that the grid-bias values are right for the anode voltages employed; and, thirdly, that the circuits are separately fed when it is at all possible or necessary.

Hum may be introduced by placing the mains unit too near the set. A badly fitting detector valve may pick up a hum, or a low-frequency valve will do this on occasions.

Smoothing may be assisted by the provision of further condensers connected between the negative and the point to which the positive side of the supply is taken. If a hum is heard when all reasonable precautions have been taken, such as outlined above, it is fairly safe to assume a faulty mains unit. One which is being overloaded, too, may allow of hum and if the voltages are too great the valves may be spoiled.

DO YOU KNOW—

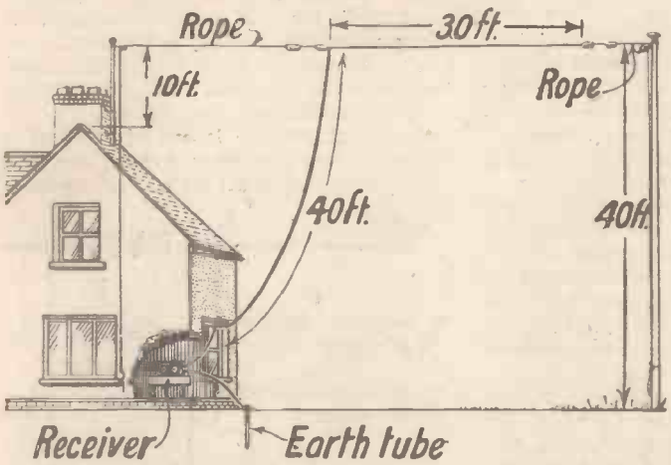
that round about 80 metres you can hear the new Italian short-wave station? This is situated just outside Rome, and is fitted with transmitting gear of British manufacture. A strange coincidence is that the gear was tested within a stone's throw of Chelmsford, 5SW, before it was sent out to Rome. The Italian station can also work on 25 metres, and when it does so it is a severe competitor to 5SW on 25.3 metres.

THE HOW AND WHY OF RADIO

VII—AERIALS AND EARTHS FOR PRESENT-DAY CONDITIONS

If you are a beginner in wireless, now is your chance to gain a clear conception of its theory and practice. In this series of articles, specially prepared for the beginner, no previous knowledge of wireless is assumed. Every aspect of the subject will be dealt with in ensuing issues, and the whole series will endow the beginner with sufficient knowledge to enable him to derive the greatest possible interest from the fascinating hobby of wireless

IF I had been writing this article five years ago I should have started by saying that as the maximum length of aerial allowed by the Postmaster-General is 100 ft., the listener should endeavour to use as much wire as allowed by law. How far from expedient that advice would be to-day!



The aerial arrangements shown above are an indication of the best practice to suit modern conditions

Yet I still find listeners having great trouble in cutting out their local station through slavishly following the old text-book dictum. It is still true that the nearer the full length is approached the greater will be the signal strength of the stations received. But as most listeners want to hear distant as well as near-by signals, it is better to reduce the length of aerial.

There are two reasons for this advice. Firstly, the great amplification of the modern valve provides ample signal strength from weak stations, even with a small aerial. And the great strength of the local stations especially if they are B.B.C. regional transmitters, enables even the simplest set to give full loud-speaker reproduction with a short aerial.

If these two reasons why a long aerial is not necessary do not convince the reader, the reason why a long aerial is definitely undesirable may do so.

A long aerial brings in the strong local stations at such volume that the more distant and weaker stations cannot be separated from the local. With powerful stations and with powerful sets, the need for a big aerial is definitely passed.

I think that for listeners living fairly close to a B.B.C. regional station, a total length of 70 ft. is about the limit. The length of an aerial is found by measuring the distance between the support at the far end and the aerial terminal of the set. In other words, the length of the aerial includes the down lead.

I have sketched my own aerial arrangement as a guide to what is considered good practice. It will be seen that the horizontal span is quite short, being only 30 ft. long. The down lead, which is 40 ft. long, is kept well clear of the wall of the house until it enters the window through a lead-in tube.

The earth lead is as it should be, very short and of thick, stranded cable. Each strand at the earth end is soldered to a different part of a metal spike. As the soil is rather dry, I have fixed a thin piece of piping near by. Through this I occasionally pour a bucket of water.

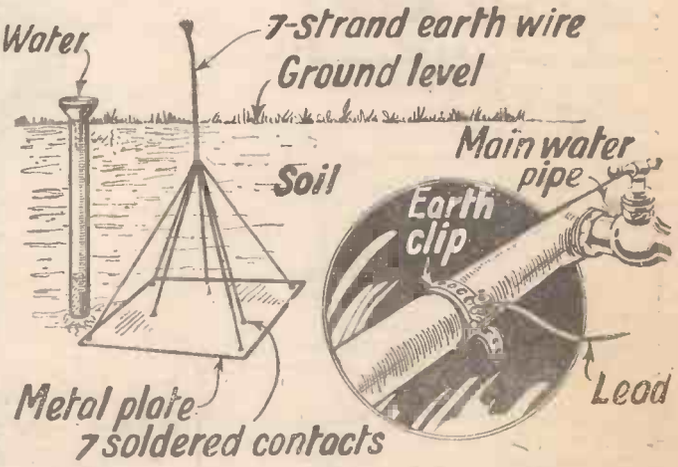
One of the lessons that emerges from a study of this sketch is that *isolation* is just as important as *insulation*. The wire is kept as far away from earthed objects as possible. This is because high-frequency currents are apt to go astray on their way to the set if an earthed object is allowed to run parallel with the wire for any appreciable distance.

At least two insulators should be arranged at each end of the horizontal stretch. The wire can be made one continuous length by twisting it round one insulator at the junction of the horizontal and vertical spans. Some listeners solder the down lead to the horizontal part of the aerial, but I do not see why one should invite a high-resistance joint so unnecessarily.

Not everyone can arrange such an ideal aerial for modern conditions as I have sketched. But however awkward the conditions may be, certain guiding rules can always be applied. For one thing, where the choice is between a high but short-length aerial and a low but long-length aerial, I recommend the former. In fact the ideal would be a single vertical length.

By now nearly every listener must have heard of 7/22-gauge aerial wire. This is much preferable to a single strand of thick wire. For one thing its tensile strength is very great; for another thing the surface area of the standard wire is greater than of a single strand of wire of the same diameter. As wireless waves travel over the surface of the wire, the stranded type obviously offers a lower resistance.

Earths are just as important to-day as they used to be when long aerials were the rule. A buried metal plate or an earth tube buried underneath the aerial wire is ideal; but here again domestic convenience is often the determining factor. That is why a main water-pipe earth connection is so often suggested as an alternative. Suitable clips are available for clamping round the water pipe, which should be filed bright before making the connection.



The earth connection is also important. Here are shown two excellent arrangements

Under no circumstances should a gas-pipe earth connection be made. There is practically no danger in this procedure,

(*Continued at foot of page 657*)

NEXT WEEK: VIII—HOW YOUR BATTERIES WORK

NEXT TIME GET A "PERTRIX"

(NON-SAL-AMMONIAC)

When your present H.T. Battery has run down, get a "Pertrix." You will be agreeably surprised at the improvement in reception, and absolute freedom from battery noise, and above all the length of time it will last.

"Pertrix" Dry Batteries *cannot* corrode, do not deteriorate when not in use, and are silent in operation. So, next time, get a "Pertrix"—your dealer will tell you the most suitable type for your set or, if you prefer it, write direct to us for leaflet which gives you full particulars of all types.

Get a "Pertrix" Battery for your torch.

PRICES

Standard capacity (Discharge 12 milliamps).
Size in inches.

60 volt.,	$5\frac{1}{16} \times 6\frac{1}{8} \times 3\frac{1}{16}$ ...	8/-
100 volt.,	$8\frac{7}{8} \times 6\frac{1}{8} \times 3\frac{1}{16}$ ...	13/-
120 volt.,	$10\frac{5}{8} \times 6\frac{1}{8} \times 3\frac{1}{16}$ ...	15/6

and many other types—ask your dealer for complete list.

PERTRIX

NON-SAL-AMMONIAC DRY BATTERIES

PERTRIX LIMITED,
BRITANNIA HOUSE, 233 SHAFTESBURY AVENUE, LONDON, W.C.2

PERTRIX ONCE — PERTRIX ALWAYS

IN MY WIRELESS DEN

WEEKLY TIPS— CONSTRUCTIONAL AND THEORETICAL

By W. JAMES.

High-mag. Screen-grids

SCREEN-GRID valves are now being made with such good characteristics, that, theoretically and in the laboratory, very high magnifications are possible.

But in practice, what with stray couplings due to coils and condensers, as well as to wiring and the circuit battery supplies, such great magnifications cannot be obtained. It is comforting to know, however, that we may practically forget the valve when considering the feed-back and couplings which limit the amount of the magnification to be obtained in practice.

When out for the maximum magnification, most complete shielding and by-passing is essential. Not only the coils and condensers, but the wiring, too, must be taken care of. All battery wires ought to be by-passed, using condensers, stopping resistances, or chokes.

Super-hets Again?

It seems possible that the super-heterodyne type of receiver, now so popular abroad, may well become a favourite here. With modern valves and circuit design, splendid results are possible.

Who does not remember the super-heterodyne of a few years back, with its seven and eight valves? What selectivity and magnification we used to obtain with a set when we had it working properly.

With screen-grid valves and better parts, a modern example ought to be well worth having. The design of such sets is not too difficult, but there is usually an amount of work in them for the amateur who builds his own coils and high-frequency transformers.

Matching the beat-frequency circuits is an interesting job if a good frequency curve is to be obtained; and complete stability is, of course, essential or the circuits will be too sharp and distort.

"Dud" Bias Batteries

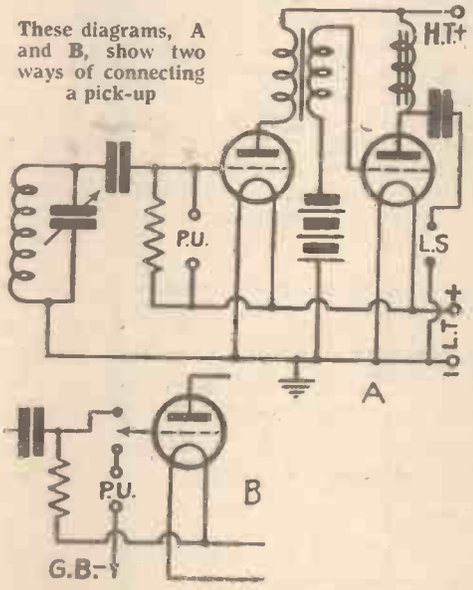
A grid battery may, if one is unfortunate, cause an amount of trouble. A new battery should be satisfactory in a set having several grid-bias tappings, but you cannot be sure.

If the battery has a relatively high resistance, it will couple the grid circuits to such an extent that bad quality or instability is produced. One is likely to overlook the grid battery when dealing with difficulties of this kind, but often it is found that the grid battery is the real cause of the trouble.

A low-resistance voltmeter is a help in a difficulty of this description, because it passes sufficient current to show whether the battery has a high resistance or not.

Pick-up Connections

A pick-up which is connected as indicated in the accompanying diagram A has not only the grid leak across it and the grid condenser, but also the grid-filament path of the valve as well.



These diagrams, A and B, show two ways of connecting a pick-up

The result is that the quality may be not too good. It depends, of course, upon the particular pick-up and the value of the grid leak and the way in which the resistance of the grid-filament path of the valve varies.

Sometimes the method is satisfactory enough for ordinary purposes. There is a better way of connecting a pick-up, shown in diagram B. A switch is used to transfer the grid of the valve from the grid condenser and leak to the pick-up. The pick-up can, therefore, be biased as indicated.

When a volume control is fitted to the pick-up, a constant load is imposed which may alter the normal characteristics of the pick-up. With too low a value of resistance the higher notes may be relatively weakened, but as the load is a constant one, the effect may be allowed for elsewhere in the set.

Low Loss in These Days

Not so much is heard about low-loss condensers these days. At one time most types were called "low loss," but now it is taken for granted that the losses are not unduly great.

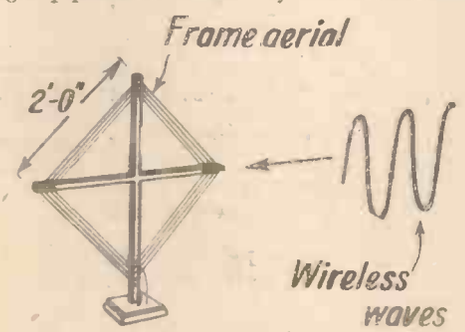
There are times, however, when one is amused at the emphasis given to the losses of valve holders and valve bases. Tuning condenser losses may on occasions be negligible, but on the other hand, they may not.

It depends upon not only the construction of the condenser, but the properties of the insulating materials used. With poor materials, and lots of it in the condenser, the losses may be more than they ought.

"AERIALS AND EARTHS FOR PRESENT-DAY CONDITIONS"

(*Continued from page 654*)

but there is considerable inefficiency; for gas pipes are sometimes joined with white lead, which has a very high resistance to wireless waves.



The frame aerial provides excellent selectivity though there is some loss of sensitivity

Sometimes listeners find it impossible to erect any sort of outside aerial. The question then arises as to whether an indoor aerial or a frame aerial is preferable. With a small set the indoor aerial is by far the better proposition. The total length need not exceed 70 ft. and can consist of a single strand of 20-gauge cotton-covered wire, which is quite efficient and sufficiently unobtrusive.

Where great selectivity is wanted the frame aerial is invaluable. Wireless waves have most effect on a frame aerial when it is pointing in the direction of the station from which the waves are being radiated. When at right angles to the direction of propagation the frame aerial is unaffected. So when two stations located in different directions with respect to the receiver are suffering from mutual interference, owing to the small difference in their wavelengths, they can be separated by a frame aerial.

But frame aerials are the least efficient of all aerials and should only be resorted to when special selectivity is wanted, or where facilities for erecting an outdoor or indoor aerial are not available.

BUDAPEST
Hungary
550 metres 23 kw.
Hallo, hier Budapest!

▪ ▪ ▪

VIENNA
Austria
517 metres 20 kw.
Hallo, Hallo, hier Radio Wien!

▪ ▪ ▪

MILAN
Italy
501 metres 8.5 kw.
Eiar, Radio Milano!

▪ ▪ ▪

MIDLAND REGIONAL
479 metres 38 kw.
Midland Regional calling!

▪ ▪ ▪

LANGENBERG
Germany
473 metres 17 kw.
Achtung für die Westdeutschen Sender!

▪ ▪ ▪

LYONS
France
466 metres 2.3 kw.
Ici poste Lyon la Doua!

▪ ▪ ▪

PARIS
France
447 metres 1 kw.
Allo Allo, Ici le Poste Radiodiffusion de l'Ecole Superieure des Postes et Telegraphes de Paris.

▪ ▪ ▪

ROME
Italy
441 metres 75 kw
Eiar, Radio Roma!

▪ ▪ ▪

BERLIN
Germany
418 metres 1.7 kw
Achtung! Achtung! Hier Berlin!

▪ ▪ ▪

DUBLIN
Ireland
413 metres 1.5 kw.
Dublin calling!

▪ ▪ ▪

KATOWICE
Poland
408 metres 16 kw.
Hallo! Hallo! Polski Raadjo Katowice!

ON THOSE THE

WHEN the local programmes pall I always take a dose of "DX." Which means that I try for some of the foreign stations. They are not entertainment substitutes for the local, owing to atmospheric and morse interference. Often these far-away stations vary greatly in strength and quality.

What exactly is the point, then, of tuning in such poor substitutes for the local? That question could, I know, be answered by scores of readers. The thrill of the chase; the detective on the scent; these are nothing compared with the excitement of tracking down dozens of Continental stations, of resolving each one of the hundred or one hundred and eighty degrees on the dial into the announcers of Budapest, Rome, Warsaw, even Moscow.

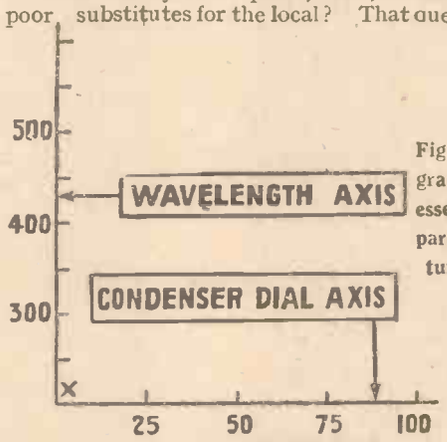


Fig. 1. This diagram shows the essentials in preparing a simple tuning graph

A few weeks ago I said a good set could get thirty stations. Let us see how the beginner can prove my contention. The tuning dial is divided into so many degrees, either 100 or 180. The ether is also divided, not in degrees, but in frequency channels. We can read a dial from 0 to 100 degrees. We can just as easily measure ether frequencies between 200 and 550 metres. In between these limits will be found most of Europe's broadcasting stations.

Before we can hope to get on the track of thirty stations we must co-relate the two divisions, of the ether and of the dial. The simplest way to do this is to construct a graph. By its aid we can eliminate most of the guesswork of long-distance reception.

Although this article is for beginners, I must assume something; that the listener knows, or is capable of locating, the dial readings for at least *three* stations. In London this is easy, for we have within easy range the National 261-metre transmitter, the Regional 356-metre transmitter and the Midland 479-metre transmitter. These three stations are suitable because of their wide difference in frequency. For listeners other than Londoners, the local B.B.C. station, one of the Regionals and a powerful foreigner will probably serve. The stipulation is that each of the stations shall be well separated and that their wavelengths shall be known.

By logging the locals we have established contact between the frequency divisions of the ether and the degree divisions of the dial. That is an important step. When the London Regional, for example, comes in at, say, 42 degrees on a 100-degree dial, it does so through the working of certain capacity and inductance constants in the set's tuning apparatus. These constants will determine the readings at which a station of another frequency, say the National, comes in. A law is involved that does not concern us. What does concern us is the manifestation of the law; its effect on the dial reading through the frequency scale.

For a graph expresses a law, and though we may not understand the law, its working, as perceived by dial readings, can be utilised to produce a graph, which can then be interpreted in a practical way. A graph, either a straight line of a curve, is a series of points joined together. The more graph points found by the graph law, the more accurate will be the graph. So the more *known* stations that can be logged for constructing the graph, the more accurately will the resulting graph interpret the *unknown* stations as dial readings.

To construct this graph we must relate frequency with dial degrees. One of the axes of the graph is a line divided into as many divisions as there are degrees on the dial, say 100. The second axis, which must be at right angles to the first, is a line divided into as many frequency divisions as there are in the ether. But as we are concerned with only a small

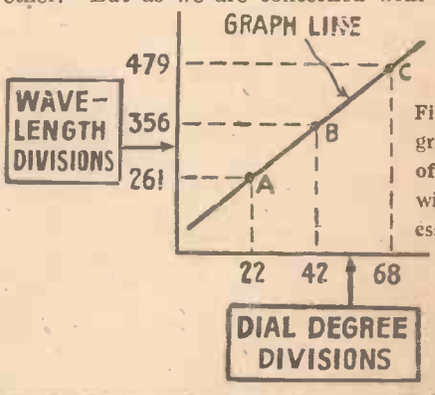


Fig. 2. Shows the graph in process of construction with the three essential points A B C in line

GLASGOW
Scotland
398.9 metres 1.2 kw.
Glasgow calling!

FRANKFURT
Germany
390 metres 1.7 kw.
Frankfurt am Main und Kassel!

TOULOUSE
France
385 metres 8 kw.
Allo! Ici Radio Toulouse!

HAMBURG
Germany
372 metres 1.7 kw.
Hier die Noragsender Hamburg, etc.

TRACK OF 30 STATIONS!

By ALAN HUNTER

slice of the total frequency band of the ether, we can divide this second axis in any convenient way.

The frequencies with which we are dealing range from 545 kilocycles (550 metres) to 1,500 kilocycles (200 metres). The brackets indicate the wavelengths corresponding to wireless waves vibrating at the frequencies mentioned. We have formed a habit of referring to a station's wavelength, probably because this can be more readily visualised than a high frequency. So we might as well refer to the fundamental frequencies of the transmitters by their wavelengths.

Our axis is divided into dial degree divisions and our second axis into any convenient wavelength divisions. Fig. 1 shows how the groundwork is prepared for a simple tuning graph. The wavelength divisions are along the vertical line and the degree divisions along the horizontal line, at right angles.

Before I started to write this article, I actually prepared a tuning graph for a non-expert friend. An account of this process will serve as a guide to the general principle. First of all one must buy suitable graph paper Large sheets measuring 30 inches by 22 inches cost about 4d. each. The squares can be either centimetre squares or one-tenth inch squares. I prefer the latter for graph making.

To prepare a handy-size graph I let one degree of the 100-degree dial represent one one-tenth inch square along the horizontal axis. This means a 10-inch line for a 100-degree dial or an 18-inch line for a 180-degree dial. The wavelengths between 200 and 550 metres, altogether 350 metres, were represented by 2 metres for a one-tenth inch square, or half the scale of the degree divisions. With 2 metres for a tenth of an inch, 350 metres take up 17½ inches. The junction of the axes starts at zero for the dial degrees, since that is the lowest limit of the dial, and at 200 metres for the wavelengths.

The general scheme is now taking shape. Having prepared suitable divisions of the axes we can carry on with the real job of graph making. Being a Londoner, I first tuned in the two Brookmans Park stations and the Midland Regional, in order to get three graph points. By the way, there is a good reason for *three* points and not just

(*Continued on page 676*)

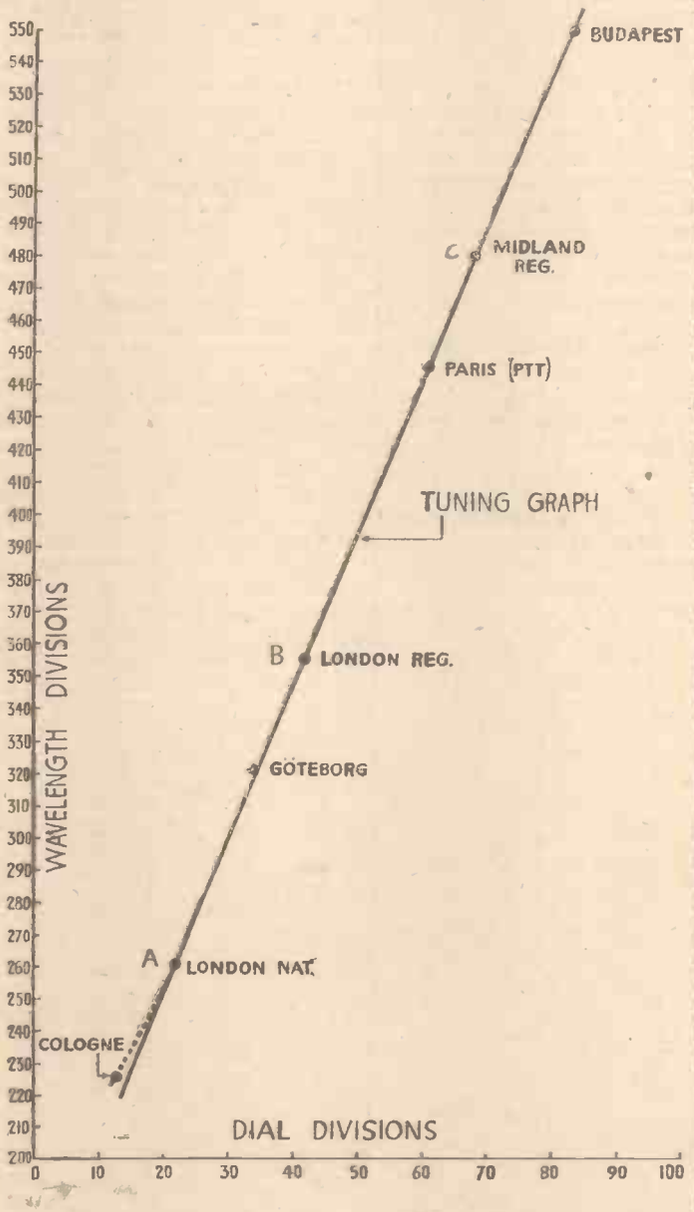


Fig. 3. Here is an example of a completed graph. Note the starting points indicated by the letters A, B, C

LONDON REGIONAL
356 metres 45 kw.
London calling!

GOTEBORG
Sweden
322 metres 15 kw.
Zherteborg rund Radio!

BORDEAUX LAFAYETTE
France
304 metres 35 kw.
Bordeaux Lafayette!

LYONS
France
287 metres .5 kw.
Ici Radio Lyon!

CORK
Ireland
224 metres 1.5 kw.
Cork station calling!

COLOGNE
Germany
227 metres 1.7 kw.
Achtung für die Westdeutschen Sender!

NURNBERG
Germany
239 metres 2.3 kw.
Hier deutsche stunde in Bayern, Munchen, Nurnberg, Augsburg und Kaiserslautern!

LEIPZIG
Germany
253 metres 2.3 kw.
Achtung! Achtung! Leipzig und Dresden!

HORBY
Sweden
257 metres 15 kw.
Stockholm rund Radio!

LONDON NATIONAL
261 metres 68 kw.
London calling!

BARCELONA
Spain
268 metres 10 kw.
Union Radio Catalana!

RENNES
France
272 metres 1.2 kw.
Ici le poste de Rennes!

TURIN
Italy
273 metres 8.5 kw.
Eiar Radio Milano!

KONIGSBERG
Germany
276 metres 1.7 kw.
Achtung! Königsberg und Danzig!

BRATISLAVA
Czechoslovakia
279 metres 14 kw.
Halo! Bratislava!

How to Use The "CHALL

THE performance of a set having two high-frequency stages depends chiefly, as you might well expect, upon the valves used. Particular attention should, therefore, be given to this.

If you put a good valve in the first stage, for instance, and a poor one in the second, you will obtain different results as compared with the reverse arrangement.

New valves will, no doubt, be nearly alike and little difference will normally be noted by changing them about. For the best results a pair of valves of the same make should be used, but there is no harm at all in trying odd valves, remembering that, as the circuit is arranged, the same value of high tension and screen voltage will be applied to both.

Suitable Valves

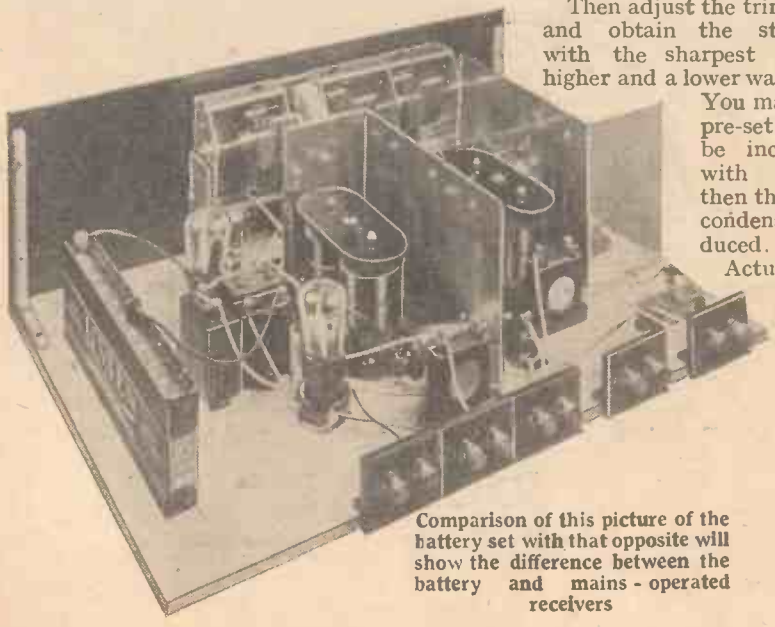
The screen-grid valves which I used in the battery model of the "Challenge Four" were Cossor 215SG, and they have proved entirely satisfactory with a high tension of 120 to 150 and a screen voltage of 60 to 75.

Most other makes have been tried and, with suitable voltages, have functioned properly. Do not use more screen voltage than necessary for the reason that the anode current increases with the screen voltage.

For detection in the battery set a Cossor 210HF valve worked well, and other valves of the same general type, having an impedance of approximately 20,000 ohms. With a valve of this class good magnification is obtained and a signal which will easily load the last valve to its capacity is secured without overloading the detector.

With a valve of lower impedance, such as from 10,000 to 15,000 ohms, good reaction effects will still be obtained, but the magnification will be down a little.

The size of the last valve and the amount of the high tension determines the actual strength of the signals. With a small valve and 120 volts high tension, the volume will be limited or overloading will occur. By using a bigger valve and more high tension you can obtain stronger signals, and that is all there is to be said about it. Use the biggest valve and the greatest amount of high tension that you can afford.



Comparison of this picture of the battery set with that opposite will show the difference between the battery and mains-operated receivers

A.C. Valves

In the mains set we have three indirectly-heated A.C. valves and a directly-heated power valve. The valves suggested last week are, perhaps, the best for the set, although here again there are alternatives.

For detection any valve of moderate impedance will work well, but in the screen-grid stages, with their common values of high tension and screen voltage, a little care is necessary, as explained in connection with the battery valves.

Both screen-grid valves are biased in the A.C. set. Wander plug G.B.—1 is connected to the first screen-grid valve and G.B.—2 to the second. A bias of —1.5 will suit the first valve and —3 the second, or —3 might be applied to both, depending upon the valves and the actual value of the high tension and screen voltage.

Grid Bias

The right bias for the power stage will depend upon the particular valve used, and for the Mullard AC064 a bias of —21 volts should be tried. This may be increased a little if tests show the results to be better.

When the set is made up with good coils it is necessary only to balance the circuits by adjusting the trimming condensers. Probably you will find that the second and third condensers will not need adjusting at all. The aerial circuit will, however.

First set the aerial circuit pre-set condenser about half in and tune to a distant station in the usual way with the volume control full on.

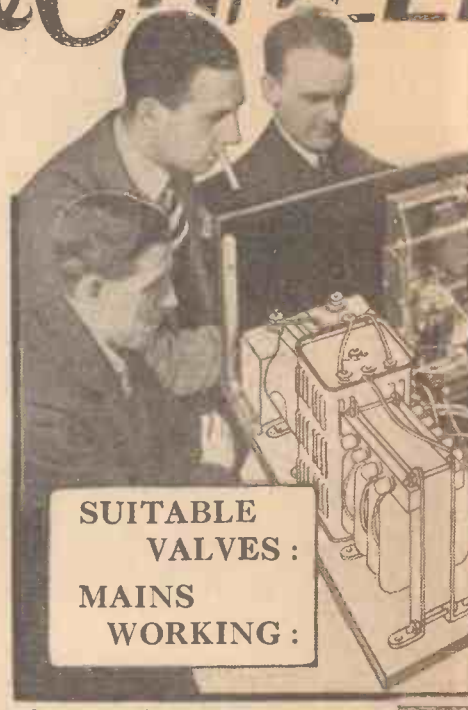
Then adjust the trimming condenser and obtain the strongest signals with the sharpest tuning. Try a higher and a lower wavelength station.

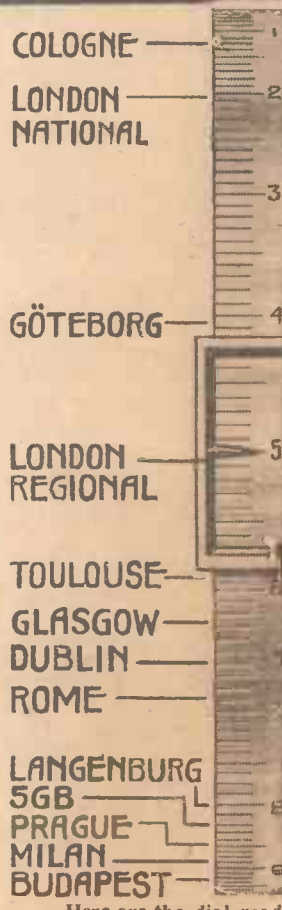
You may find that the pre-set condenser can be increased a little with advantage and then the first trimming condenser must be reduced.

Actually, the work is not at all difficult and the best all-round setting will soon be found by trial. It is a mistake to try adjusting all trimming condensers without a method or to loosen the moving plates upon the shaft and to shift them.

Those having a milliammeter will be able to adjust the circuit very quickly. Connect the meter in the anode circuit of the detector and tune the circuits to *reduce* the current by the greatest amount. With a detector having a grid condenser and leak, the anode current falls off when a signal is received and the amount of the reduction is a rough measure of the signal strength.

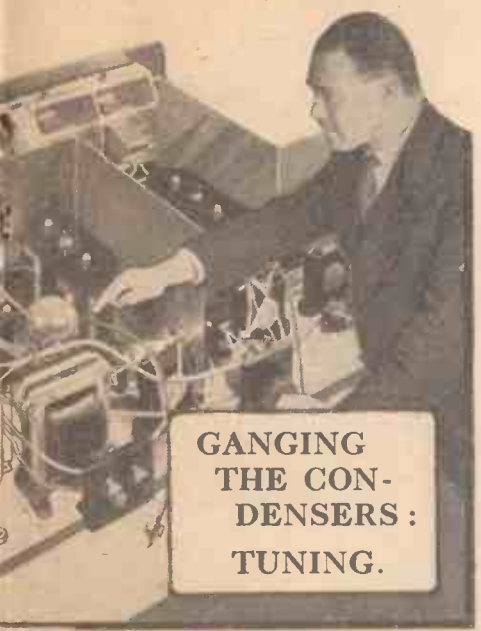
The high-frequency volume control fitted affects the tuning a little, but in such a manner that the effect is hardly noticeable. When the





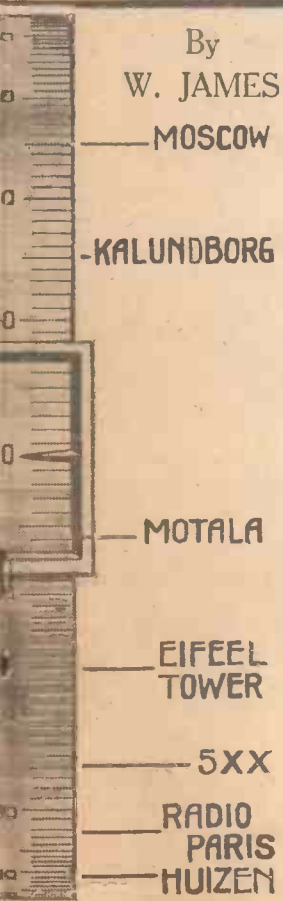
Here are the dial read Four." These will be

ENGE FOUR"



GANGING THE CONDENSERS: TUNING.

By W. JAMES



ings of the "Challenge lp you to log stations.

a little broader, but as this happens only when we have a strong signal, the effect is of no great consequence. The same thing usually happens when using reaction, for less is employed with a strong signal, and so the tuning is not quite so sharp.

Excellent Results

Of the numerous stations tuned in, only a few are indicated. Most stations, apart from the relay stations, are to be heard, the tuning being sharp. Comparing the results with, say, "Everybody's Three" or the "Brookman's Three," the chief difference, apart from the ease of tuning, is the readiness with which the stations are brought in. There is not so much forcing, the selectivity is better, and also the quality of the reproduction. This follows from the fact that there is no need for forcing and not being necessary to use so much reaction. After having used this four-valve set, the results obtainable from a good three-valve receiver seem lacking both in volume and quality. Four-valve sets will, undoubtedly, take the premier place in popularity.

control is full on, the circuit should be properly in tune, but when the volume is reduced the aerial circuit is detuned a little, its capacity being reduced by a small amount.

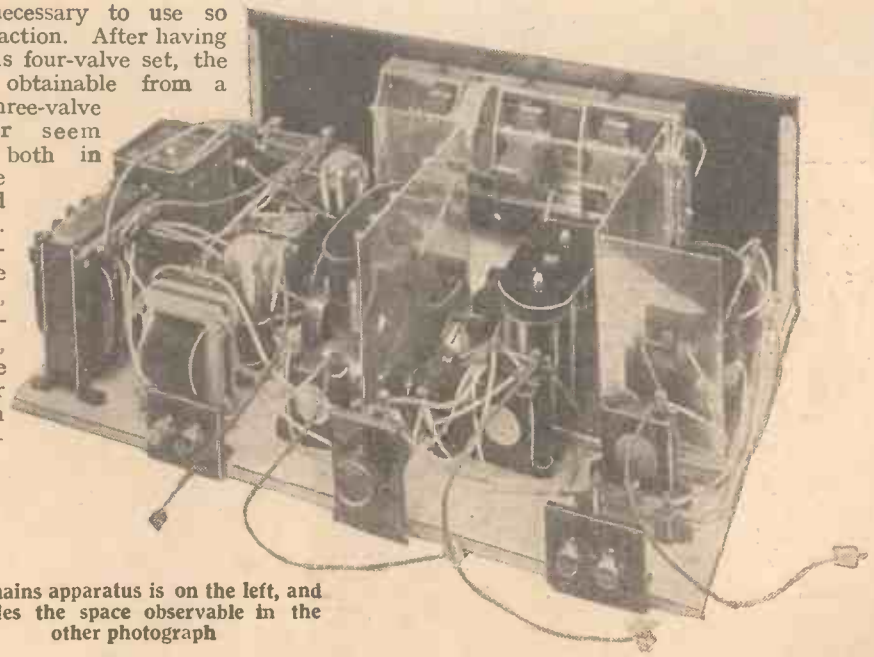
This is because the first valve has capacity and it is across the coil when the control is full on. When the control is put, say, half on, a resistance is in series with the condenser (formed by the valve, its wiring, and the potentiometer), with the result that the effective capacity across the circuit is reduced by a small amount. Thus the tuning is made

COMPONENTS REQUIRED FOR THE "CHALLENGE FOUR"

Cabinet (Clarion).
Ebonite panel, 21 in. by 7 in. (Trelleborg, Becol, Raymond).
Three-gang .0005-mfd. condenser with drum dial (J.B., Lotus, Polar, Formo).
.00034-mfd. differential reaction condenser (Lotus).
120,000-ohm potentiometer (Regentstat).
On-off switch (Readi-Rad, Bulgin, Benjamin).
Three special dual-range coils (Clarke's Atlas, Tunewell, Wearite, Readi-Rad, H. & B.).
Two 5-pin Universal valve-holders (Junit, H. & B., Parex).
Five-pin valve-holder (Burton, Lotus, Benjamin, W.B.).
Four-pin valve-holder (Burton, Lissen, W.B., Lotus, Benjamin).
Three 1-mfd. fixed condensers (Lissen, T.C.C., Dubilier, Igranic).
2-mfd. fixed condenser (T.C.C., Igranic, Dubilier, Lissen).
Two H.F. chokes (Telsen, Lissen, Varley, Readi-Rad, Igranic, R.I., Lewcos, Wearite).
Two .0003-mfd. fixed condensers (Lissen, T.C.C., Atlas, Readi-Rad, Dubilier, Watmel, Igranic, Graham-Farish).
.0002-mfd. fixed condenser (Lissen, Dubilier, Readi-Rad, T.C.C., Watmel, Atlas, Igranic, Graham-Farish).
1-megohm grid-leak with combinator (Lissen, Dubilier, Readi-Rad, Graham-Farish).
Low-frequency transformer (Varley Ni-core II, Telsen, R.I., Lewcos, Lissen, Igranic, Ferranti, Brownie, Burton).
Five terminal blocks (Junit, Belling-Lee, Lissen).
Ten terminals, marked: L.S.+, L.S.—, A., E., H.T.—, L.T.—, L.T.+, H.T.+1, H.T.+2, H.T.+3 (Belling-Lee, Eelex, Clix, Igranic, Burton).
Set of special screens (Readi-Rad, Parex, H. & B., Wearite).
15,000-ohm Spaghetti resistance (Bulgin).
Pair panel brackets (Bulgin, Readi-Rad, Keystone).
Pre-set condenser, .0001-mfd. maximum (Formo, Sovereign).
Two-volt accumulator (C.A.V. AG9, Exide, Ever Ready, Fuller).
100-volt H.T. battery, power type (Fuller, Ever Ready, Pertrix, Siemens).

ADDITIONAL APPARATUS REQUIRED FOR MAINS SET

A.C. transformer with following secondaries: 4-volt, 6-amperes, 135-volt (R.I. type E/Y19).
Metal rectifier, type HT7 (Westinghouse).
Low-frequency choke (Ferranti type B2, Igranic, R.I., Lissen, Varley).
Low-frequency choke (Igranic C30).
Three 4-mfd. fixed condensers (T.C.C.).
One 2-mfd. fixed condenser (T.C.C.).
Two 1-mfd. fixed condensers (Lissen).
Four wander plugs, marked: G.B.+, G.B.—1, G.B.—2, G.B.—3, (Belling-Lee).
120,000-ohm potentiometer (Regenstat) and ebonite bracket 3 in. by 2 in.
One 20,000-ohm and one 30,000-ohm Spaghetti resistances (Bulgin), replacing the 15,000-ohm resistance in the battery set.
In addition, only two terminal blocks and four terminals are needed for the mains set, and the on-off switch is omitted.



The mains apparatus is on the left, and occupies the space observable in the other photograph

A Weekly Programme Criticism—By SYDNEY A. MOSELEY.

Without Fear or Favour

TWO GOOD TRANSMISSIONS

DRAMA IDENTITIES

TWO important events were *Strife*, by John Galsworthy, and *Madame Butterfly*.

The transmission of *Madame Butterfly* was remarkable, in my view, because of the extraordinary tremolo of the lady in the name part! I am inclined, however, to put this down to nervousness, for as the transmission proceeded, "Butterfly" settled down.

Incidentally, I have never been impressed with the narrative manner of Filson Young. He has improved a wee bit since I first remarked on his monotonous delivery.

◆ ◆ ◆

I always like Galsworthy's works, and have read and re-read *Strife* and *Justice* and his other plays. I followed the transmission of the former play on two nights. There was certainly little cutting. At any rate, so far as the first act was concerned.

I find the difficulty in these productions is that of so differentiating the voices that you can tell at once who is speaking. Even with a book I am sometimes at a loss. However, the whole production was worthy of the B.B.C. and the Productions Department, not forgetting Howard Rose.

I hope they will go on to others of Galsworthy's works.

◆ ◆ ◆

If there is a better bass singer than Foster Richardson on the ether I should like to hear him.

◆ ◆ ◆

I was very glad to hear Harry Dearth in the League of Mercy concert.

Curiously enough, I was at Savoy Hill at 6.15 and saw Lady Tree, Mr. Henry Ainley and Miss Sophie Tucker, and another man whom I faintly recognised. He was Harry Dearth. The last time I heard him sing was when he sang a patriotic song very popular at the time, called "Motherland"; but that was rather a younger man who sang the stirring refrain.

At 6.30 I was listening a mile or more away to the talented artiste I had seen in the flesh a quarter of an hour previously. A double treat!

◆ ◆ ◆

I have not been able to throw bouquets to many singers of the past, but there is certainly nothing wrong with Harry Dearth, and I hope he will continue to appear before the "mike."

Henry Ainley, of course, needs no further bouquets. He is as good-looking and as gallant as ever. Lots of men would have looked stupid kneeling before the redoubtable Sophie. Not so our Henry!

◆ ◆ ◆

If it was indeed Norah Blaney who sang and mimicked at the Manchester Radio Exhibition, she was at her best. Bransby Williams, who also appeared, maintained his consistently high standard of entertainment, while Stainless Stephen's rather pathetic aside, "If the B.B.C. adopt television I am ruined," was as funny as the rest of his patter.

◆ ◆ ◆

By the way, talking about plays, how is it that there are so many changes in the cast before the actual performance? It seems to me people are chosen as a sort of try-out and that the official list is not the list of starters, but merely a list of entries.

◆ ◆ ◆

Frankly, I was disappointed in Astra Desmond when I heard her recently, and thought it was my set. Even if this were so, I cannot congratulate her on her choice of songs, which were by no means contrasted—all on a sombre key.

◆ ◆ ◆

Why must scientists use long words? Professor J. S. Haldane read us an essay on something about "mechanistic interpretations" in a dull monotone which spoilt what could have been an interesting paper on science and religion for many listeners. Personally, I let it go at that after listening for three or four minutes.

Victor Lewishon in cartoon

CHANGES OF CAST

ADVERTISING

◆ ◆ ◆

The Grand Hotel Orchestra, with Tom Jones, is deservedly popular, because they give us a popular programme without being banal. For instance, a programme consisting of "A Christmas Overture," by Quilter, the popular aria from *La Traviata* and Rigoletto's fantasy on *Carmen*, and another fantasy on the music of Mendelssohn, gives us melody we all know and like. The Mendelssohn fantasy was particularly welcome.

The singer, Thelma Tuson, sang those two arias in one, which so try the best of heroines in *Traviata*. Miss Tuson was perhaps not quite Milanne, but was very good indeed.

Two or three weeks ago I heard a lady singer in Berlin's chief opera house sing those arias very indifferently, although otherwise she was a perfect operatic singer.

◆ ◆ ◆

The trouble with most of these orchestras which centre round the conductor with his violin is that the violin is too much in evidence! Sometimes, too, there is too much musical gymnastics. But there is no gainsaying that the hotel orchestras are exceedingly popular with listeners.

◆ ◆ ◆

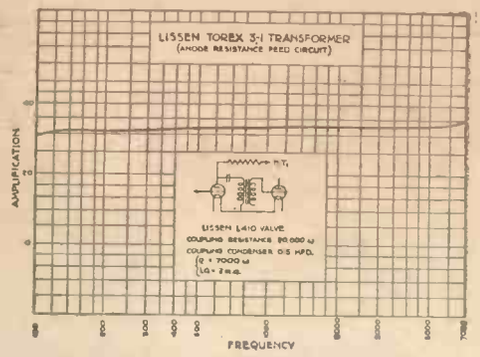
Robert Naylor has an agreeable voice for light ballads, but he has neither the fullness nor the dramatic quality needed for such efforts as two popular tenor songs in *Tosca*. Incidentally, I should like to announce that Mr. Naylor was singing by the "kind permission of the Palace management."

These announcements savour to me too much of advertising, although I quite understand that Mr. Naylor's contract may necessitate this grandiloquent "if it were not for the Palace I would not be singing here" sort of thing.

◆ ◆ ◆

Red Tabs, the play which was broadcast and was printed in the official organ, sounded better than it reads. I could not quite understand the end, however. The whole point seemed to me to be lost. I wonder if this was the case with other listeners. Perhaps I was in a dense mood.

A MIGHTY good TRANSFORMER WITH A CURVE!



for 5/6

THIS new Lissen Torex Transformer enables you to make a big cut in the cost of building amplifiers. It is a high-grade silicon-steel core transformer, with remarkably even amplification over the whole band of audible frequencies (see curve). It is a neat, compact component; moulded bakelite case which is hermetically sealed and completely insulates the windings. Proof against shorting, leakage or moisture.

WHERE TO USE IT

Use this Lissen Torex Transformer for the first L.F. stage of any amplifier. Use it where big amplification is desired at small cost. Use it for all temporary "hook-ups"—you can change it from set to set because it is a "general purpose" transformer.

Particularly fine results are obtainable when this transformer is used in an anode resistance feed circuit.

LISSEN

TOREX TRANSFORMER

LISSEN LIMITED, Worple Road, Isleworth, Middlesex

Please Mention "A.W." When Corresponding with Advertisers

SETS OF DISTINCTION

THE COSSOR EMPIRE MELODY MAKER

Makers: A. C. Cossor, Ltd.

Price: £6 - 17 - 6 complete with valves.

The Empire Melody Maker as it appears when completed

I AM a little behind the times in giving readers an account of the new Cossor Empire Melody Maker. This kit set really deserves all I can say about it. Here we have this year's effort on the part of Cossor's to meet the needs of non-expert listeners desiring to build a set that will give good reception with a moderate outlay.

For a three-valver with a stage of high-frequency amplification, the Empire kit is fine value, especially when you remember that the valves are included. Before I wrote this account, I had to satisfy myself that the Empire Melody Maker fulfilled two conditions. Firstly, it must be easy to build. Secondly, when built it must work well. So the makers supplied me with a small brown paper parcel containing all the parts, just as the constructor would get from his dealer.

The Empire Melody Maker kit ready for assembly

Everything was neatly packed. Even the screws and odd sundries such as hinges were packeted separately. In addition to the variable condensers, dual-range coils and other parts, this parcel contained pieces of wood and metal for the assembly of quite a good-looking cabinet.

A large assembly chart smooths out any wrinkles on the brow of the would-be constructor. By placing the picture of the baseboard exactly over the baseboard itself, one can punch through the pictured screw-holes to prepare for the mounting of the components. No snags at all at this stage; and after fixing the coils, low-frequency transformer, screen partition, and one or two other parts, I got on with the wiring. Here, again, the chart should enable the tyro to get on level terms with the technical man. The point-to-point wiring instructions are explicit.

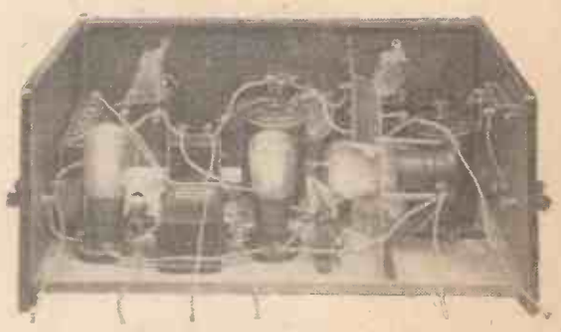
The wire is thin tinned copper, over which one slips the required lengths of insulated sleeving. Here is an example of the wiring sequence. No. 3 wire from terminal F on valve holder C to terminal on fuse holder L. No. 4 from same terminal on fuse holder L to terminal on .0003 condenser E. Now I see no reason why two separate leads should be used here. Why not a single length, starting at terminals F, looped round the fuse holder and continued to the .0003 condenser? That is what I did wherever possible. It saves quite a lot of time and certainly avoided making double pressure contacts under each terminal.

Gradually the set took shape, as I fixed the cabinet sides to the base, so that the panel components and terminals on each of the cabinet sides could be wired up according to instructions. That brought me to wire 33, leaving wires 34 and 35 for grid-bias leads. Then by consulting a smaller diagram I could see where to connect the high-tension and low-tension battery leads.

During tests of the completed Empire kit I noted the control lay-out. The aerial tuning condenser is on the left and the tuning condenser of the high-frequency coupling on the right. Between them is the on-off switch, with volume control on its left and reaction control on its right. The wavelength range from medium to long waves is changed by pulling or pushing small switches on the tops of the coils. This method makes for simplicity and as it eliminates complicated switching wiring it must also aid efficiency.

I found the volume from the two Brookmans Park stations overpoweringly loud. Here the volume control, which is a filament rheostat in the screen-grid valve circuit, acted well in cutting down the volume. Quality, considering the power valve is only a 215P, was good. But, remember, I use good batteries and a linen-diaphragm or inductor dynamic loudspeaker. The Cossor low-frequency transformer, preceded by the Cossor 210RC detector valve, delivers a good-quality signal.

Within limits, the selectivity is controllable by means of a pre-set condenser mounted in the cabinet. The makers have had to face the dilemma of all designers of this type of set. Whether to make the coils selective and thus lose volume on distant stations, or to make the coils suitable for long-distance reception and thus lose selectivity. I think they have arrived at a happy mean, with a slight tendency towards sensitivity.



A back view of the completed set

At all events, by the full use of the pre-set aerial condenser I was able to obtain adequate selectivity without loss of volume on the distant stations. The overall amplification of the three valves is very great, so that one can take some liberties with the aerial circuit.

I am including a list of signals heard during one hour's ether searching with the Empire kit. I think readers will agree that the set delivers the goods. I picked up many other signals during these tests, but as I could not identify them they are not logged. Finally, let me say that A. C. Cossor, Ltd., have produced a good kit at a popular price.

Stations received with the Empire Melody Maker during a recent test

	Dial Readings			Dial Readings	
Budapest	170	180	Dresden ...	82	92
Vienna ...	165	170	Bordeaux	78	84
Milan	154	164	Bratislava	62	73
Midland ...	146	160	National...	54	70
Langenberg	144	156			
Paris	136	150	Huizen ...	152	164
Belgrade...	131	144	Radio Paris	140	152
Berlin.....	128	140	Zeesen.....	136	140
Dublin ...	126	137	Daventry	130	135
Katowice	124	135	Eiffel Tower	110	124
Hamburg	115	126	Hilversum	50	68
Regional...	104	118	Aircraft ...	30	34

WE TEST FOR YOU

A weekly review of new components and tests of apparatus.

Conducted by our Technical Editor, J. H. REYNER, B.Sc., A.M.I.E.E.

Wates Polyscope

THE Wet H.T. Battery Co., Ltd., who market the Wates Three-in-One pocket meter, have produced a tester to work in conjunction with this meter, which they have named the Polyscope.

It consists of a small cylindrical container to take a standard two-cell battery. When in position the cell makes contact at one end with a long metal prong terminating in a point, and at the other end with a split socket.

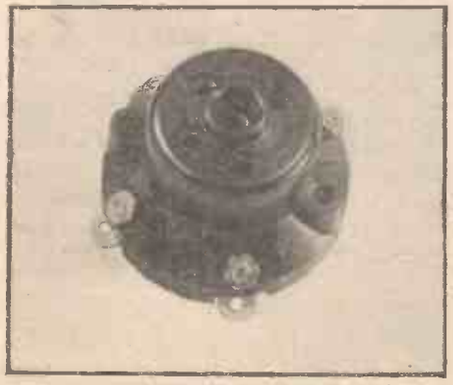
It is intended that this gadget should be interposed in the voltmeter circuit by placing the prong of the test meter in the socket and using the metal prong of the tester in its place.

Methods of testing for short circuits, continuity, insulation, or values of resistance are clearly explained in a leaflet. Resistance values corresponding to the Wates Three-in-One test meter have been fully worked out. A reading of 1 milliamp on this meter indicates that the resistance of the circuit being tested is 2,800 ohms, and in most cases a reading will be obtained when measuring through the primary of an inter-valve transformer.

It is always handy to have a means of testing for short circuits and continuity, and we can, therefore, recommend this device, which sells at 3s.

New Burton Valve Holder

WE have already referred in these columns to the fact that many indirectly-heated valves have rigid pins and,



A new Burton valve holder

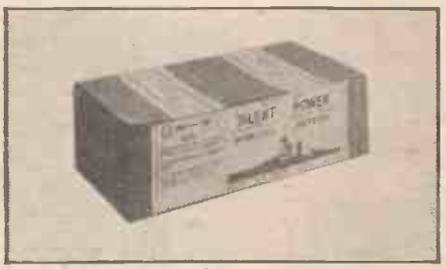
therefore, rely for contact on the efficiency of the holder.

In the new Burton valve holder the five sockets are made of thin phosphor bronze, bent round in the form of a cylinder, with overlapping wall. The pin of the valve causes the wall of the socket to expand, and as a result of this a good electrical contact is made between the pins and sockets without the necessity for an overtight fit. In addition there is a narrow piece of metal linking the socket up with the external soldering tags, which serves to insulate the valve from external vibration. Although most of the new indirectly-heated valves are so robust in construction that springing is unnecessary, this slight resilience will be of value in certain circumstances. Positive stops are provided for preventing undue movement of the sockets when inserting a valve.

This holder can be recommended to readers.

Silent Power Batteries

THIS week we have tested a "Silent Power" wireless battery, manufactured by L. E. Lewer, of Haxey, Doncaster. The cells of this battery are housed in a card-



A Silent Power high-tension battery

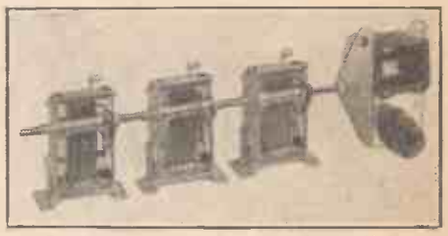
board container, measuring 10 in. by 5 in. by 3 in. high. The new battery is supplied with a sealed cardboard lid, with two accessible taps for voltage testing. One of these is made in the form of a stud and is, therefore, not available for continuous use until the seal has been broken. This safeguards purchasers against premature use. The full voltage of the battery is approximately 108, and eleven tappings provide intermediate values of voltage.

The battery was tested in our laboratories on a continuous discharge commencing at 7 milliamps and continuing until the rate had fallen to 3½ milliamps. This it did after a period of 191 hours, representing a useful capacity of just over 1,000 milliampere hours, thereby reaching the standard of 1,000 milliampere hours set for cells of normal capacity

Lotus Gang Condensers

MESSRS. GARNETT-WHITELEY, makers of Lotus components, are keeping abreast of the times with their new ganged condensers. These include the well-known Lotus brass vane variable condensers, with the addition of lugs attached to the end plates for mounting to the baseboard. The spindle connecting the moving vanes of these condensers is adjustable and it is, therefore, possible to alter the distance apart of consecutive condensers.

Finally, there is the drum-drive mechan-



Lotus gang condenser and drum dial

ism, operated by rotating an external knob. The scale reading is viewed through an attractively shaped moulded window, which when mounted in position, will be at a height of approximately 4 in. from the baseboard. The double spring-loaded friction gearing is particularly smooth in action and quite devoid of slip even when three or four condensers are being driven. Considerable care appears to have been expended in the design of this mechanism.

We recently tested a Lotus triple-ganged condenser unit, and can vouch for the efficiency of the unit. No screening is included, but this may be readily added. The maximum and minimum of each condenser was taken separately, and in no case did the variation exceed 4 micro-micro-farads, a value which may easily be exceeded by the grid-filament capacity of the wiring.

This unit is thoroughly efficient, both electrically and mechanically.

H. Clarke (Manchester), Ltd., have now a new London office at 60 Chandos Street, Strand, W.C.2 (phone, Temple Bar 7130), where may be seen the complete range of Atlas parts, including the new mains units.

Now fitting out on the Clyde, the mammoth new Canadian Pacific liner, *Empress of Britain*, will carry one of the latest Marconi short-wave wireless telephone installations when she enters the Atlantic service next year. This equipment will allow passengers to communicate with other telephone subscribers in Europe, Canada, and the United States through appropriate land stations. The input power to the transmitter will be 20 kilowatts, and the installation will be similar to that used by Marconi recently when he spoke from his yacht in the Mediterranean to nearly all parts of the world.

HOW TO TEST YOUR L.F. TRANSFORMER

By J H REYNER, B.Sc., A.M.I.E.E.

ONE occasionally encounters a low-frequency transformer which has broken down, or which is suspected of being defective in some way or another. The question then arises as to how one's suspicions may be verified in the most expeditious manner. One of the simplest remedies, of course, is to replace the existing transformer with another one, preferably of somewhat similar characteristics. Then if the circuit behaves correctly with the new transformer, there is something wrong with the old one.

In order to check up the old transformer, having removed it from the set, a battery and a milliammeter should be employed. The old method of using a pair of 'phones is not reliable, because the self capacity of the winding is capable of causing a relatively loud "click" on making the circuit, even though there is no actual continuity. Therefore, it takes a somewhat expert ear to discriminate between the noise which is made if the winding is continuous and in order, and the capacity click which is obtained if the winding is broken.

Using a Milliammeter

A milliammeter, on the other hand, will show up the defect at once. The average resistance of a transformer primary ranges from a few hundred to, perhaps, 1,000 ohms, and one should choose the voltage to suit the milliammeter in order to obtain the satisfactory deflection. For example, if one has a milliammeter reading up to 20 or 30 milliamps, so that it is quite possible to detect a reading of 5 milliamps, then a 4½-volt battery will be sufficient. If the transformer has a resistance of 1,000 ohms a reading of 4½ milliamps will be obtained if the winding is "through." If the transformer resistance is less than this, say 500 ohms, a reading of 9 milliamps will be obtained. If, on the other hand, the winding is broken, no reading at all will result.

A similar test may be placed on the secondary winding of the transformer, but here the resistance is usually several thousand ohms, and one must use a rather higher voltage battery, somewhere between 10 and 20 as a general rule, in order to obtain a satisfactory deflection. It should be emphasised, however, that when dealing with the secondary winding of a transformer, the current should be kept within reasonable limits, as owing to the fine wire used, there is a possibility of heating up. Do not pass more than about 10 milliamps through the secondary winding of a transformer, in order to be on the safe side.

Testing for Shorts

Another test which one may have to make is that for a short circuit to the frame, or a connection between the two windings. For this purpose a voltmeter should be used, capable of reading about 100 volts or more. Connect one side of the voltmeter to a 100-volt battery and the other side to the primary winding of the transformer. The other side of the battery should then be connected either to the core or the secondary winding, according to the test required. If there is a direct connection between these two points, the voltmeter will read. If it reads the full value, there is a direct short circuit; if it only reads a fraction of the full voltage, the short circuit is a partial one, indicating a resistance of several thousand ohms, but this is, nevertheless, quite sufficient to give trouble in an amplifying circuit. A similar test may be made, if desired, between the secondary winding and the core.

Continuity Tests

Testing for breaks may be carried out without removing the transformer from the circuit For this purpose a voltmeter is required, the test being carried out as follows. The negative terminal of the voltmeter is connected to H.T.—, while the positive terminal is connected to a lead, preferably terminating in a test prod, or some similar device. Place this test prod first on the H.T. tapping which feeds the particular transformer under examination. Note the reading. Now move along to the H.T. point on the transformer. This should give the same reading. Now make a test on the other side of the transformer primary, i.e. the terminal going to the anode of the valve. This, again, should give practically the same reading, allowing for a small voltage drop due to the current taken by the meter itself. If the transformer is broken, however, there will be no voltage at this point and this at once gives a definite indication.

A similar test may be made on the secondary, using a lower range voltmeter, and measuring the grid-bias voltage. The voltage at the D.C. side of the transformer secondary should give the full grid-bias voltage. On the grid side of the transformer there should still be an appreciable voltage. Owing to the high resistance of the transformer secondary, however, there will be an appreciable voltage drop in this case, unless the voltmeter is one which takes a very small current. If any indication is obtained at all, however, it indicates that the circuit is functioning, whereas if there is a distinct break no voltage will be developed.

RADIO WEATHER-CHARTS FOR SHIPS?

IS it possible and convenient to broadcast weather charts to ships by any radio-picture system?

Such services are being largely used for the transmission of newspaper drawings and advertisements from one country to another. Interest has consequently been aroused in the possibility of utilising this in connection with ships and aircraft.

The subject was one of those which came under discussion at the meeting of the Executive of the Comite International Radio-Maritime in Brussels last month. The experts gathered there, representing some forty countries, were satisfied that it would be premature at present to undertake a service of picture transmission to ships.

The difficulties which have yet to be surmounted are both technical and commercial. Cost is a decided obstacle at present, and the results obtained do not at this stage appear to justify the cost.

The main object of such a service is the contribution it will make to safer navigation and quicker voyages, with reduced risks. It can do this by supplying the navigator with weather charts which will give him an indication of the weather conditions, so that he can see at a glance where bad areas of weather lie.

At the present stage of development, sets to give reliable results such as would be required to inspire confidence, must be fairly elaborate, and from the commercial point of view the probability is that such a weather chart service could not be conducted at a charge of less than a guinea a day for each ship.

In addition, the time taken is considerable—amounting to about twenty minutes continuous transmission for a weather chart and while this is being received on board ship the handling of ordinary traffic would probably have to be suspended.

The technical "snags" still to be overcome include interference from other signals and from atmospherics—which might render the charts illegible in parts.

Television might solve the time question, for the transmission would be instantaneous, but there would still be fading to tackle.

K. U.

A NOTE REGARDING THE "CHALLENGE FOUR"

IN the half-scale wiring plan of the mains version of the "Challenge Four," at a point approximately 1¼ in. above the letter "E" in the word ebonite, two wires which should cross may appear to be joined. These wires are connected to the screen-grid of the second screen-grid valve holder, and to the right-hand terminal of the 120,000-ohm potentiometer, and, of course, must not be connected together.

The Rectifier—Horizontal or Vertical?

The Westinghouse Co. have written to me regarding the mounting of the metal rectifier, style HT7, in the A.C. model of the AMATEUR WIRELESS "Challenge Four" receiver, pointing out that this unit is designed to be mounted horizontally.

They say that in mounting the unit vertically its safe output is reduced. I knew this at the time and, from experience, know that the rectifier will perform satisfactorily with the load imposed upon it by the receiver, but any reader desiring to do so could, of course, fix the unit horizontally, according to the makers' recommendation, but this will involve some re-arrangement of components.

W. JAMES.

"Britain's Favourite Two"

SIR,—In answer to Mr. H. Andrews' (Birmingham) request on October 11, I should like to offer this list of stations obtained on "Britain's Favourite Two" This is on the original "B.F.T," as I stand by ordinary plug-in coils.

LONG WAVES

Huizen	138°	Zeesen	113°
Radio Paris	119°	Eiffel Tower	91°
Hilversum	37°		

SHORT WAVES

Budapest	176°	London Regional	99°
Milan	157°	Barcelona	96°
Midland Regional	149°	Brussels No 2	91°
Rome	134°	Breslau	80°
Berne	119°	Aberdeen	69°
Toulouse	110°	Bratislava	60°
Hamburg	106°	Turin	57°
National	50°		

These readings are with Ormond slow-motion dial.

Most of these are fair loud-speaker stations, but several more are obtainable by phones. W. G. G. (Merstham).

Condensers and Tonal Quality

SIR,—The letter from A.J.W. (Manchester) under the above heading regarding differences when using brass or aluminium vanes is very interesting, but is the writer sure there was no difference in the construction, capacity, or the quality between the condensers he mentions?

I have proved that the wider spacing of variable condenser vanes gives a higher degree of efficiency. In my opinion, many of the present-day condensers have too much metal in them, and it is only just recently that I have been able to obtain manufactured condensers which are nearly ideal; that is, no end plates are fitted and the size is kept to the minimum.

I have made variable condensers with plates of brass, copper, zinc, and aluminium, but in substituting one for the other in a set I have not noticed any difference which I attributed to the different metal used. However, I shall be glad if A.J.W. will write me direct. J. W. HOBLEY.

The Drive,
Wellingborough.

Show Salesmen

SIR,—With reference to R.L.'s letter in the issue of AMATEUR WIRELESS dated October 11, his is not the only experience. One salesman told me how many of a certain article he had sold in a certain time. He had maintained the same rate right from the opening of the Exhibition. When I got home I worked it out, and found he had sold enough to keep his factory going for twenty years without a stop. I don't know what he had done by the end of the show! F. M. (Rugby).

Augmented Orchestras

SIR,—This to draw your attention to the opinions of your numerous readers in the north.

When will the B.B.C. learn that we do not want a great volume of *noise* transmitted to us?

The augmented orchestras simply give a mass of "mush," and the sooner orchestras are cut down to give us more music and less noise, the better we shall enjoy it.

W. B. (Stockport).

RADIOGRAMS

MORE Djinn and Bitters, which was first broadcast last year, is to be revived by Gordon McConnel on November 4 and 5, with music by Harry S. Pepper, the "Co-Optimist."

The Reid Orchestra of Edinburgh, one of the leading musical combinations north of the Tweed, will be heard on November 6, when a programme will be relayed to the National transmitters as well as to the Scottish stations. The concert will be conducted by Professor Tovey, and will include the "Symphony No. 1 in C minor," by Brahms, and a Scottish overture by Dr. J. B. MacEwan.

"That Certain Trio," who made their microphone debut last year, return to Savoy Hill on November 7 in a Regional vaudeville programme, minus one of the original members. She is Anne de Nys, who sang in French. Her place is to be taken by Peggy Cochrane, the concert violinist, who is equally at home in syncopation at the piano. William Walker remains with the trio, also Pat Waddington.

The National Orchestra of Wales, conducted by Reginald Redman, will give a musical comedy programme from Cardiff on November 10. The vocalists will be Nita Barri and Arthur Holland, who have specialised in singing duets from musical comedy and revues. Mr. Holland tells an amusing story of a contest in which he unwittingly took part. He was singing Friar Lawrence in Gounod's *Romeo and Juliet* at a Yorkshire choral concert and, thinking the trombone unusually loud, he began to sing louder in order to be heard. However, this had no effect, for the trombone just put on pressure. After the performance the trombone player came to the artistes' room to compliment the tired singer. "Aye, lad, 'twere a treat," he said. "That's the best blow A've had for years!"

Pompey the Great, the tragedy by John Masefield, which ranks with John Galsworthy's *Strife* as one of the greatest dramatic broadcasts ever carried out by the B.B.C., will be revived on the National transmitters on November 7.

The Manchester Unity of Oddfellows concert, which is to be given by the North London district, will be relayed from the Queen's Hall on November 8. Besides the Wireless Military Band, several old broadcasting favourites will be heard, including Stuart Robertson and T. C. Sterndale Bennett.

The outstanding item in the Manchester and Leeds programmes for the week beginning November 2 will be the relay of the performance by the Huddersfield Choral Society of *Solomon*, by Handel. This choir of three hundred is conducted by Sir Henry Coward, and the orchestra is led by Alfred Barker. The fame of the Huddersfield Choral Society is widely spread, and during a visit to Holland two years ago they obtained the reputation of being the best choir ever heard.

A contrast in war plays will be heard by Cardiff listeners during a *Martial Medley* programme on November 15. The first, entitled, *At Monk's Close*, is an episode of the Commonwealth, by Miriam Pritchett. The second play, *Wait For It*, by Donald Davies, has for its setting an estaminet in France in 1916. The author will take the part of one of the old soldiers who "never die."

"Challenge Four" Valves. — It should be noted that the figure of £2 19s. for the valves for the "Challenge Four," given in the H. & B. advertisement on page 637 of "A.W." No. 437, applies to the battery valves only. The mains valves are £4 2s. 6d.

FULL-SIZE BLUEPRINTS

When ordering, please send Postal Order, NOT STAMPS

CRYSTAL SETS (6d. each)

B.B.C. Brookman's Park Set AW206
Regional Crystal Set WM176

ONE-VALVE SETS (1s. each)

B.B.C. Official One AW208
Hartley Single-valver WM198

TWO-VALVE SETS (1s. each)

Talisman Two (D, Trans) AW194
No-battery A.C. Mains Two (D, Trans) .. AW230
No-battery Gramo-radio 2 (D, Trans) .. AW238
1930 Talisman 2 (D, Trans) AW239
Easy Tune Short-wave 2 (D, Trans) AW242
Searcher Two (D, Trans) AW245
Arrow Two (D, Trans) AW249
Forty-five-shilling Two (D, 8 Trans) AW250
Brookman's Two (D, Trans) WM168
New Crusader (D, Trans) WM182
Radio-Record Two (SG, D) WM187
Gleaner Two (D, Trans) WM201
Music Monitor (D, Trans) WM208
Merlin Two (A.C. Set) WM213

THREE-VALVE SETS (1s. each)

Wide World Short-wave Three (HF, D, Trans) AW207
1930 Ether Searcher (SG, D, Trans) AW211
Best-by-Ballot Three (SG, D, Trans) Price 4d. free with copy of "A.W." AW217
Everybody's All-electric Three (SG, D, Trans) —A.C. AW221
1930 Clarion Three (SG, D, Trans) AW223
Beginner's Regional Three (D, 2LF) AW233
Britain's Favourite Three 1930 (D, 2 Trans) .. AW243
Car Three (D. R.C. Trans) AW244
The "A.W." Exhibition 3 .. .. AW247
Standard Coil Three (HF, D, Trans) WM117
Brookman's Three (SG, D, Trans) WM161
Community Three (D, RC, Trans) WM164
Brookman's Push-Pull Three (SG, D, Trans) 1/6 WM170
All-nations Three (D, 2 Trans) WM178
Inceptordyne (SG, D, Pentode) WM179
Brookman's A.C. Three (SG, D, Trans) 1/6 .. WM184
Music Marshal (D, 2 Trans) WM190
Gramo-Radio D.C. Three (SG D Trans) .. WM196
Concert Three (D, 2 Trans) WM199
New Lodestone Three (HF, D, Trans) WM205
De-Luxe Three (D, RC, Trans) WM209
Five-Point Three (SG, D, Trans) WM212
Falcon Three (A.C. Set) WM217
New Brookman's Three (SG, D, Trans) .. WM218

FOUR-VALVE SETS (1s. 6d. each)

Music-Lover's Gramo-radio (SG, D, RC, Trans)—1s. 6d. AW202A
Music-Lover's Gramo-radio (Loud-speaker) 1s. AW202B
Horizon Four (SG, D, 2 Trans) AW237
Challenge Four (2SG, D, Trans) with copy of "A.W.," 4d. post free AW251
Challenge Four (2SG, D, Trans, mains operated) with copy of "A.W.," 4d. post free AW252
1930 Monodial (2SG, D, Trans) WM158
Electric Four (All A.C.—SG, D, RC, Trans) .. WM162
Brookman's Four (2SG, D, Trans) WM174
Transportable Four (SG, D, 2 RC) WM180
Super Q4 (SG, D, 2 Trans) WM189
Lodestone Four (HF, D, RC, Trans) WM193
Searcher's Four (SG, D, RC, Trans) WM194
Invitation Four (SG, D, RC, Trans) WM200
Regional Band-pass Four (SG, D, RC, Trans) WM211
Five-Point Four (SG, D, RC, Trans) WM216

FIVE-VALVE SETS (1s. 6d. each)

James Quality Five (2SG, D, RC, Trans) .. AW227
All-wave Lodestone Five (HF, D, RC, Push-pull) WM146
1930 Five (2HF, D, RC, Trans) WM171
Dual-screen Five (2SG, D, RC, Trans) WM185
Radio-Record Five (SG, D, Trans-parallel) .. WM188
Overseas Five (3SG, D, Trans) WM191

AMPLIFIERS (1s. each)

"A.W." Gramophone Amplifier AW205
Two-valve Amplifier AW216
"Mag" Gramo Unit AW224
Radio-Record Amplifier (DC Mains) WM183
Selecto Amplifier (HF, Unit) WM210

MISCELLANEOUS (1s. each)

Short-wave Adaptor (1 v.) AW183
Simplest H.T. Unit AW197
By-pass Unit (Wavetrap) with copy "A.W."—4d. AW218
"Twin" Brookman's By-pass (6d.) AW222
James H. T. and L.T. Charging Unit AW232
Simplest H.T. Eliminator for D.C. Mains .. AW234
Simplest H.T. Eliminator for A.C. Mains .. AW236
Choke Output Unit AW240
Simple Tester Unit (6d.) AW246
"A.W." Improved Linen-diaphragm Speaker AW248
A.C. Mains Amplifier WM149
H.T. Unit for A.C. Mains WM159
Brookman's "Wipe-outs" WM186
Short-wave adaptor for Overseas Five WM192
Staminator Unit for A.C. Mains WM202
Universal Push-pull Amplifier WM204
Outspan Short-wave Adaptor WM207
"W.M." Standard A.C. Unit WM214
"W.M." Standard D.C. Unit WM215
Falcon A.C. Unit WM219 1/-

PORTABLE SETS

Continental Portable (SG, D, Trans) .. AW241 1/-
Pedlar Portable Two (D, Trans) .. WM195 1/-
Pedlar Portable Three (D, 2 Trans) .. WM197 1/-
James Portable SG3 (SG, D, Trans) .. WM203 1/-
Foursome Portable (SG, D, 2 Trans) .. WM206 1/6

Copies of the "Wireless Magazine" and of "Amateur Wireless" containing descriptions of any of these sets can be obtained at 1s. 3d. and 4d. respectively, post free. Index letters "A.W." refer to "Amateur Wireless" sets and "W.M." to "Wireless Magazine."

AMATEUR WIRELESS 58-61 FETTER LANE LONDON, E.C.4.

"ON THE TRACK OF THOSE 30 STATIONS!" (*Continued from page* 659)

two. For any two points can be joined by a straight line, but a straight line can be drawn through three points only if all obey the same law. If we attempted to form our graph line by logging one station at the top of the scale and a second station at the bottom, and joining the two wavelength-degree points together, the graph might be accurate, but in all probability it would not. It is true that the two points would obey the same law, but a third point checks up one's observations of that law.

I started with the National, which came in at 22 degrees on the tuning dial. From the "A.W." list I find this station has a wavelength of 261 metres. Here, then, are my first two points. Moving along the horizontal axis I stop at 22 degrees and rule a vertical line from that point. Moving up the vertical axis I stop at 261 metres and rule a horizontal from that point until it intersects the vertical just drawn. This point of intersection is *the* point, obeying the graph law. It is marked A in Fig. 2.

Next, I tuned in the Regional, which was logged at 42 degrees. Its wavelength is 356 metres. As before, I moved along the horizontal axis until I stopped at 42, then ruled a vertical from that point. Moving up the vertical axis until I reached 356 metres I ruled a horizontal from that point. The intersection of the horizontal and vertical lines gave me point B. Even at this stage, points A and B could be joined together and extended up and down to complete the graph, but the graph would be accurate only between the points A and B, corresponding to a wavelength range between 261 and 356 metres. And that is assuming points A and B are themselves accurate.

So I continued by tuning in the Midland Regional, logged at 68 degrees. Its wavelength is 479 metres. So once more I moved along the horizontal axis, stopping at 68 degrees to rule my third vertical. Then up the horizontal axis until the 479-metre point was reached, when a horizontal was ruled at that point. Its intersection with the vertical gave me point C—and enough to start my graph.

Although I must have drawn thousands of graphs in my time, I always get a little excited when the time comes to join up the points. In this example I found my care rewarded, for the three points, A, B and C, could be joined by a line running absolutely true through all three. Had one of the three been off the track I should have carefully re-tuned the stations to see whether the dial readings had been accurately logged. For with accurate dial readings, and a knowledge of the wavelengths of B.B.C. stations, an accurate graph is possible.

To test the accuracy of the graph line after joining up A, B and C, I decided to try four powerful foreigners. According to the graph, Budapest at 550 metres should come in at 83 degrees on the tuning dial of the set involved. I logged this station at 82 degrees, which is good going, considering its position is right at the top of the line.

Rome at 441 metres should, according to the graph, come in at 60 degrees. It could not be found, but Paris was logged at 61 degrees. This corresponds to 446 metres on the graph, again not far out, for this Paris station's wavelength is 447 metres. Greatly cheered, I decided that a station between B and A would serve a useful check. I chose Göteborg on 332 metres. Moving up this mark on the graph and then horizontally to the right until I hit the graph line and dropping a vertical at that point to the tuning scale axis, I found Göteborg should come in at 35 degrees. Actually he came in at 34 degrees, which was very pleasing. Only one more check was deemed necessary.

The bottom of the graph is the most likely to be inaccurate, as the straight line tends to curve off as the capacity of the tuning approaches its minimum. So I selected Cologne as my last check. Its wave of 227 metres corresponds to 15 degrees on the graph. Actually Cologne came in at 13 degrees, so a slight modification of the lower end of the graph would be needed to make it accurate.

I have dealt at length with the making of this graph to show how easy it is to cut out the guesswork of long-distance reception.

It is a great feeling when you hear: "Achtung Fur die Westdeutschen Senderl" to be able to say to yourself, "I *knew* it was Cologne before the announcer spoke!"

BROADCAST TELEPHONY

Broadcasting stations classified by country and in order of wavelengths. For the purpose of better comparison, the power indicated is *aerial energy*.

Metres	Kilocycles	Station and Call Sign	Power (Kw.)
GREAT BRITAIN			
25.53	11,751	Chelmsford (GSW)	15.0
200	1,500	Leeds	0.16
242	1,238	Belfast	1.2
261	1,148	London Nat.	68.0
288.5	1,040	Newcastle	1.2
288.5	1,040	Swansea	0.16
288.5	1,040	Stoke-on-Trent	0.16
288.5	1,040	Sheffield	0.16
288.5	1,040	Plymouth	0.16
288.5	1,040	Liverpool	0.16
288.5	1,040	Hull	0.16
288.5	1,040	Edinburgh	0.4
288.5	1,040	Dundee	0.16
288.5	1,040	Bournemouth	1.2
288.5	1,040	Bradford	0.16
301	995	Aberdeen	1.2
309.9	968	Cardiff	1.2
356	842	London Reg.	45.0
376.4	797	Manchester	1.2
398.9	752	Glasgow	1.2
479	626	Midland Reg.	38.0
1,554	193	Daventry (Nat.)	35.0
AUSTRIA			
246	1,220	Linz	0.6
246	1,220	Salzburg	0.6
283.6	1,058	Innsbruck	0.6
352	851	Graz	9.5
453	666	Klagenfurt	0.6
517	578.5	Vienna	20.0
BELGIUM			
206	1,460	Antwerp	0.4
212	1,415	Binche	0.2
216	1,391	Chatelineau	0.25
243	1,235	Courtrai	0.1
244.7	1,226	Ghent	0.25
251.4	1,194	Schaerbeek	0.5
338.2	887	Brussels (No. 2)	12.0
509	590	Brussels (No. 1)	1.2
CZECHO-SLOVAKIA			
263	1,139	Moravska-Ostrava	11.0
279	1,076	Bratislava	14.0
293	1,022	Kosice	2.5
342	878	Brunn (Brno)	3.0
487	617	Prague (Praha)	5.5
DENMARK			
281	1,067	Copenhagen	1.0
1,153	260	Kalundborg	10.0
ESTONIA			
401	748	Reval (Tallinn)	0.7
FINLAND			
221	1,355	Helsinki	15.0
291	1,031	Viipuri	15.0
1,796	167	Lahti	54.0
FRANCE			
172.5	1,739	St. Quentin	0.3
200	1,500	Radio Roubaix	0.2
210	1,430	Radio Touraine	0.2
219	1,370	Béziers	0.6
222.9	1,346	Fécamp	0.7
235.1	1,275	Nimes	1.0
249.5	1,202	Juan-les-Pins	0.5
256	1,171	Toulouse (PTT)	1.0
265	1,130	Lille (PTT)	1.0
272	1,103	Rennes (PTT)	1.2
286	1,049	Montpellier	1.2
287.2	1,044.6	Radio Lyons	0.5
296.6	1,012.2	Limoges (PTT)	0.08
299.5	1,001.3	Paris Experimental and on 40.9 m.	3.0
300	1,000	Strasbourg	0.35
304	988	Bordeaux (PTT)	8.0
316	950	Marseilles (PTT)	1.5
328.2	914	Grenoble (PTT)	1.2
329	911	Caen (Normandy)	0.6
329.5	910.3	Poste Parisien	1.2
345.2	869	Strasbourg (testing shortly)	15.0
369.3	812.3	Radio LL (Paris)	0.5
385	779	Radio Toulouse	8.0
447	671	Paris (PTT)	1.0
466	644	Lyons (PTT)	2.3
1,446	207	Eiffel Tower	15.0
1,725	174	Radio Paris	17.0
GERMANY			
31.38	9,560	Zeesen	15.0
218	1,373	Flensburg	0.6
227	1,319	Cologne	1.7
227	1,319	Münster	0.6
227	1,319	Aachen	0.31
232.2	1,292	Kiel	0.3
239	1,256	Nürnberg	2.3
240.4	1,217.2	Cassel	0.3
253.4	1,184	Leipzig	2.3
259.3	1,157	Gleiwitz	5.0
270	1,112	Kaiserslautern	0.25
276	1,085	Königsberg	1.7
283.6	1,058	Magdeburg	0.6
283.6	1,058	Berlin (E)	0.6
283.6	1,058	Stettin	0.6
316.6	947.6	Bremen	0.3
318.8	941	Dresden	0.3
325	923	Breslau	1.7
360	833	Stuttgart	1.7
372	806	Hamburg	1.7
390	770	Frankfurt	1.7
419	716	Berlin	1.7
452.1	663	Danzig	0.25
473	635	Langenberg	17.0
533	563	Munich	1.7
560	536	Augsburg	0.3
566	530	Hanover	0.35
570	527	Freiburg	0.3
1,635	183.5	Zeesen	35.0
1,635	183.5	Norddeich	10.0
HOLLAND			
31.28	9,599	Eindhoven (PCJ)	30.0
299	1,004	Hilversum	8.5
299	1,004	Radio Idzerda (The Hague)	0.6
1,071	280	Scheveningen-Haven	5.0
1,875	160	Huizen	8.5
HUNGARY			
210	1,430	Budapest (Csepel)	1.0
550	545	Budapest	23.0
ICELAND			
1,200	250	Reykjavik (shortly testing)	16.0
IRISH FREE STATE			
224.4	1,337	Cork (1FS)	1.5
413	725	Dublin (2RN)	1.5
ITALY			
25.4 and 80		Rome (3RO)	9.0
247.7	1,211	Trieste (testing)	3.0
274.1	1,094.5	Turin (Torino)	8.5
332	905	Naples (Napoli)	1.7
379.5	790	Genoa (Genova)	1.5
441	680	Rome (Roma)	75.0
453	662	Bolzano (IBZ)	0.2
501	599	Milan (Milano)	8.5
LATVIA			
525	572	Riga	12.0
LITHUANIA			
1,935	155	Kaunas	7.0
NORTH AFRICA			
363.4	825.3	Algiers (PTT)	13.0
416	721	Radio Maroc (Rabat)	10.0
1,350	222.2	Tunis Kasbah	0.6
NORWAY			
364	824	Bergen	1.0
365.7	820.4	Frederiksstad	0.7
453.2	662	Porsgund	1.5
453.2	662	Nidaros	1.2
1,071	280	Oslo	0.5
POLAND			
214.2	1,400	Warsaw (2)	1.9
234	1,283	Lodz	2.2
244	1,229	Cracow	1.5
313	959	Wilno	0.5
338.1	887.1	Poznan	1.9
381	788	Lvov	2.2
409.8	732	Katowice	16.0
1,411	212.5	Warsaw	14.0
PORTUGAL			
240	1,247	Oporto (Teatro Apollo)	0.25
320	937.6	Lisbon (CTIAA)	0.25
ROMANIA			
394	761	Bucharest	16.0
RUSSIA			
720	416.6	Moscow (PTT)	20.0
800	375	Kiev	20.0
824	364	Sverdlovsk	25.0
938	320	Kharkov	25.0
1,000	300	Leningrad	20.0
1,060	283	Tiflis	10.0
1,103	272	Moscow Popoff	40.0
1,304	230	Moscow-Stchelkovo (C.C.S.P.)	100.0
1,380	217.5	Bakou	10.0
1,481	202.5	Moscow (Kom)	20.0
SPAIN			
251	1,193	Barcelona (EAJ15)	0.5
266.7	1,125	Barcelona (EAJ13)	10.0
349	860	Barcelona (EAJ1)	8.0
368	815	Seville (EAJ5)	1.5
424	707	Madrid (EAJ7)	2.0
400	652	San Sebastian (EAJ8)	0.5
SWEDEN			
135	2,222	Motala	30.0
231	1,301	Malmo	0.75
257	1,166	Hörby	15.0
300.2	999.3	Falun	0.65
322	932	Göteborg	15.0
436	689	Stockholm	75.0
542	554	Sundsvall	15.0
770	389	Ostersund	0.75
1,223.5	244	Boden	0.75
1,348	222.5	Motala	40.0
SWITZERLAND			
318.8	943	Basle	0.65
403	743	Berne	1.1
459	653	Zurich	0.75
678.7	454.6	Lausanne	0.6
760	395	Geneva	1.5
TURKEY			
1,200	250	Istanbul	5.0
1961	153	Ankara	7.0
YUGOSLAVIA			
306.8	978	Zagreb (Agram)	0.7
430.7	696.5	Belgrade	3.0
577.1	519.9	Ljubljana	2.8

POSTCARD RADIO LITERATURE

Kone-Dope Portable

IT'S amazing how portable-set prices are coming down; now there's a Kone-Dope portable (five-valver) at only nine guineas. You can get full details through the free catalogue service. **81**

For Selectivity

Here is a gadget which will appeal to all set users—the McMichael wavetrap for portables. If your portable cannot cut out the National or Regional, then write for literature from McMichael describing this little unit, which costs only 18s. 6d. **82**

Burndept Sets

If you are on the look-out for a complete receiver working either from the mains or from batteries, or if you are in need of a high-performance portable set, then you should get the new Burndept folder which shows the whole range and, incidentally tells how any receiver, including portables, can be obtained on a small deposit and twelve subsequent monthly payments. **83**

Home-made Eliminators

A good idea of Fel-Ectric Radio is to supply kits of parts to make up H.T. and L.T. eliminators. This is work which any amateur can undertake. You should get the little booklet which gives details of the kits available. **84**

(*Continued on next page*)

POSTCARD RADIO LITERATURE

(*Continued from page 679*)

Behind the Knob

"What's Behind the Knob?" is the question which is asked and effectively answered in a new booklet issued by Rothermel, the distributors for Centralab rheostats and similar gadgets. OBSERVER. **85**

GET THESE CATALOGUES FREE

Here "Observer" reviews the latest booklets and folders issued by well-known manufacturers. If you want copies of any or all of them FREE OF CHARGE, just send a postcard giving the index numbers of the catalogues required (shown at the end of each paragraph) to "Postcard Radio Literature," "AMATEUR WIRELESS," 58/61, Fetter Lane, E.C.4. "Observer" will see that you get all the literature you desire.

"Amateur Wireless and Radiovision." Price Threepence. Published on Thursdays 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. **Queries** should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed. **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.

PREPAID ADVERTISEMENTS

Advertisements under this head are charged THREEPENCE PER WORD, minimum charge THREE SHILLINGS. DEPOSIT SYSTEM

As the Publishers cannot accept responsibility for the bona fides of advertisers in this publication, they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom double fees are charged.

The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to "AMATEUR WIRELESS" ADVERTISEMENT DEPARTMENT 58/61 FETTER LANE, LONDON, E.C.4

PATENTS.—Trade Marks, Advice Handbook free.—B. T. King, Regd. Patent Agent, 146a Queen Victoria Street, London.

DECORATE YOUR LOUD-SPEAKER YOURSELF. Transfers giving painted effects on Fabric, Wood, Metal, etc. Sample and catalogue 1/-. A.W., Axon Ltd., Jersey, England.

"KONE-DOPE" DRESSING for Linen Diaphragm Speakers 6d. and 1/- per bottle. 3d. postage. Doped Linen for Speakers 5/- square yard. Any size cut. Complete Kit of Double Linen Diaphragm Speakers 19/6. *Trade Enquiries:* "Kone-Dope" Co., 54, Idmiston Road, Stratford, E.15.

AMMETERS.—Hot wire, 0-1, 4/-; new moving coil milliammeters, 0-5 upwards, 15/-; portable micro ammeters, 5-in. scale, 0-200 upwards, 105/-; double range voltmeters, 3/6; instrument repairs and alterations of every description; send for list.—The Victa Electrical Co., 47 High Street, Battersea, S.W.11.

YOUR UNWANTED RADIO PARTS taken in part payment for brand new guaranteed. Please state condition and lowest price acceptable for your goods, and new goods required. Parts bought for cash. Ryalls Radio, 182 Kennington Road, London.

GREAT EXCHANGE OFFER.—We will send you a latest type cabinet cone speaker in exchange for your old horn speaker or surplus radio parts; send P.C. for particulars.—Grosvenor Electrics, Broadway Chambers, Ilford.

ENGINEERS.—IMPORTANT NOTICE.—Results now to hand show that 93 per cent. of our candidates pass their Exams. at the first attempt, a remarkable record, unapproached by any other organisation and showing why we alone guarantee "NO PASS—NO FEE." If 93 out of every 100 ordinary men can succeed, why should you remain in the ranks? Now is the time to "get busy" and investigate. Our handbook, "ENGINEERING OPPORTUNITIES," explains the most simple and successful home-study methods of passing B.Sc., A.M.I.Mech.E., A.M.I.C.E., A.M.I.E.E., A.M.I.A.E., G.P.O., C. & G., Matric., etc., Exams. This book outlines Courses in all branches of Civil, Mech., Elec., Motor and Wireless Engineering, shows the unique advantages of our Appointments Dept. and includes a brilliant foreword by Prof. A. M. LOW, in which he shows clearly the chances you are missing. Send for FREE HANDBOOK now (state branch, post, or Exam.). — BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY, 109 Shakespeare House, 29-31 Oxford Street, London.

EVERYTHING FOR THE CONSTRUCTOR.—Instrument Wire, Coil Formers, Nuts, Bolts, Foil, etc.—Frost, 132 St. John Street, E.C.1.

ALEXANDER BLACK, Wireless Consultant, will call and cure your set. (London and Home Counties). Radio Association appointed representative. Components and McMichael Portables on hire.—55 Ebury Street, S.W.1. Sloane 1655.

SPEAKER CABINETS.—Solid oak, well finished, polished, fret front. Takes all standard units. Handsome appearance. 6/6 each, carriage paid.—Uneeda, 107a Icknield Street, Birmingham.

WE WILL ACCEPT YOUR SURPLUS APPARATUS (making you a high allowance) in part payment for any new apparatus. Your inquiry will be dealt with promptly. —Bostock & Stonnill, 1 Westbourne Terrace, S.E.23.

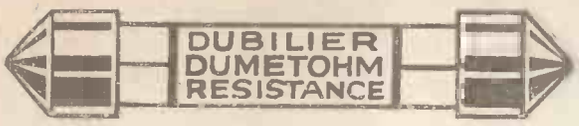
WIRELESS NOTES.—For all those who want the best in Radio, Gramophone, or Televislon.—Post card for particulars to Capt. Robinson, Langmead, Pirbright, Surrey.

ACCUMULATORS, 2/6. Transformers, 3/6. Hegra adjustable Units, 3/11. Triotron D.E. Valves, 2 or 4 volts, 3/11; Power, 4/11. H.F. Chokes, 1/6. Speaker Cabinets, 3/3. Triotron Units, 7/3. Six-pin Coils, 1/11. Variable Condensers, 2/-. Slow-motion Dials, 1/6. Hercules Batteries, 60 volts, 4/3; 100, 7/3. Sprung Valve Holders, 6d. Double Cones and Chassis, 4/11. Thousands of other Bargains. Orders under 20/- add 6d. towards postage.—"Universal," 20 Victoria Road, Peckham, S.E.15.

INSTALL A CHARGING PLANT. Moore's motor generators and lighting plants are the best. Moore's, 246 Taimblemill Road, Smethwick.

BANKRUPT BARGAINS. No rubbish. List free. Faradex transformers 3/3, Telsen 9/6, Ace 6/6. Bullphone dual coils 8/6, others 5/-. .0005 variable 2/6. Polar .0001 2/-, Polar .0003 2/9. Bullphone speaker units 6/6 and 9/6, 66K 18/6, Undy 8-pole 18/6. Eliminators, kits and everything wireless at very low prices. Butlin, 143b Preston Road, Brighton.

DUBILIER RESISTANCES NOW COST YOU LESS

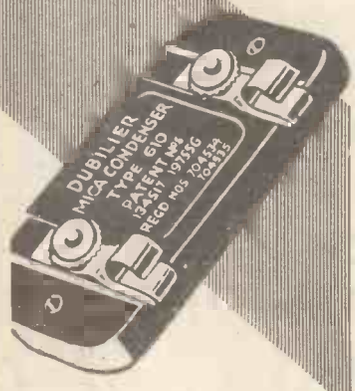


Dumetohms reduced to 1/9. All values

There is no excuse for using inferior resistances, because Dubilier now pass on to you the benefits of increased production, *namely* —lower price.

Good resistances are essential if the best results are to be obtained, so ask for Dubilier next time. Use Dubilier Condensers too!

Duwirohms now from 4/6 to 11/-, according to value



FIXED CONDENSERS
TYPES 610 and 620

.00005 to .0009 ..	1/8
.001 and .002 ..	2/-
.003, .004, .005 ..	2/3
.006	2/6
.01	3/-

Use Dubilier Components and be Certain of Satisfaction

DUBILIER CONDENSERS

DUBILIER CONDENSER CO. (1925) LTD.
Ducon Works, Victoria Road, N. Acton, London, W.3.

High Efficiency Rectification

MARCONI H.2

The Facts

Marconi H.2, the new two-volt detector, combines to an unusual degree high efficiency rectification and high quality reproduction. H.2 has an amplification factor of 35 and an impedance of only 35,000 Ohms—mutual conductance 1.0 M.A. per volt—*the highest ever attained in this class.*

It is the *obvious* detector for portables, or indeed for any set where maximum efficiency is essential; because of its advanced design it will give wider range, better tone and freedom from all microphonic troubles.

Expert Testimony

Here is convincing evidence of the reliability and efficiency of Marconi Valves.

Marconi Valves are used by The B.B.C., Imperial Airways, Croydon Control Tower, Metropolitan Police, Trinity House Beacon Stations and Lightships, Empire Wireless Communications, large Passenger Liners, etc., etc., because of their longer life—clearer tone—greater range and volume.

Public Testimony

One of the many entirely unsolicited letters we receive from the public about Marconi Valves.

"I thought it might be of interest to you to learn of the performance of a Marconi Valve which I purchased in December, 1923. . . . From the date on which it was purchased to the 10th July, 1930, it has been in constant use in my wireless receiver, which is a three-valve instrument. The Marconi valve has been working in the detector holder and in the other holders at different periods. Despite the fact that it has certainly been abused, it is still going strong and may be good for some time yet."—*J.B., Hamilton.*

Use the Valve the EXPERT *uses!*

MARCONI VALVES

G. Marconi

Printed in England. Published by Bernard Jones Publications, Ltd., 58/61 Fetter Lane, London, E.C.4
Sole Agents for South Africa: CENTRAL NEWS AGENCY, LIMITED. Sole Agents for Australasia: GORDON & GOTCH, LIMITED. Saturday, November 1, 1930

BUILD OUR "CHALLENGE THREE" KIT SET

HIGH QUALITY WITH LOW H.T. SEE PAGE 695

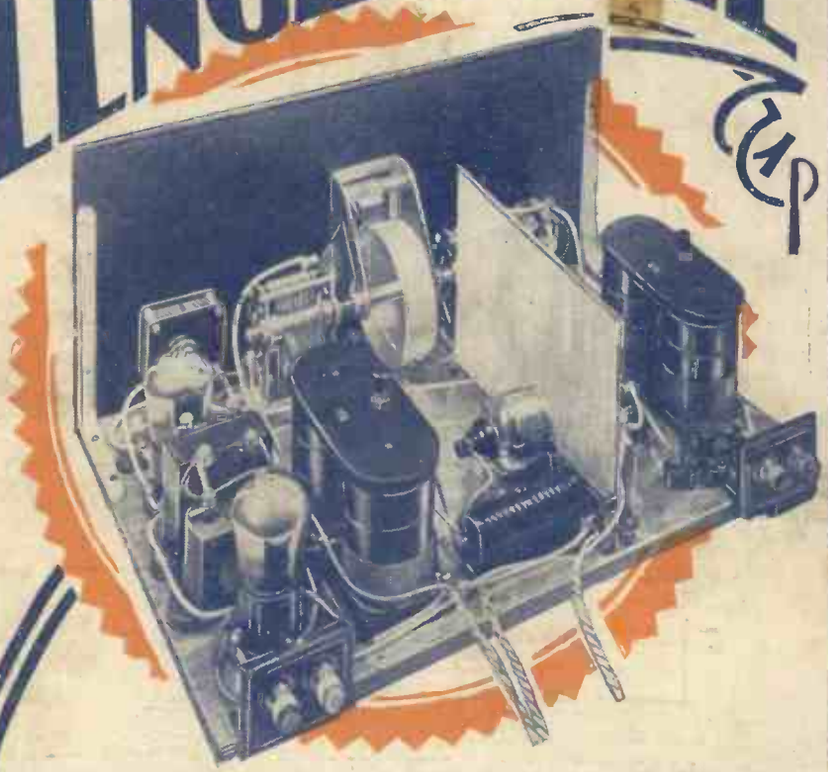
Amateur Wireless

and Radiovision

Every Thursday 3d

Vol. XVII. No. 439 Saturday, November 8, 1930

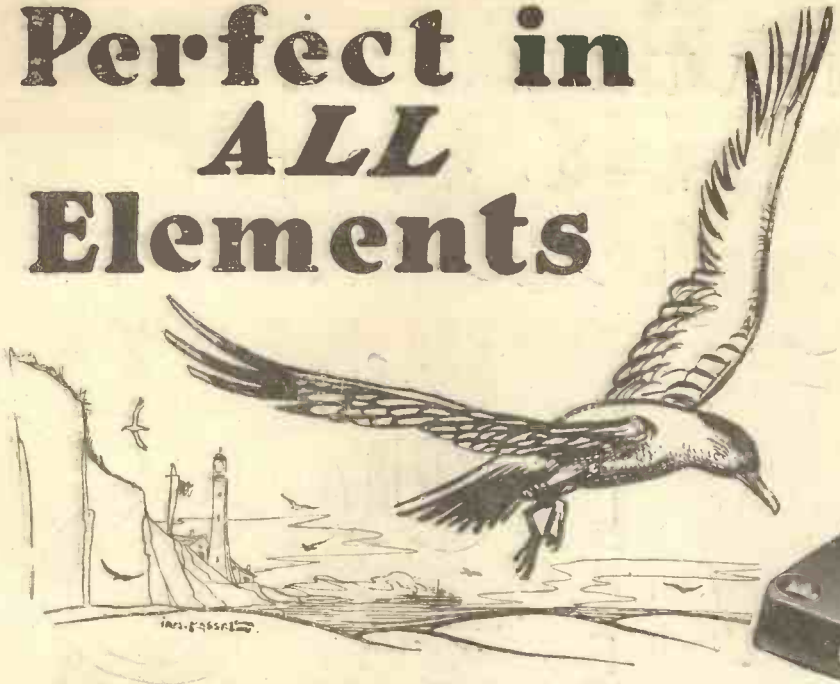
The CHALLENGE THREE KIT SET



CHEAP TO BUILD | **ONE-KNOB CONTROL** | **EASY WIRING**

Registered at the G.P.O. as a Newspaper

Perfect in ALL Elements



Whatever the atmospheric conditions, the Seagull—the most versatile of birds—is perfectly at home on land, sea, and in the air.

The Gull is not alone in its ability to conquer the elements, for the Lewcos H.F. Choke is renowned for its capacity to separate the H.F. surges from the L.F. side of the receiver.

THE LEWCOS H.F. CHOKE

The Lewcos H.F. Choke is "The most efficient choke we have tested," and, "Its design places it in the front rank of high-class components," writes Industrial Progress (International) Ltd., of Bristol.

A fully descriptive leaflet, Ref. R33, giving tested values, will be sent on request.

NONE GENUINE UNLESS IT BEARS THIS LABEL

THE LEWCOS H.F. CHOKE ILLUSTRATED ABOVE IS SPECIFIED FOR THE "CHALLENGE THREE" DESCRIBED IN THIS ISSUE

LARGE STOCKS OF LEWCOS RADIO PRODUCTS are HELD AT ALL BRANCHES.

WRITE FOR LEWCOS FREE SHEET OF BLUEPRINTS OF FOUR SUGGESTED CIRCUITS UTILISING LEWCOS COMPONENTS, REF. R70.

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED

Church Road, Leyton, London, E.10

LEWCOS RADIO PRODUCTS FOR BETTER RECEPTION

Advertisers Appreciate Mention of "A.W." with Your Order

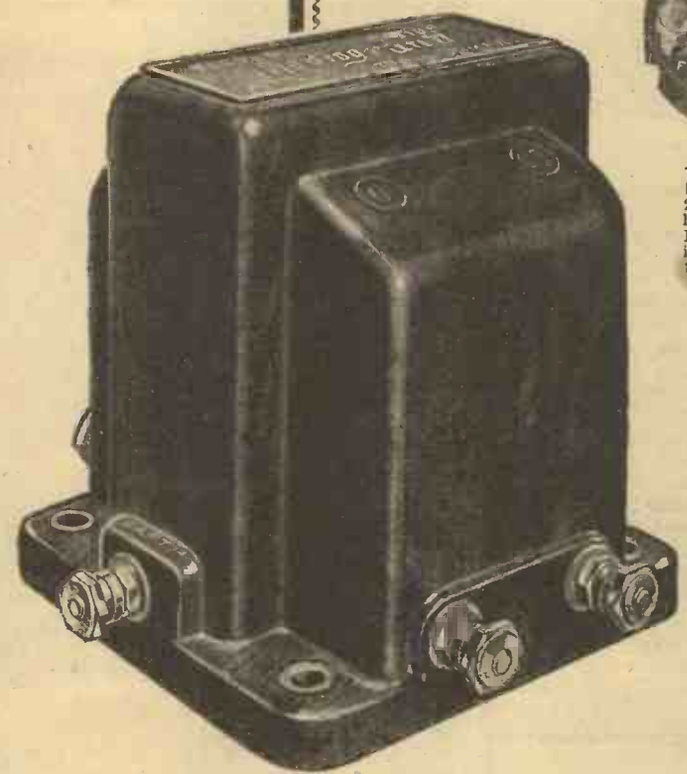
LIFELIKE REPRODUCTION *demands perfect* RADIO COMPONENTS

"GOOD ENOUGH" is not "Good enough" in the Telsen laboratories! Here, they realise that the public are getting keen judges and critics of radio reproduction. Here, they select and adopt the principles that will give trouble-free and faithful reception. Here, they build their Components as well as it is possible to build them, and only the finest materials and craftsmanship are employed . . . . and yet their prices still remain—one of their attractive features.

ASK YOUR DEALER TO SHOW YOU THE COMPLETE RANGE OF TELSEN COMPONENTS; EACH ONE EMBODIES SOME EXCLUSIVE FEATURE THAT WILL TEND TO INCREASE YOUR ABILITY TO GET "LIFELIKE REPRODUCTION."

TELSEN VALVE HOLDERS. Low capacity, self-locating, supplied with patent soldering tags and hexagon terminal nuts. Price 1/-

TELSEN FIVE-PIN VALVE HOLDER. Pro. Pat. No. 20286/30. Genuine Bakelite Mouldings fitted with Nickel Silver shock-absorbing spring contacts. Price 1/3 each.



TELSEN "RADIO-GRAND" TRANSFORMER, new model, shrouded in Genuine Bakelite, with new windings and core, fitted with earth terminal. Made in ratios 3—1 and 5—1. Price 12/6 each.

TELSEN "ACE" TRANSFORMER, the ideal model for all Portable Sets, and where space is limited. Made in ratios 3—1 and 5—1. Price 8/6 each.

TELSEN 7—1 SUPER RATIO "RADIO-GRAND" TRANSFORMER, giving enormous amplification with perfect reproduction, shrouded in Genuine Bakelite, with new windings and core, fitted with earth terminal. Price 17/6 each.

TELSEN H.F. CHOKES. Designed to cover the whole wave-band range from 18 to 4,000 metres, extremely low self-capacity, shrouded in Genuine Bakelite. Inductance 150,000 henries. Resistance 400 ohms. Price 2/6 each.

TELSEN FIXED (MICA) CONDENSERS. Shrouded in Genuine Bakelite, made in capacities up to .002 mfd. Pro. Pat. No. 20287/30. .0003 supplied complete with Patent Grid Leak Clips to facilitate series or parallel connection. Can be mounted upright or flat. Tested on 500 volts. Price 1/- each

TELSEN COMPONENTS

Advt. of Telsen Electric Co. Ltd., Birmingham

Highest actual amplification!

—due to its abnormally low inter-electrode capacity

The effective H.F. amplification per stage that can be obtained in any Screened Grid Set is largely controlled by the inter-electrode capacity of the S.G. Valve. It is well known that the lower the self capacity of the valve the greater its effective stage amplification. Important features in its design and construction permit the inter-electrode capacity of the new Cossor 215 S.G. to be reduced to the order of .001 micro microfarads. This is substantially lower than the self capacity of any other Screened Grid Valve on the market. It follows, therefore, that this new valve permits a big increase in effective amplification. In fact, results are obtained which, a year ago, would have been considered quite impracticable.

Cossor 215 S.G. 2 volts, ·15 amp. Impedance 300,000. Amplification Factor 330. Mutual Conductance 1·1 m.a/v. Normal working Anode Volts 120. Positive Voltage on Screen approx. 60. Price 20/-

Send for one of the novel, Circular Station Charts which have just been issued. They give identification details of nearly 50 stations and space is provided for entering your own dial readings. Enclose 2d. stamp and head your letter "Station Chart R.T."

THE NEW

COSSOR 215 S.G.

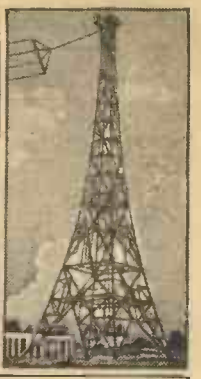
GREATEST *EFFECTIVE* STAGE GAIN

A. C. Cossor Ltd., Highbury Grove, London, N.5.

6510

No. 439. Vol. XVII. NOVEMBER 8, 1930

Amateur Wireless and Radiovision



EDITOR: BERNARD E. JONES.
TECHNICAL EDITOR: J.H. REYNER, B.Sc., A.M.I.E.E.
THE LEADING RADIO WEEKLY FOR THE CONSTRUCTOR, LISTENER & EXPERIMENTER.
RESEARCH CONSULTANT: W. JAMES.
ASSISTANT EDITOR: H. CORBISHLEY.

NEWS · & · GOSSIP · OF THE · WEEK

THE ELEVENTH

AS in former years, the B.B.C. will take an active part in the Armistice Day ceremonies on Tuesday next, November 11. The ceremony at the Cenotaph will be broadcast in the ordinary way, with the Post Office line link *via* the B.B.C. O.B. van in Richmond Mews—a little turning opposite the Cenotaph. This line link has been used for the past two years and has been so satisfactory that the technical arrangements will remain practically the same.

THE MENIN GATE BROADCAST

ANOTHER feature of the broadcast arrangements for Armistice Day is the relay from the Menin Gate. The "Last Post" and "Reveille" will be relayed by ordinary telephone wire to the Lapanne cable station, and then by cross-channel cable to England and the ordinary Post Office land lines. The Belgian broadcast engineers have been co-operating with the B.B.C. engineers for some weeks past on this relay and elaborate precautions have been taken against a breakdown.

A new glimpse of the rapidly-growing Slaithwaite. All three masts are now "up," and the heavy Diesel engines are being fitted. First transmissions are promised by the end of the year

ANTI-"RED" STATIONS!

RUSSIA is experiencing another epidemic of anti-Soviet broadcasting, and the Government officials are having a great deal of trouble in putting direction finders to work on a station—or, perhaps, a chain of stations—which is causing a great deal of harm by broadcasting propaganda to the peasants. Most of the small Russian villages have been provided with receivers by the Kremlin, and now the anti-Soviet broadcasters are using these receivers for "talk"—and a lot of it—against the Government. The strength appears to be constant over a large area of Russia, and so it seems probable that there is more than one station at work.

THE KING TO BROADCAST

HIS MAJESTY THE KING has approved the broadcasting of his speech in opening the Indian Round Table Conference. This will be transmitted by all B.B.C. stations (including 5SW), beginning at 12 noon on Wednesday next, November 12. Subsequent speeches, including that of the Prime Minister, also will be broadcast.

MORE CENTRALISATION?

THE B.B.C.'s centralisation policy seems to be developing along personal lines. It comes as a surprise to Northerners to learn that Mr. Joseph Lewis, who was music director at the Birmingham station for seven years, has been transferred to Savoy Hill, where he will act as one of the conductors of the B.B.C. Orchestra and will be concerned in programme-building on the musical side. Both before and since he joined the B.B.C. he has been connected with musical activities in the Midlands. He was for some time assistant conductor of the City of Birmingham Orchestra, under Dr. Adrian Boult. Listeners in the Midlands are not to be deprived of Mr. Lewis's services in consequence of his transfer to London. Many of the performances which he will conduct will be broadcast nationally, and others will be given regionally.

CANADA LEARNS FROM US

MR. E. A. WEIR, Director of Radio for the Canadian National Railways, has been visiting England in the belief that this country can furnish the Dominion with good ideas. He says: "I have studied broadcasting in England, and I am convinced that you can teach us much in the technique of programme presentation. Particularly is this so in the production of wireless plays in which branch of broadcasting Great Britain is far in advance of us on the other side of the Atlantic. I have come to England to learn what I can of the methods employed by the B.B.C. in the

PRINCIPAL CONTENTS

NEXT WEEK: FOR GRAMOPHONE USERS—A SIMPLE TWO-VALVE AMPLIFIER

NEWS · & · GOSSIP · OF THE · WEEK —*Continued*

presentation of this type of radio entertainment."

PRAISING THE B.B.C.

ASKED what he really thought of the B.B.C., Mr. Weir said: "Undoubtedly a system of state monopoly in broadcasting has many advantages, not the least of which is more systematised and orderly programmes. It also makes possible programmes of a more diversified character appealing to every class of listener. I do not mean by this that a system indentical

NEXT WEEK.

FULL DETAILS OF A TWO-VALVE

GRAMOPHONE AMPLIFIER

to that of the B.B.C. would suit the needs of Canada, but I do feel that much could be adapted from British practice which would be of the greatest advantage to the Canadian listener." So *somebody* thinks the B.B.C. system is right!

BE "CLUBBY"

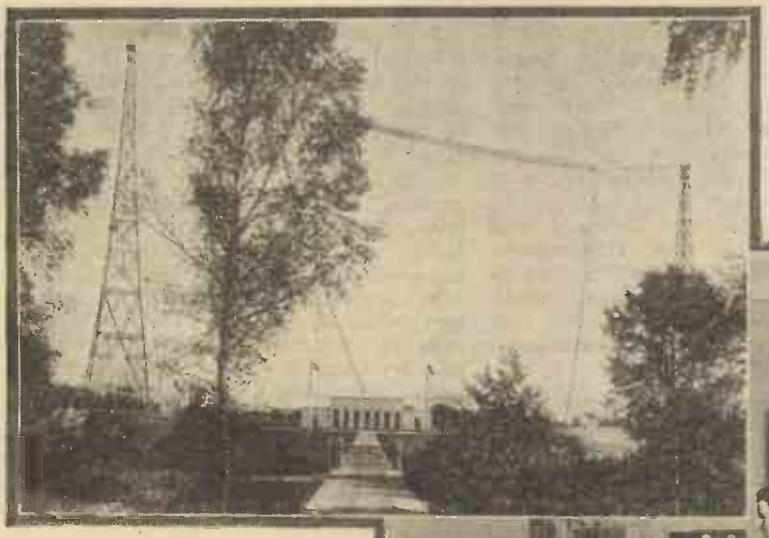
HAVE you ever thought of joining a Radio Club? You know, there are plenty of advantages in "getting together" in wireless, and you are almost sure to find a Club somewhere in your locality. There's a good one in Golders Green, for instance. The Golders Green and Hendon Radio and Scientific Society have just changed their headquarters and have moved to Woodstock School, Golders Green Road, a few minutes from Golders Green tube station, where meetings will be held on the second and fourth Thursday of each month at 8.15 p.m. The object of the move is to be in the centre of local activities. An interesting programme has been arranged, which will include visits to Brookmans Park, the National Physical Laboratories, Teddington, and the Air Port at Croydon.

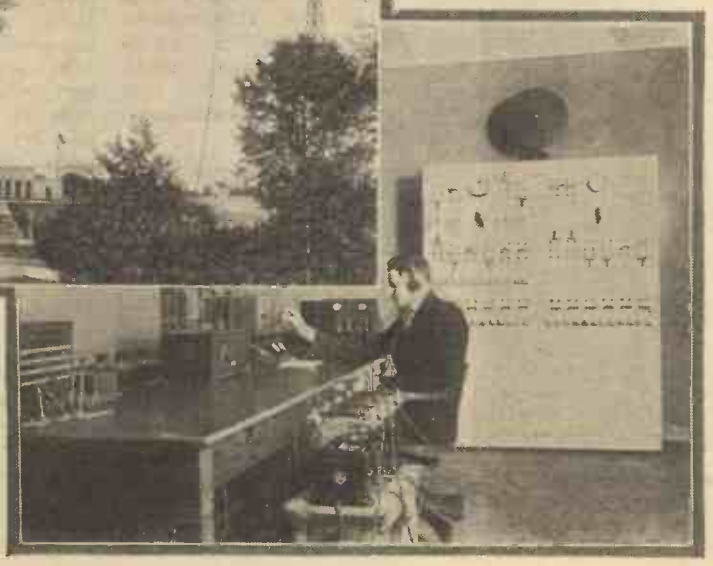
CINEMA ORGAN BROADCASTS

MOST listeners appear to like the broadcasting of cinema organ music. Reginald Foort's organ broadcasts from Bournemouth enhanced the reputation which he made among listeners when he presided over the organ at the New Gallery Cinema a year or two ago. Now Mr. Foort moves on to the new Victoria Cinema, from which his first broadcast takes place this week. He designed the organ himself, and he describes it as the instrument of his dreams. It conveys the sounds of motor horns, saxophones, cathedral chimes, carillons, gongs, cycle bells, human voices, or the rushing of express trains. Three manuals can be brought into use by means of what Mr. Foort describes as "second touch." It might not be a bad idea to get Mr. Foort to design a cinema organ specially for broadcasting.

SPONSORED PROGRAMMES LIKED

AT the time of writing, Irish listeners are experiencing their second week of the sponsored-programme experiment. Dublin and Cork broadcasting stations give one hour per evening to chocolate makers, suitcase makers, billposters, and jam and pickle merchants. In return a sponsored programme is arranged for the mutual benefit of the advertiser and the listener in search of entertainment. Except for one Catholic paper, the Irish press has commented very favourably upon the experiment, which is to continue until November 20. We learn that the 120-kilowatt high-power transmitter will probably be erected in a central position. From this it would seem that the promoters have an eye on a much bigger audience than is contained in the Free State.





Two views of a well-known long-waver—Motala. You can hear this station any evening on 1,348 metres, and it comes through well, having a power of 40 kilowatts. The aerials, station building and control room are seen here

AMERICA WANTS OUR TALKS

THE B.B.C. has been asked by the Columbia broadcasting system of America for permission to relay two of the talks in the "Science and Religion" series. Sir Arthur Eddington on November 23 and Dean Inge on December 7 are particularly wanted. It may not be generally known that talks have been arranged by Columbia

Mr. Joseph Lewis, who is leaving the Midland Regional area to take an active part in musical direction at Savoy Hill

representatives in London for relay to America through the transatlantic telephone.

NATIONAL AND REGIONAL

ACCORDING to B.B.C. engineers, no dislocation has been caused by the modification in the Brookmans Park wavelengths, whereby the 356-metre channel is used for National broadcasting at times when only one transmitter is in use. It is pointed out that *every* listener can get the 356-metre transmitter, since it is on the old 2LO wavelength. And those who have altered their sets to bring in the 261-metre transmitter lose nothing by the re-arrangement.

TWIN-STATION CRYSTAL SETS

WE hear so little of crystal sets these days that we are apt to overlook the fact that the Regional Scheme of broadcasting was first conceived for listeners with these simple sets. We are interested to hear that, in connection with the National Institute for the Blind scheme of crystal-set installation, both Regional and National programmes can be clearly received. At Oxford good reception is reported of both stations, which can be separated quite easily.

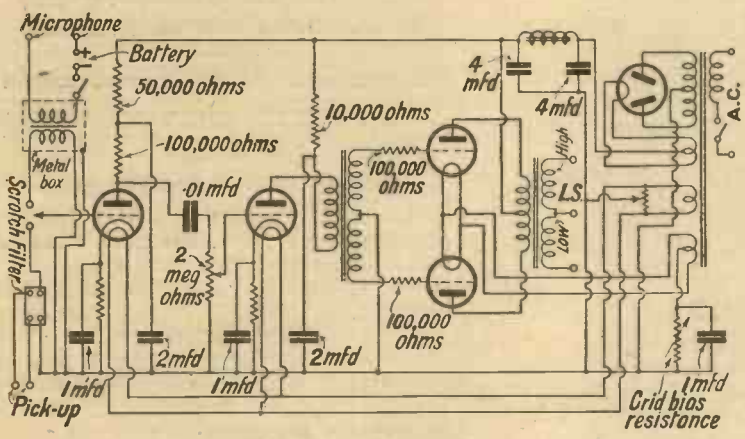
AN IDEAL GRAMOPHONE AMPLIFIER

The amplifier and case—the complete instrument is shown in the rear

THERE are many readers who want to get really great volume from a wireless set or a gramophone pick-up for some special purpose, such as radio dancing at home or for broadcast music in a small public-hall.

Provided the amplifier is made up properly it is entirely reliable, and, working from A.C. mains, does not need any careful adjustment of battery values and so on.

An accompanying panel shows the makes and types of the most important components used in the various parts of the circuit; small parts, such as terminals and valve holders, are not mentioned.



The circuit of the amplifier

Starting at the input side of the circuit, the microphone transformer is optional and is needed only if the amplifier is to be used for public-address work. The "mike" transformer should be purchased complete with the microphone. It will usually have a ratio of 40 or 50 to 1, but this will depend entirely on the microphone used. The scratch filter used for gramophone work is a special Wearite component.

Note the way in which the first low frequency stage is decoupled with a stabilising resistance of 50,000 ohms, the anode resistance having a value of 100,000 ohms. Wire-wound components should be used.

The push-pull coupling is on quite straightforward lines, the stage preceding the push-pull coupling being decoupled with a 10,000-ohm resistance and a 2-mfd. condenser. There are stabilising resistances in the grid circuit of the push-pull valves; these are of 100,000 ohms. Varley DP6 and DP7 push-pull transformers are used, and both high- and low-impedance outputs are available.

Grid bias is obtained automatically by means of dropping resistances, the values of these for the first and second stages being 1,000 ohms. The grid-bias resistance for the push-pull stage is a low-range 40-watt Clarostat (power type).

A single mains transformer is used which delivers 450-0-450 volts, 7.5, 5.5 and 4 volts. This is a Parmeko component.

So far as valves are concerned, an Osram MHL4 is used in the first stage, an Osram ML4 in the

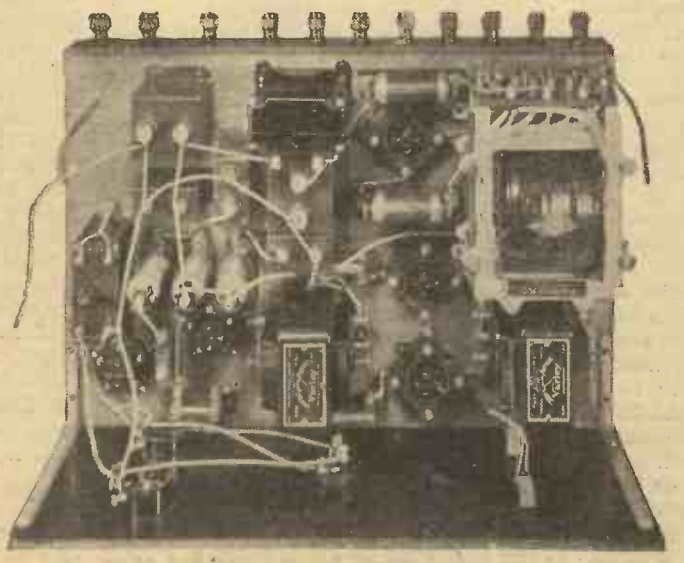
(*Continued in 3rd col. of next page*)

COMPONENTS FOR THE AMPLIFIER

Mains transformer (Parmeko), with secondaries for 450-0-450, 7.5, 5.5 and 4 volts
Push-pull input and output transformers (Varley DP6 and DP7, Ferranti)
Smoothing choke (Ferranti B2, Varley, Parmeko, R.I.)
Scratch filter (Wearite)
Grid bias resistances, first and second stage, 1,000-ohms (Claude Lyons)
Grid bias rheostat for push-pull stage (Clarostat power, low-range 50-250 ohms, 40-watt: Regentstat)
Microphone and microphone transformer (Ediswan, Rothermel, Igranic)
Anode resistances, wire-wound, (Varley power type, Ferranti, R.I.)
Volume control resistance (Rotor Electric, Regentstat, Igranic)
One 30-ohm Humdinger (Claude Lyons)
One .01-mfd. mica-dielectric condenser (T.C.C.)
Two 4-mfd. paper-dielectric condensers, 1,000-volt test (T.C.C.)
Two 2-mfd. and three 1-mfd. paper-dielectric condensers, 400-volt test (T.C.C.)
Two 5-pin and three 4-pin valve-holders (Lotus, W.B.)
Two 100,000-ohm grid-leaks for push-pull stage (Lissen, Ediswan, Graham-Farish)
Valves, (first stage, MHL4: second stage, ML4: push-pull, 2 LS5A's: rectifier, U8)

An amplifier entirely suitable for this work is that which has been made up for use in the AMATEUR WIRELESS laboratory for test purposes. A brief reference to this was made in "A.W." No. 430, in an article "The Art of Using a Pick-up," which explained how to adapt a set for gramophone working. As many readers have asked for further details, these are given below.

The circuit of this amplifier is shown herewith, and experienced amateurs should have no difficulty in making up the amplifier from this diagram. It must be understood that no wiring plan is available because, obviously, the construction of the amplifier would be beyond those who are not capable of obtaining the particulars from the circuit and details given here.



The layout will be apparent from this plan view

BERLIN'S NEW "BROADCASTING HOUSE"

BERLIN has beaten London by a short head in the race to get a new broadcasting headquarters complete on time. The new Berlin "Funkhaus," representing the combined efforts of the Reichs-Rundfunk-Gesellschaft and of the Funk-Stunde, is situated in Charlottenburg, away from the centre of Berlin and adjoining the well-known grounds of the Berlin Exhibition.

A bird's-eye view of the new building taken from the top of the aerial mast adjacent. The futuristic architectural design is striking

A Huge Building

In size the Berlin building is superior to the B.B.C.'s Broadcasting House now in course of erection. It is very much larger, having a frontage of about 500 ft., and, with five stories, is roughly 66 ft. in height. The entire building is of iron and stone construction and in the side portions, where some of the studios are situated, special arrangements have been made to render these completely sound proof.

As seen in plan, and as you can see from the accompanying bird's-eye view, the building is roughly triangular in shape with a central portion running from the apex of the triangle through to the base. The design is rather futuristic.

An Open-air Studio

The centre building contains the main studios and their accompanying ante-rooms and control rooms. The top of the central portion is a flat roof and here it is intended to give open-air concerts. Many items, military bands, for example, sound better in the open air, where acoustic problems of studios have not to be considered.

Part of the studio accommodation in this new building is for the Deutsche Welle, and one main and two smaller studios are set aside for the transmissions of this organisation. Covered courtyards situated between the central portion of the two sides can also be used for broadcasting.

The building covers an area of 24,500 sq. ft., and by reason of its size is one of the new landmarks of Berlin. It is conveniently situated near the artistic centre of the city—an important thing to be considered, as the designers of our Broadcasting House had to bear in mind when they chose Portland Place as a site.

The whole business of broadcasting is carried on at this new "Funkhaus," and apart from the studios and office buildings, there is a museum devoted chiefly to radio technical apparatus and a large laboratory where much research work for the R.R.G. is carried out.

In the district which the R.R.G. has chosen for the new building there is room for development should this be necessary in later years, whereas with our broadcasting House there is little space to spare in the Portland Place district of the West End of London.

Studio Arrangements

Comparison between the internal arrangements of this building with those of the B.B.C.'s building is interesting, particularly as the B.B.C. places a deal of importance on its central control tower. The studios are arranged in the centre portion of the building, with sound-proof linings, and although there is no control tower equivalent to that designed for our Broadcasting House, there is a deep well running through the centre of the main studios (as in many American studios), and through the glass-lined windows of these the activities in each of the studios can be seen from a gallery above.

The larger studios have ante-rooms attached, similar to the B.B.C.'s silence cabinets. It is understood that some of these will be used later for housing television apparatus, which can thus be connected easily with the adjacent studios for use when the R.R.G. undertakes television broadcasts on a more organised basis than at present.

Berlin's Broadcasting House is now complete and is in operation, and the staff is being transferred from the other buildings in the various parts of the capital. It would appear that another twelve months must elapse before the B.B.C.'s new headquarters are complete.

There is a "well" running down between the main studios, as in many American stations

"AN IDEAL GRAMOPHONE AMPLIFIER"

(*Continued from preceding page*)

second, and two battery valves, LS5A's, in the push-pull stage. The rectifier is a U8 valve. The smoothing choke is a Ferranti type B2, and this has 4-mfd. condensers placed on each side.

When making up the amplifier allow plenty of baseboard space, for it is easy to get L.F. interaction if the parts are crowded together. A good plan is to use an elevated baseboard so that the major parts may be placed on top of the decoupling resistances and condensers for each stage underneath. This is the layout which has been adopted in the AMATEUR WIRELESS amplifier. The small controls, such as the mains on-off switch and the volume control, are on the panel.

Wiring should be carried out with bare wire in lengths of insulated sleeving and the baseboard layout should follow as nearly as possible the arrangement of the theoretical circuit diagram. No attempt should be made to crowd the first two stages close to the push-pull stages or the rectifier arrangements.

An amplifier made up exactly on these lines, and using the valves and power transformer specified, will deliver sufficient undistorted power to work several moving-coil speakers, such as the Ediswan R.K. Senior, etc.

John Masefield's great tragedy, *Pompey the Great*, will be revived through the National transmitters on November 7.

MAKING THE MOST OF A TRANSPORTABLE

If you are not satisfied with the reception from your transportable, or if the running costs are high, then you will be interested in this practical article by KENNETH ULLYETT, in which some useful ideas are given.

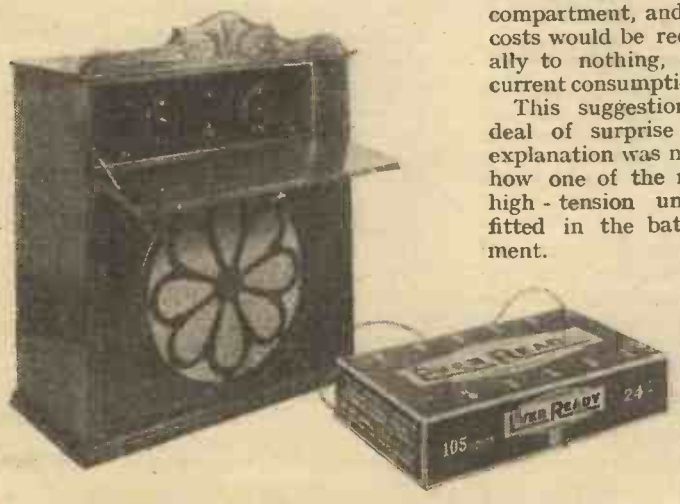
"IT'S all very well for you to say that wireless doesn't cost anything," said a friend to me the other day. "You people who work your sets from the mains can reckon that reception costs only the solitary ten shillings a year for the licence; but with me it is different. I have a transportable, you know, and I find that I have to buy at least four high-tension batteries every year."

"But you have the mains," I said.

"Yes: but, as I say, my set is a transportable—which rather cuts out the possibility of using mains, doesn't it?"

This seemed to open up so many possibilities of improvement that we fell a-talking about getting better reception from transportables. The set under discussion was a five-valver, and the makers of it optimistically claimed that the high-tension consumption was only 10-milliamperes. A quick test with a milliammeter in the negative high-tension lead showed that the amount of current being taken from a very much overworked standard capacity battery was 16 milliamperes.

The causes were two, namely, the slight softening of the power valve with age and the consequent increase in the high-tension current it consumed; and also the deterioration of the 9-volt bias battery, the maximum of which had dropped to a practically immeasurable value on my pocket meter.



A large high-tension battery can be accommodated outside the set, and will give economical working

Consequently the high-tension current had increased, and although a new battery had only recently been fitted, I knew that it was doomed to an early death.

Two suggestions I made were to fit a new and larger grid-bias battery (there was room for a 16-volt battery, and about 12 volts of this could have been used with advantage) and to fit a very much larger high-tension battery as soon as the existing one ran out.

"But, you see," said the set owner, "there is not room for a larger battery. The man at our local wireless shop told me some time ago that I should fit a double-capacity battery, but as you see, there isn't room in the set for one."

The Question of Current Supply

At considerable length I explained that a double- or even triple-capacity battery could be hidden away underneath the table upon which the set stood, and that lengths of flex could connect up to this from the high-tension terminals of the set. It is surprising how many people seem to think that an external high-tension battery cannot be fitted.

"Anyway," I said, "why go to the trouble of persevering with dry high-tension batteries when you have the mains supply 'on tap.' For the amount which you would expend on high tension over a couple of years you could buy one of the new portable-set type mains eliminators. This would fit in the battery compartment, and then your high-tension costs would be reduced practically to nothing, for the mains current consumption is so small."

This suggestion met with a deal of surprise and further explanation was needed to show how one of the many portable high-tension units could be fitted in the battery compartment.

"Furthermore," I said, "you can buy a trickle-charging model and keep the accumulator up to tip-top condition without having to run it to the charging station every fortnight or so."

"There is just one point, as I cannot be here to see you install it yourself: you may find that when it is placed in one position in the battery compartment a certain amount of hum may be introduced in the set, due to the stray magnetic field set up by the transformer and choke in the eliminator. If you place the eliminator on its side you may find that this cuts out much of the hum. Another way of curing the hum is to use an earth connection, but perhaps you have an earth already."

The tapping to the frame aerial—seen in the centre—enables an external aerial to be used without impairing selectivity

"Oh no," was the reply, "the set has a frame aerial."

Then explanation was needed of the way in which an earth connection can be added to practically every portable or

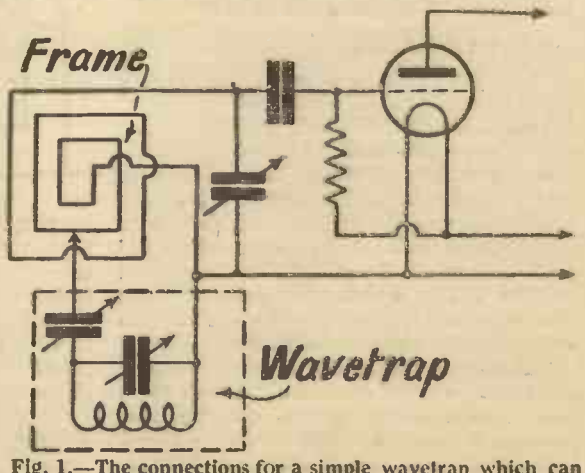


Fig. 1.—The connections for a simple wavetrap which can be added to most transportable sets. It is described in the accompanying article

For the Newcomer to Wireless: GRID BIAS

WILL you please tell me why grid bias is used in wireless sets?

We will think, first of all, of a low-frequency amplifier, such as the output valve of the set. Just what has this valve to do?

I suppose that it receives fairly powerful impulses on its grid and reproduces these in magnified form in its plate circuit.

You have put it in a nutshell. The great thing to remember is that the impulses reaching the grid of a low-frequency valve are pretty big. Now supposing that we didn't use any grid bias, the grid would be at zero potential, wouldn't it? In other words, it would be at the same potential as the negative end of the filament.

Yes, I follow that.

Very well, then. In comes an audio-frequency impulse, which we may regard as consisting of a positive crest and a negative trough. If the grid was at zero before the impulse arrived you will agree that the crest of the wave must make it positive.

Yes, that's clear.

Now think what happens. The filament of the valve is throwing off electrons which are strongly attracted by anything within the bulb that is at a positive potential.

I see. Then they are attracted by both the grid and the plate?

That's just it and the result is that instead of the whole stream going to the plate, as it should, part of it is diverted by the grid, returning to earth by the filament circuit. If you think it out you will see that it means that whenever the grid goes positive there is a reduction in the proportion of the electrons that go to the plate and this means that the plate-circuit fluctuations are not quite a faithful copy of those in the grid circuit.

That, of course, would introduce distortion, wouldn't it?

It would; in fact, it often does in sets that are not properly biased.

Then just what does grid biasing mean?

By means of a grid-bias battery you set the grid at a strongish negative potential. What happens now is that a negative half wave reaching the grid makes it still more negative, whilst a positive half wave, if the bias is properly arranged and the valve is up to its job, can never make the grid actually positive.

Then there is no starvation of the plate, and no distortion?

You have hit it exactly. The main purpose of grid bias is to prevent distortion by preventing the grid from ever becoming positive. It has, too, a secondary and very useful purpose.

And that is?

By making the grid negative we cut down the high-tension current and, therefore, save the high-tension battery.

What about H.F. valves?

Here the impulses reaching the grid are usually very tiny, but it is just as well to use grid bias if we can to prevent any flow of grid current.

What effect does grid current have on H.F. valves?

It introduces damping and is, therefore, fatal to selectivity. We used to hold down H.F. amplifiers by making their grids positive and deliberately damping the circuits. Modern circuits incorporate either the neutralising principle or the screen-grid valve and damping is not necessary. Therefore H.F. valves can always be given a negative bias, which improves the selectivity and again saves the high-tension battery.

"MAKING THE MOST OF A TRANSPORTABLE"

(*Continued from preceding page*)

transportable set by taking the lead to the negative low-tension or high-tension terminal.

"And while you are fitting an earth," I said, "it might be worth while trying an external aerial."

A length of flex was obtained, untwisted into its separate lengths of rubber-covered wire and hidden along the top of the picture rail of the room in which the set was installed.

The far end of the wire was left free, of course, and the down lead was taken to a point on the frame aerial which I chose at random, and to which connection was made simply be baring one of the frame aerial wires for about half an inch and twisting the down lead end round it.

An External Aerial

"Can you add an external aerial to every portable set?" asked my friend.

I pointed out that where separate tuning controls are provided for the frame aerial and high-frequency stages then it is safe to add an aerial, because although this makes a difference to the tuning, this difference can be corrected. With sets in which the H.F. and frame aerial circuits are ganged it is not always wise to add an aerial unless the ganging can be reset—not a job everyone may care to undertake.

"Tuning is rather broad, even without the aerial, isn't it?" he said. "I wish there were a good way of cutting out the local station. Even by turning the frame round I do not find that it makes much difference. Is it possible to fit a wavetrap?"

On a piece of paper I sketched out the circuit shown in the diagram, Fig. 1.

"The little coil and condenser," I explained, "make up the wavetrap. One side of the trap is connected to low-tension and high-tension negative, and the other side is taken through a variable condenser (which can be .0003 maximum pre-set condenser) to an intermediate point on the frame aerial, just as I have done when trying out an external aerial on your set.

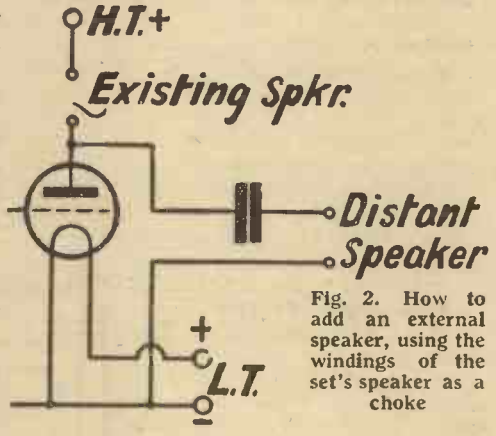


Fig. 2. How to add an external speaker, using the windings of the set's speaker as a choke

If you make up the wavetrap yourself then you can use a pre-set condenser for tuning the trap coil. By changing the value of the pre-set coupling condenser (not the condenser across the wavetrap coil) and by changing the tapping point on the frame aerial you can control the selectivity of the wavetrap."

"A difficulty that I foresee," said my friend, "if I fit a mains unit, is that the set ceases to be a portable and I shall have to work it only in this one room. The mains points in the other rooms are already occupied with radiators."

"Then why not leave the set where it is," I suggested, "and make provision for an external speaker on an extended lead?

Using Two Speakers

"There are several ways of doing this. One, of course, is to disconnect the two wires going to the speaker in the set and take them to a couple of sockets at the side of the cabinet. The speaker in the set should have a length of flex connected to its terminals and a plug on the external speaker should be similarly fitted up and then at will you may plug in one or the other.

"A disadvantage of this is that both speakers have the high-tension current running through them, and with an extended speaker and with the set working from the mains, this may be dangerous, for the extended leads will be at a high voltage above earth. If you do not object to the set's speaker working at the same time as the external speaker, then you can get over this trouble by rigging up a simple choke output circuit, and using the windings of the set's speaker as the choke."

I sketched out the scheme of connections as shown by Fig. 2.

"The only additional piece of apparatus you will need," I said, "is a 2-microfarad fixed condenser, capable of standing up to the mains voltage. With this arrangement the extended leads are entirely insulated from the high-tension voltage and there will never be any danger of getting a shock from the speaker in the other room."

These ideas are worth putting into practice in many portables and transportables.

ANOTHER 140-PAGE BUMPER ISSUE

Including a SPLENDID 16-PAGE COLOUR SUPPLEMENT entitled:

"EASY STEPS TO RADIO"

The November issue of the "Wireless Magazine" is full of good things for the radio enthusiast. It contains a 16-page SPECIAL SUPPLEMENT dealing with radio Step by Step—telling the whole story of the practical side of reception—appealing to everyone who owns a receiving set. A careful study will enable you to get the very best results from your set.

EASY STEPS TO RADIO

Contents of Splendid Supplement:

The Nature of Wireless—Aerial and Earth Essentials—What the Tuner Does—Why You Need a Detector—Amplification at High Frequencies—Amplification at Low Frequencies—Valves for Every Purpose—Power for the Receiver—Points about Commercial Sets—A Selection of Home Constructor Sets.

HERE ARE A FEW MORE OF THE MANY INTERESTING FEATURES CONTAINED IN THE NOVEMBER ISSUE:

Is Television at a Standstill?—by Bernard E. Jones.

Further Notes on the Regional Band-pass Four—by W. James.

A New Brookmans Three for £7—a revised edition of a famous Screened-grid Receiver.

A Change of Heart at the B.B.C.?

Your Loud-speaker Where You Want It—by W. James.

The Five-point Four — a Simple Screened-grid Set, with Two-pin Plug-in Coils.

Making Your Own Records—by J. H. Reyner, B.Sc., A.M.I.E.E.

Putting Over Sponsored Programmes—by Alan S. Hunter.

The "W.M." Standard D.C. Unit.

One-knob Tuning for Modern Sets—by W. James.

The Falcon Three—an A.C. Set for Use with any Standard Mains Unit.

The Falcon A.C. Unit—High tension Supply with a Valve Rectifier.

WIRELESS MAGAZINE

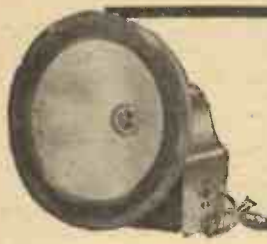
NOW ON SALE

PRICE 1/-

GET YOUR COPY TO-DAY—

don't forget that the October issue was sold out within a few days of publication

Perfect reproduction now costs less



SENIOR R.K. (For A.C. Mains Field Excitation). Fitted with 10" corrugated cone, with moving coil having an impedance of 10-15 ohms at 50/4000 cycles. Price £10 10s. Also supplied complete with Oak cabinet £20. Mahogany cabinet £24 10s. Walnut cabinet £25 10s. Also supplied without rectifier.

JUNIOR R.K. Fitted with 6" corrugated Cone, with moving coil having an impedance of 10-15 ohms at 50/4000 cycles. Price £4 15s. This model is not supplied complete with cabinet.

PERMANENT MAGNET R.K. Fitted with 8" Corrugated Cone. Price £6 15s. Also supplied complete with Oak cabinet £16 16s. Mahogany cabinet £21. Walnut cabinet £22.

The wonderful R.K. reproducers have stood the test of four years and still remain in unchallenged supremacy. They are without doubt the finest reproducers ever built. We agree that R.K.'s cost a little more than some other loud speakers, but the results are so far superior as to make the additional cost seem absurdly inadequate. Our unique hire purchase facilities are at your disposal, so that you can possess and use one of these remarkably fine speakers on payment of only a small deposit.

RK REPRODUCERS

ASSOCIATED ELECTRICAL INDUSTRIES LTD

THE EDISON SWAN ELECTRIC CO. LTD.,
Incorporating the Wiring Supplies, Lighting Engineering, Refrigeration and Radio Business of the British Thomson-Houston Co., Ltd.
Radio Division,
1a, Newman Street, Oxford Street, W.1
Showrooms in all the Principal Towns.

EDISWAN W. 109

3 OUTSTANDING MAINS UNITS

A.C. 72

UNRIVALLED ANYWHERE for OUTPUT, SIZE and PRICE

A.C. 188

A.C. 16

YOU CAN OBTAIN ANY OF THESE AMAZING UNITS FOR 10/- deposit each.

MAKE ANY SET ALL-MAINS standard or portable.

This remarkable new Model A.C. 188 ensures constant High- and Low-tension power entirely free from hum. It is as simple to use and as compact as an H.T. Battery and just as safe. The output is the highest of any Unit at anything like the size and price. This fine instrument ensures ALL-MAINS economy and quality with any type of receiver.

Tappings: 2 Variable—0/100 and 0/120 Volts: 1 Fixed—150 Volts. Output 25 m/A. Combined trickle charger for 2-, 4- and 6-volt L.T. Accumulators. Incorporating the Westinghouse Metal Rectifier. PRICE £6, or 10/- deposit and the balance in easy monthly instalments.

MODEL A.C. 72. This efficient H.T. Battery Eliminator incorporates the Westinghouse Metal Rectifier and is suitable for any three-valve set. Three fixed tappings of 90, 60/80 and 120/150 Volts. Output 15 m/A. PRICE £3 : 17 : 6 or 10/- deposit and the balance in easy monthly instalments.

MODEL A.C. 16 is the old favourite H.T. Battery Eliminator and employs Full-wave Valve Rectification. Suitable for any Set from one to five valves. One variable tapping of 0,100 Volts and two fixed of 120 and 150 Volts. Output 25 m/A. PRICE £4 : 10 : 0, or 10/- deposit and the balance in easy monthly instalments.

ALL UNITS GUARANTEED FOR 12 MONTHS.

ASK YOUR DEALER OR WRITE THE MAKERS for FOLDER 55.

"CLARKE'S "ATLAS" MAINS UNITS

H. CLARKE & CO. (M/CR) LTD., OLD TRAFFORD, MANCHESTER

(2)

On Your Wavelength!

A WONDERFUL RELAY

WE are rapidly drawing nearer and nearer to the time when it will be possible for one human being to be able to speak to the entire world. On October 27 the greatest relay ever attempted by wireless was made with great success. All over Europe, Asia, and America were relayed the speeches of the British Prime Minister, the American President, and the Prime Minister of Japan. Each of these spoke from his own capital—Mr. Ramsay MacDonald from London, Mr. Hoover from Washington and Mr. Hamaguchi from Tokio. It was an amazing piece of organisation. The Japanese Prime Minister's speech, for example, was broadcast from the Japanese stations and picked up in America by the Pacific short-wave link. Thence it was passed on to the U.S.A. broadcasting chains and to the trans-atlantic telephone service for transmission to this country. The same links, but running in the opposite direction, were used for Mr. Ramsay MacDonald and for President Hoover. Perhaps the most surprising part of the relay was the extraordinary good quality which was obtained from Tokio.

THE FUTURE

THIS great relay has shown what wireless can do in the matter of spanning distance and even of time—there was a time difference of about 15 hours over the three continents which participated. It will not, I think, be long before some great singer or instrumentalist gives a world broadcast. It could be done quite easily, and it would be an epoch-makinge vent. Suppose, for example, that Galli-Curci was billed to sing to the world from the Albert Hall. The B.B.C.'s normal outside broadcast arrangements would, of course, provide reception in this country. A further transmission would be made to Rugby, whence it would be relayed by means of the existing wireless links to Australia, India, Canada, South Africa, and the United States. By short-wave transmission or by land line and cable, PCJ would be connected up to relay to Bandeong, whence the transmission could be passed on to the whole of the Far East. At the same time the European land lines would convey it to big broadcasting centres in every country of the Old World for relaying. In this way the great singer's voice would be heard in every civilised country in the world, and her audience would probably run to hundreds of millions.

A BIT OF A PROBLEM

A MATTER that is seriously worrying the B.B.C. people just now is the disappointing service area of the Brookman's Park National transmitter. They pushed up the power to 68 kilowatts, but still it fails to provide a reliable service over anything like the radius that it should. In some localities signal strength is poor, and rather farther afield bad fading is the rule rather than the exception. The trouble is, of course, the short wavelength, and short wavelengths do not seem to fit in with high power. It seems as if the station with its present wavelength might be something of a white elephant, for it is actually far more "regional" in its service than is the London Regional working on 356.3 metres.

WHAT IS TO HAPPEN?

A NATIONAL transmitter giving an unreliable service to a comparatively small area is clearly absurd. An attempt has been made recently to overcome the difficulty to some extent by sending out parts of the National programmes from the London Regional transmitter, but this is clearly not very satisfactory. We who live in the wipe-out area of "Noisy Nat" might suffer in silence if we felt that hundreds of thousands of others benefited though we were swamped. As it is, we have rather the feeling that we are getting all the kicks whilst no one gets the halfpence. Other problems of a similar nature are likely to arise when further twin super-power stations come into operation, for several of the wavelengths available are on the short side. Those that are allotted to Great Britain include 301 metres, now used by Aberdeen; 288.5, used by most of the relays; 242 metres, used by Belfast; and 200 metres, used by Leeds. It seems, on the face of it, quite likely that most of these will be found not too suitable for high-power broadcasting.

WHAT ABOUT IT?

IF five out of the ten wavelengths assigned to this country don't fit in with high-power broadcasting it rather seems that the Regional Scheme might find its style, so to speak, a bit cramped. It is no use building enormously expensive transmitters and pushing their power up and up and up if you cannot make them deliver the goods. Myself, I think it would be best to make it a rule that for each twin station the longest wavelength available should be assigned to the National transmitter. In the natural order of things this wavelength will carry the best programme, and will therefore appeal to the widest circle of listeners. A shorter wavelength could be devoted to the Regional programme. I am wondering, though, whether there is not some little snag concerning broadcasting below about 300 metres that is baffling our people.

On the Continent it seems to be generally recognised that medium-powered stations do best on the shorter wavelengths. The only European super-power transmitter working anywhere near them is Bordeaux Lafayette on 304 metres with 35 kilowatts. Of other short-wave stations, Vibourg on 291 metres, with a rating of 15 kilowatts, has a very disappointing range, and the same is true of the 15-kilowatt Hörby and of Helsingfors with similar power. On the other hand, the 14-kilowatt Bratislava and the 11-kilowatt Moravska-Ostrava are both pretty well heard at times. Curiously enough, of the shorter wave stations those with the best range appear to be using quite moderate power. Nürnberg and Cologne, for instance, generally come in amazingly well, though the power of the former is only 2.3 kilowatts and that of the latter 1.7 kilowatts. Turin, with his modest 8.5 kilowatts, is a marvellous transmission, whilst Gleiwitz with 5.6 kilowatts, Leipzig with 2.3 kilowatts, and even Kiel with .3 kilowatts, all have splendid ranges.

FRAME MOUNTING

HEAPS of us use home-made frame aerials which are satisfactory in most respects but when we come to construct them we are apt to find ourselves up against a rather thorny problem in the matter of pivoting arrangements, and the connections between the frame itself and the terminals of the set. What many people do is to stick a couple of terminals (or three if a centre tapping is required) on a small piece of ebonite attached to the upright member of the cross piece. To these are attached flex leads which run to the terminals of the set. The drawback here is that as you turn the frame the leads wind themselves round the upright.

A SOLUTION

I HAVE just made a frame with which I am very pleased. My solution of the pivoting problem kills two birds with one half-brick, and readers will find it useful. To the upright member of the cross piece I fixed a good quality plug by means of strips of ebonite. If you use a flat plug there is no difficulty about making it a tight and rigid fit. The "in" and "out" ends of the windings go respectively to the sleeve and tip of the plug. The stand of the frame consists of a box with an ebonite top on which are mounted a good strong jack and a couple of terminals. The jack is of the single open-circuit type, one contact being wired to each terminal. Simply stick the plug on the end of your frame into the jack on the box and you have a pivot which works well and automatically connects the windings to the terminals on the stand. Leads are taken from the latter to the terminals of the set, and you can turn the frame as much as you like without affecting them. Unless, though, you are very careful about the jack selected, you may find that the spring which makes contact with the point of the plug is too weak to ensure a good connection as the aerial is rotated. There are heavy-duty jacks specially made for the purpose, and these are excellent.

STATIC POTENTIALS

A CORRESPONDENT sends me the following ingenious theory of what he regards as an unsuspected danger to airships of the size of the ill-fated R101. It is well known, he argues, that the electric potential of the atmosphere is by no means evenly distributed. In the first place there is a more or less definite potential-gradient as one moves vertically upwards from the earth's surface. This is often manifested by a steady hiss heard in

On Your Wavelength! (continued)

the phones of a wireless receiver as the aerial wire discharges the potential difference across its ends. Sometimes, in thundery weather, the aerial discharge current becomes so heavy that a stream of sparks will pass between the plates of a series condenser, accompanied by a sharp crackling noise. In the second place, areas of unequal electrical pressure certainly exist in the higher regions of the atmosphere, particularly in the vicinity of clouds. When the concentrated charge exceeds a certain voltage it discharges itself in the form of lightning.

A PERIL OF THE ETHER

WE have now, he continues, started to launch huge airships, built up around a metallic framework, into a region which is, in effect, full of uncharted electrical dangers. A metal structure of girders and stays, over 700 feet in length, and insulated from earth, must inevitably encounter large potential differences as it moves from point to point through the air. In these circumstances, changing currents will be induced which may well spark across an imperfect contact in the framework and so cause disaster in an atmosphere containing explosive gas.

This certainly seems rather alarming, but I fancy the designers of such craft must be well aware of the danger from atmospheric "static," and will have taken suitable precautions, for instance by carefully bonding all joints in the metalwork, to prevent "sparking."

REPRODUCTION AND DISTANCE

I WAS at a trade show the other night of a new picture produced at Elstree, and for the first time in my life I saw a picture from the front row of the stalls of an ordinary theatre. From the visual point of view the effect was, perhaps, a little bewildering at first. Whenever the camera was "panoramed" around, the effect was somewhat similar to that experience when taking off in an aeroplane. The various objects and people moved by with dazzling rapidity. Farther back in the auditorium, of course, this effect is not noticed.

The point which impressed me particularly, however, was in connection with the sound reproduction, for, of course, the picture was a talkie. I was quite prepared to find the reproduction unpleasantly loud, but, to my surprise, I found it very much the reverse. In fact, it started off so softly, I thought for one moment that the apparatus was not functioning correctly; yet as the picture proceeded no difference was noticeable in the strength. But apparently there was no difficulty in hearing all over the theatre, which goes to show that filling a large theatre is not so much a matter of enormous volume as purity of reproduction and correct attention to the acoustics of the hall. One of the tests I always put on loud-speakers myself is to see how intelligible the speech is a considerable distance away. If there is any distortion present there is a muffling of the sound reproduced, and no increase in the volume will render it any more easily understood.

STEERING BY WIRELESS

SPEAKING recently at Leeds, Rear-Admiral Blount referred to the small radio-controlled launches used during the war by the Germans off the Belgian coast. These craft were loaded up with a cargo of gun-cotton and then steered by wireless from the shore, with the idea of ramming their victim amidships. Of course, they carried no crew. The steering gear was normally set to give a straight course, but was swung to port or starboard by means of two tuned relays energised by radiation from the shore transmitter. A wavelength of say, 500 metres closed the port relay. During "no signal" intervals, the steering reverted to normal, whilst a wavelength of 1,000 metres brought the starboard relay into operation. This kind of thing, which looks simple enough on paper, is apt to prove quite another matter in practice, and I don't think these "engines of destruction" ever did much real damage or proved to be worth their salt. For one thing, effective control is limited to a comparative short range. Then, if the other side happens to be fitted with wireless, it is easy for them to "jam" the controls and so leave the craft an easy target for gun-fire. Given a sufficiently powerful wireless transmitter, one could even take charge of the steering gear and send the thing back to "hoist the enemy with his own petard."

AT LONG LAST

OLD readers of AMATEUR WIRELESS will remember that many years ago I suggested that the time was ripe for the introduction by manufacturers of valves designed specially for the function of rectification. The detector, when you come to think of it, is a very curiously placed valve, for it has remarkably complex duties to perform. First of all, it has to convert high-frequency impulses into audio-frequencies; secondly, it has to magnify at high-frequency; thirdly, it has often to be worked much closer to the point of oscillation than any other valve in the set. It is simply no good telling me that a good medium-impedance valve suitable for H.F. amplification purposes is the ideal detector. Should you do so, reader dear, I will merely open the lid of your cabinet and flip your detector valve with my dainty finger-nail. And in nearly every case your loud-speaker will respond with a mighty pong. Most of us have experienced microphonic troubles at one time or another.

WHAT IS WANTED

SOMETIMES pongs occur only when the set receives knocks that really should not come its way; sometimes they happen when you walk across the room; in extreme cases the jolly little business known as singing round the ring takes place. This means that vibrations from the loud-speaker set the detector vibrating and that a howl builds up. Clearly, then, the detector should be as nearly non-microphonic as makes no matter if it is to be of real use. Next, it is important that, if it is to be used as an anode-bender, it should have a very pronounced curl at the lower end of its curve and that it should be capable of offering a decent straight-line portion to what we may call the positive halves of incoming waves. For grid-leak-and-condenser purposes its grid-current curve must be just so. Last, but by no means least, it must enable its user to obtain perfectly smooth reaction effects. And I have always maintained that none but a valve specially designed for the purpose could do all of these things as they really should be done.

BUT LET ME HAVE ONE GROUSE

I HAVE one little grouse that I really cannot help ventilating, for I think that it is a matter which requires attention. Nothing is more annoying than to see an advertised component which is obviously good and has received excellent test reports and then to find, on ordering it, that it is unobtainable and that delivery cannot be promised within any definite time. This kind of thing does occur rather too often, and the sooner it comes to an end the better I, and countless others, will be pleased. I know, of course, how it comes about. Some manufacturer of a rather nervous disposition evolves a really good component. He has not the courage to put it into extensive production right away, but resolves to go gently until returns from advertisements begin to show whether it is likely to be a success or not. Often the thing is a run-away success. Orders amounting to thousands pour in and existing stocks are sold out in a few days. Since no machinery has been installed in the factory for coping with such a demand, the maker does not know where to turn.

A little more vision is, I think, required. If I were a manufacturer and got hold of what I believed was a bright idea, I would send my component out for test, and if the test reports were enthusiastic I would have everything ready for big production when I launched my advertising campaign. I am sure that everyone would benefit if something of the kind were done. The maker who achieves a big paper success but cannot supply the demand does himself a lot of harm, for disappointed customers remember the old proverb, "Once bitten, twice shy," when another component of his comes along.

THERMION.

DO YOU KNOW—

that in your new short-waver you might try a .0001-mfd. grid condenser and a 3- or 5-megohm grid leak, the lower end of which should be taken to the arm of a potentiometer connected across the low-tension supply? This gives a very nice control of reaction.

that with most pick-ups a negative bias of 1½-volts is advisable on the grid of the first valve? The average pick-up delivers about 1-volt maximum, although some develop a considerably greater voltage, and adequate bias is needed to prevent overloading the first amplification stage. If your pick-up quality is not all that it might be, then try increasing the bias.

HIGH QUALITY WITH LOW H.T.

It is generally imagined that first-class quality demands very high H.T. voltages. There is, however, a method of obtaining quality with comparatively low voltages, as Alan Hunter explains in this article

TO achieve better quality of reproduction, power valves used to be connected in parallel; grid to grid, anode to anode, and filament to filament. That was before really good power valves were available. Yet the notion must still prevail that two power valves in parallel are an advantage. An amateur friend of mine was quite surprised when I recently condemned his output stage. He had two P215 2-volt power valves in parallel, with 150 volts high-tension supply, as in Fig. 1.

When asked the reason for this arrangement, he said he thought it contributed to the cause of good quality. We can see what this misguided amateur was doing by comparing the characteristics of his paralleled P215 valves with the characteristics of the new P2 power valve. Here are the essentials:—

Valves.	*Impedance.*	*Amplification.*	*H.T.*	*Grid Bias.*
P215's	2,500 ohms.	7	150	12
P2	2,300 ,,	6.5	150	10.5

The P215-s singly have impedances of 5,000 ohms, which is halved when they are in parallel. What advantage is there in the paralleled P215's? I can see none. The amplification factor is no greater than the P2 alone. The grid swing of the P215's is hardly any greater than the P2. The impedances are also similar. When valves are in parallel the input voltage is applied equally to the two grids. So the grid swing of the pair is the same as for one. The pair will overload just as easily as one.

Effect of Paralleling

The only effect of paralleling is to halve the impedance, but that is done more conveniently in the P2, by slightly increasing the filament consumption. In fact, the make-shift arrangement of paralleled valves is now no longer necessary. Modern power valves used singly have the low impedance that was the only advantage of paralleled valves. But it is extraordinary how the idea persists that paralleling valves increases the permissible grid voltage swing.

Just as the grid swing of two paralleled valves of similar characteristics is no greater than for one of them, so the anode voltage must remain the same for both as for one. To increase the anode voltage of paralleled valves beyond the maker's rating has the same effect as upon one of them—the filament emission is quickly ruined.

At the back of these ideas of using two power valves instead of one is a sound enough theory—that one power valve cannot always effectively deal with the signal handed on by the preceding stages. Every listener knows of sets that behave perfectly until the orchestra reaches a *crescendo* part of the score, when terrible "blasting" occurs. The trouble with the average set is its inability to handle the peaks of radio reception.

Most sets are worked up to the limit of their power-handling capabilities, so that when an extra strain is put upon them the quality breaks down. My previous mention of modern power valves reminds me that if one has enough "juice," even this general short-coming of reception can be remedied. Experience bears out the axiom that good quality with a single power valve is not possible with less than 300 or 400 volts.

That sounds fairly impracticable for the average amateur, but where there is a will there is a way. And the way is push-pull, a logical method of using pairs of power valves. Two valves of similar characteristics connected in push-pull, as shown by Fig. 2, provide scope for good quality and with low high-tension supplies.

There is a world of difference between paralleled and push-pulled valves. For one thing the impedances of push-pull valves are in series. So in push-pull two 2,300-ohm valves, P2's for example, would have an impedance with respect to the loud-speaker of 4,600 ohms. That point is important when the question of matching the loud-speaker is considered, but still more important is the fact that the grid swing of push-pull valves is double that of either used separately.

Grid Swing

There is no magic in grid swing. If we can get the required power with a small grid swing so much the more efficient is the power valve. But with this proviso, namely that grid swing in itself is no aim, there is still a lot in favour of providing facilities for as great a grid voltage swing as possible. For then the peaks of reception—those passages that cause the average set to wince!—can be handled without strain.

Overloading, or exceeding the permissible voltage on the grid of the output valve, is a much more common fault than many are prepared to admit. Those who do admit the fault go to push-pull, unless they have sufficient high-tension voltage to work a really large power valve.

The amateur, forced to use batteries, naturally shies at much more than 120 volts, owing to the big increase in the current drain on the battery. But, assuming he will go to 150 volts, two P2's in push-pull will provide a grid swing of over 20 volts. This compares very favourably with the 24 volts grid swing of a P625, needing 250 volts on the anode.

Push-pull

Those going in for radio gramophones would do well to remember push-pull. In gramophone reproduction, more than in radio, the way "blasting" occurs during loud passages is positively heart-rending. If push-pull appeals to the battery user, it should appeal no less to those with an electric-light supply. Large 400-volt power valves *could* be used in the home-builder's radio gramophone, but why go to all the expense of high-voltage smoothing apparatus when two 250-volt power valves in push-pull will do the trick equally well.

One of the biggest fallacies about push-pull is the theory that for distortionless reproduction both the push-pull valves

(*Continued in third column of next page*)

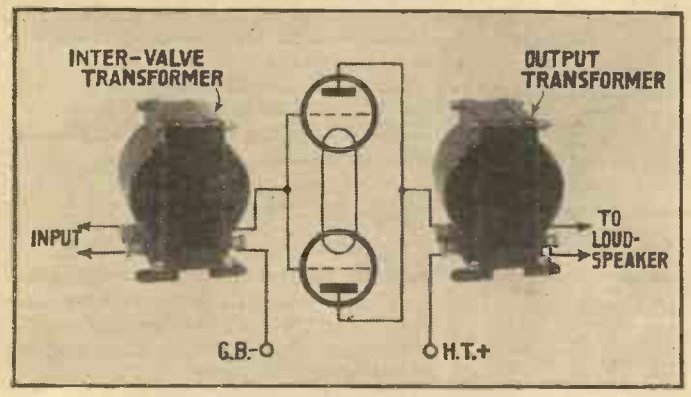


Fig. 1. This pictorial diagram shows the arrangement of two power valves connected in parallel

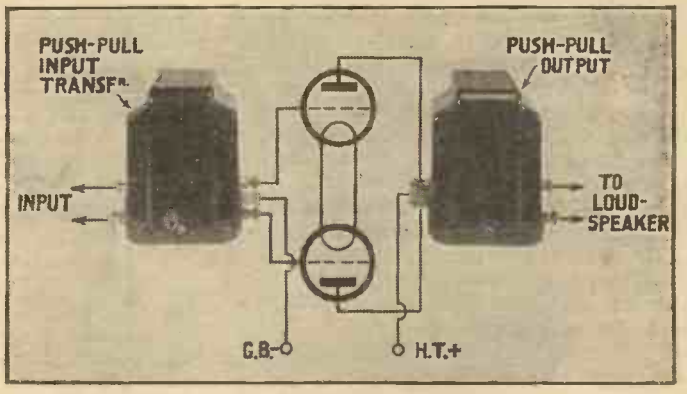


Fig. 2. Here is a better system with valves connected in push-pull, which allows of using a lower H.T. voltage

IN MY WIRELESS DEN

WEEKLY TIPS— CONSTRUCTIONAL AND THEORETICAL

By W. JAMES.

Microphonic Screen Grids

HAVE you ever had a microphonic screen-grid valve? I had one in a set last week and a fine noise it caused, too. There must have been a bad weld somewhere.

It could not be seen, of course, but the poor contact was there all right and there was nothing which could be tried to remove it. Generally, we go straight to the detector when a noise starts, but here is an instance of the screen-grid valve being the faulty one.

Stray Sounds

Some stray microphonic noises are difficult to trace, being due to an intermittent disconnection somewhere in the set. A dry joint is often surprisingly hard to locate. The best plan is to test each joint by starting it with a pair of pliers. Sometimes it is a component that is faulty, the poor contact being between the terminal and the part itself. An example is certain types of valve holders, which seem especially troublesome.

Mains-unit Matters

A point which is sometimes overlooked when fitting a filter to a rectifier, whether valve or metal, is that the size of the condenser connected directly across the rectifier puts a limit on the maximum safe rectified current.

The larger the condenser is made, and the actual output from the unit remaining constant, the greater is the loading of the rectifier.

A usual value is 4 microfarads. If, for the purpose of obtaining perfectly quiet reception, the condenser is increased in size to say, 8 microfarads, the loading of the rectifier has also been increased and, therefore, its heating.

It may or may not stand the extra load. The point is that we should note the effect of the condenser and be ready to reduce the output if necessary.

Soft Valves

Have you ever had a really soft valve? I was trying a set the other day with new valves and found that the power valve was "blue glowing."

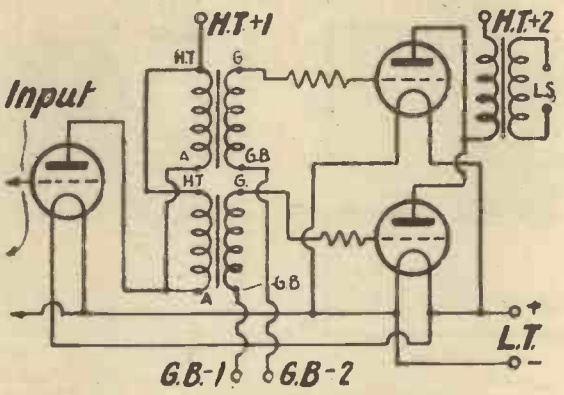
Out of curiosity I measured the anode current which was passing, and found it to be well over 50 milliamperes. The battery, a super-capacity type, would soon have been ruined had the valve been left on. Soft valves are, fortunately, rare in these days.

Parallel Valves

It is not very often that valves are connected in parallel in the output stages of amateurs' sets, but when they are three points ought to be remembered.

The first is that a resistance of, say, 10,000 ohms or more ought to be joined in each grid wire. This is for the purpose of preventing self oscillation of the output stage, which, if it did occur, might ruin the valves.

The second point is that a separate grid bias is needed for each valve if the finest results are to be obtained. This applies more particularly to the larger power valves and not so much to the small types.



If you want to get extra low-frequency power, then you might care to try the scheme of connections shown here. Details are given in the accompanying paragraph

Two transformers may be used to feed a pair of valves in parallel, being connected as indicated in the accompanying diagram. Note particularly that the two primary windings are connected in parallel in the right direction. If one is reversed the net result will be poor signals.

The third point referred to above is that the output circuit must be adapted for the relatively low impedance. Therefore, the choke or transformer must be designed to pass the relatively heavy current with safety.

Pick-ups and Hum

There is nothing like a pair of long pick-up leads for introducing hum into a set, especially when it is of the mains type.

When there is a volume control in the set or a transformer, the effect is not always so bad. The hum is collected by the pick-up wire going to the grid of the valve, and sometimes the long wire will cause the set to howl.

Obviously, the wires ought to be made quite short. This is not always possible, I know, so that other steps must be taken.

You can try an armoured cable, earthing the aluminium sheath, as is often arranged in the anode circuits of screen-grid valves. This sometimes helps. Another tip is to connect a grid leak across the ends of the pick-up wires as near to the valve as possible.

This grid leak ought not to be lower in resistance than is necessary, for the reason that a low resistance cuts off the higher notes and thus reduces the strength of the treble. It may even be necessary to use a grid leak and shielded cable and also to earth the pick-up carrier.

"Wandering" High-frequency Currents

More trouble than you might think possible is caused by allowing high-frequency currents to pass into the low-frequency and anode-supply circuits. Instability, howling, and poor quality, with loss of magnification, are all to be expected if the precaution of fitting suitable filters is not taken.

When high frequency reaches the loud-speaker wires, for example, the amount fed back to the aerial may well be sufficient to cause the set to oscillate. Proper filtering includes the use of by-pass condensers, stopping resistances, and sometimes chokes.

"HIGH QUALITY WITH LOW H.T."

(Continued from preceding page)

must have absolutely the same impedance. I have measured quite appreciable differences in the impedance of push-pull valves without being able to detect aurally or to measure any distortion.

As long as the common grid bias is adjusted to the value recommended for one valve, slight differences in the valve characteristics do not affect the quality. For those who want to match up the impedances exactly, one well-known firm markets a push-pull transformer with a broken centre tap secondary, so that separate grid bias can be applied to each push-pull valve.

In brief, let it be said that the need for paralleled valves has been eliminated by the production of better power valves; and that when the fullest advantage cannot be taken of the modern super-power valve, owing to insufficient anode voltage, two power-valves in push-pull point the way to the ultimate goal of true reproduction.

THE MAKING OF A RADIO PLAY

A continuation of the article in last week's issue describing the highly technical work which broadcast drama entails.

The picture shows the Dramatic Control Panel by means of which the productions of several studios are blended before being actually transmitted

THERE is a department at Savoy Hill which deals with what is known as "Outside Broadcasting."

This department handles all the broadcasting which concerns the relay of such events as the Grand National, the Cup Final, the Boat Race, evening dance music from popular hotels and so on, and, strange to say, this department has been called in more than once to help in the production of radio plays.

Last year the B.B.C. produced a radio version of the well-known novel, "The Prisoner of Zenda," and it was found necessary to include the sound of a church organ in the wedding scene.

A full-size organ being unavailable at Savoy Hill, the producer elicited the services of the outside broadcast department—generally known as the "O.B.'s"—and a microphone was installed in a certain church in the City of London, the local organist engaged and the necessary Ruritanian nuptial music provided. At a given signal the organist burst forth and the same was relayed to Savoy Hill by land-line, conveyed to the Dramatic Control Panel, where the producer "brought it in" for the wedding scene as required.

Rehearsals

Rehearsals are interesting. Let us eavesdrop at, for example, the first rehearsal of a radio play. Imagine if you will that the artistes, orchestra, chorus, crowd, effects man and so on, are all assembled in their various studios. The producer has taken his seat at the Dramatic Control Panel, and his assistant is by his side, ready to work the cue switches—or, as we have previously called them—the "flicks."

At the producer's side is a telephone connected with the engineers in the main control room. In front of him is the D.C.P. and over it his microphone for "talking back." On the desk in front of the D.C.P. itself lies the script of the play carefully marked with the various cues. The room is in darkness except for one powerful shaded light which illuminates the "working area" itself.

"All ready, Mr. Saunders?" says the producer.

"Yes, everything O.K.," answers his assistant.

The producer puts down his talking switch and leans forward to the microphone which is connected to the loud-speakers in all studios.

The Call

"Stand by everybody, please. Mr. Parkington," he calls the leader of the orchestra, "commence as soon as I give you the red flick, will you?"

Back comes the reply through the loud-speaker on the wall: "Right-ho—all ready here."

"Get that stop-watch ready will you, Saunders?" goes on the producer. "O.K.? Good—all right—flick No. 7!"

And through the loud-speaker comes the strain of the overture from the orchestra in No. 7 studio.

"Stand by to give the artistes in No. 4 their flick. Are you ready? Right! Flick 4."

Down goes the switch and a second later a girl's voice is heard. The producer slowly revolves the knob on the panel marked 7, and the music fades out.

"I suppose you've heard the news, Harry," says the girl's voice.

"What news?" asks a male one.

"Why—George Fenton is coming down for the week-end: aren't you glad?" continues the girl's voice.

"Why, yes," says the man, "I'm—er—delighted, I——"

"Just a moment, please," "cuts in" the producer, "Harry."

The actor answers "Yes."

"You don't get that 'why, yes' quite right you know," continues the producer through his microphone. "I want your voice to sound much more 'dead.' Give the impression that for a long time you have been expecting this George Fenton to turn up, you hate the sight of him, of course, but as your wife likes him you are resigning yourself to the circumstances. Have you got that?"

"Yes, I see what you mean," comes the answer.

"All right," replies the producer. "We'll just go back and try that again. And don't forget, Harry" (actors are nearly always addressed by the name of the character they are portraying), "make your voice as *dull* as you possibly can. We'll give you another flick to start—stand by everyone."

And so it goes on. Later, perhaps, there is an effect to be brought in. "George Fenton" arrives by car and as the girl says: "Here is George coming down the drive" down goes the flick switch marked 2E—the effects studio—and promptly comes the noise of the approaching car. A pained expression comes over the producer's face. "Half a minute, everybody. Hullo, Effects studio—Hullo 2E."

Back comes the reply, "Hullo, yes, Effects here."

"I say, I'm awfully sorry, Effects, but I forgot to tell you that this George Fenton arrives in a perfectly good 30/98 racing affair—the car noise you sent me sounded like a runabout. Can you improve on that?"

"Yes, O.K., Mr. Howard. I'll give you a deeper exhaust note with a muffled bass drum. Would you like to hear it?"

And so the runabout becomes a high-powered sports model and the producer is satisfied.

As a general rule radio plays require anything from six to eight rehearsals, each lasting about three hours and the concentration required by all concerned would be a lesson to most people.

A Tense Atmosphere

To sum up, the atmosphere at Savoy Hill is tense to an extreme. Many of my readers have experienced that "pent up" feeling always connected with the first night at a theatre. Well, that is precisely what almost every night feels like to the radio play producer.

And this worthy never experiences that delightful sensation which is often attendant after theatrical first nights—the sensation of success and the knowledge that the play is in for a long run and the well-earned holiday in sight. No, our hard-worked friend wakes up the next morning with the cold facts of another production staring him in the face and the knowledge that he must be at the office early to read through the new script of another play which, maybe, must be ready for production only a few days later.

Of course, television is on its way—the first sight and sound play, has already been produced—but this will be something different again, and there will have to be born a new art, a new sense of production, a new technique and most important of all, a new type of artiste.

PRODUCER.

WHAT IS AN INDUCTION MOTOR?

By J. H. REYNER, B.Sc., A.M.I.E.E.

MANY of the gramophone motors which are available to-day for running off alternating current supply are listed as "induction" motors. It is urged in their favour that they have no brushes, so that there can be no sparking, with its attendant interference with reception. Many readers must have wondered what this peculiar form of motor is, and what are its limitation, if any.

The induction motor is a device which is only suitable for use with alternating current, and operates on an ingenious principle. In the diagram we have two coils at right-angles to one another, these coils being each wound in two sections with a gap in the centre. In this gap we place a small magnet, which is pivoted so that it can rotate. Let us pass a current through the coil A B. A magnetic field will be produced, and this will cause the magnet to set itself in line with the field; that is, along the dotted line A B. If we switch off the current from the first coil and pass a current through the coil C D, a magnetic field will be produced at right-angles to the first one, and the small pivoted armature will rotate and take up a position along the line C D.

A Rotating Field

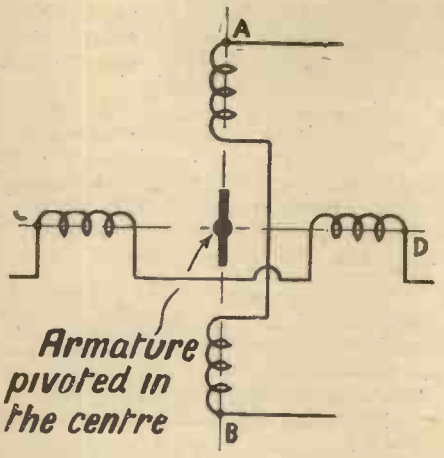
If we go one stage further than this we can alternately switch the current on to the first coil and then on to the second, and then on to the first coil in the opposite direction and again on to the second, causing the armature to rotate 90 degrees at each change of connection. If we can continue to change the connections in this manner the armature will rotate continuously. We can, however, produce the same effect without actually changing connections, if we supply an alternating current to the two coils. Such a current is one which rises to a maximum value and falls to zero again, and then passes through the same state of affairs in the opposite direction. Thus, if we apply alternating current to the two coils we shall have the same effect as the switching on and off; in fact, it will be rather better, because the variation will be gradual instead of sudden.

The effect is, then, that on switching on the current to the system we produce what is known as a rotating magnetic field, which will act upon an armature placed in the centre in the manner just described.

Practical Construction

This is a very brief discussion of the underlying principles. Practical forms of the motor differ in detail. For example, the armature is not a simple pivoted magnet. In most cases it consists of a laminated cylinder of sheet steel in which is embedded a winding. This winding is completely short-circuited on itself, and the currents which are set up therein, due to the magnetic field, serve to magnetise the armature so that it acts in the same manner as the simple model we have just described. There is thus no point in the system at which the current has to be led in and out of a rotating piece of mechanism. Such a device, which is known as a commutator, is essential with a D.C. machine or with a universal motor which can be used on either type of supply, and it is here that sparking occurs.

A further important advantage of this type of machine is that its speed is independent of the voltage of the supply. Reference to the original simple system will show that the armature will rotate once for every complete change of the connections, or in the alternating current



This diagram shows the principle upon which the induction motor works

case, for every complete cycle of operations. The ordinary alternating current fluctuates at a regular rate, anything from 25 to 50 times per second, the latter figure being the most usual in this country, and being the standard which will ultimately be adopted. Therefore, in a simple system such as that described, supplied with 50-cycle alternating current, the armature would rotate 50 times per second, or 3,000 revolutions per minute.

The voltage of the supply does not affect the speed, provided that sufficient power is obtained to drive the armature (and any associated mechanism) round. The frequency of the ordinary A.C. supply is much more constant than the voltage. It depends upon the speed of the generators at the power station, and these are all governed within very fine limits. Indeed, it is essential, in these days of interlinked supply stations, that the frequency shall remain absolutely constant. The voltage, on the other hand, may vary at different times of the day, according to the load which is being taken by the various consumers.

The induction motor is thus a constant-speed motor, the rate of revolution being determined entirely by the construction of the machine and the frequency of the supply. This in some cases is a disadvantage, since it renders it less flexible in use, but for gramophone practice it is a good point, since the motor is suitably geared to the turntable and the speed then remains constant irrespective of fluctuations in the voltage.

"Slip"

There still remains the proviso just made, that the motor must be capable of handling the power which it is called upon to supply. The speed of rotation is actually not quite the same as that of the rotating field. If a load is placed on the motor the armature slows down very slightly, and this causes current to be induced therein. The interaction between these currents and the magnetic field sets up a mechanical force and urges the armature round, so overcoming the resistance due to a mechanical device, such as a turntable, which has to be driven. The heavier the load, the more is this "slip," as it is called. Thus on a gramophone, for example, it is possible for the motor to slow up slightly on a heavy passage on the record where the resistance is suddenly increased, but if the motor is designed correctly this variation will be negligible.

Usually the motor is made to drive against a governor. It is provided with an excess of power, and the greater proportion of this power is absorbed in the braking action of the governor. The variations in the additional load due to the record are thus very small and are automatically corrected for by a slight easing up of the braking action of the governor.

To sum up, the induction motor gives a very steady speed in actual practice, and a complete freedom from any sparking or worse troubles. Its disadvantage is that it only operates on alternating current and that it can only run at a fixed maximum speed.

DO YOU KNOW—

that the best method of using two speakers together is not always to connect them in series? The best way to use more than one speaker is to fit a choke-output transformer, so that the impedances can be matched. Alternatively, a high-resistance speaker can be connected directly in the anode circuit, and a low-impedance one via an output transformer or choke filter.

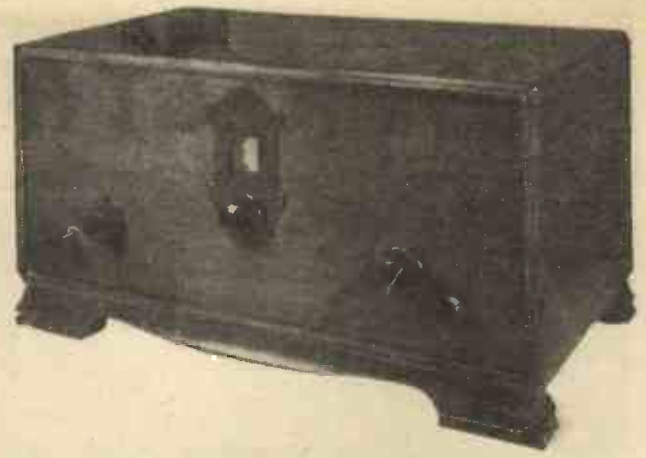
that the word "omroep" which you see so often in connection with the Dutch stations means "broadcast"? It is derived from the old Dutch word "omroepen," which was the name given to the town crier in small villages in Holland.

MOTOR-MADE "STATIC"

WIRELESS beam stations receiving wavelengths in the neighbourhood of 10 metres are subject to considerable interference from passing motor-cars, which radiate short-wave oscillations from the ignition systems. In order to avoid this type of disturbance, a screen of short conductors is sometimes hung across the road so as to form a kind of archway. The conductors are earthed at one end and act as reflectors to absorb the disturbing radiation away from the beam aerial. B. A. R.

SETS OF DISTINCTION

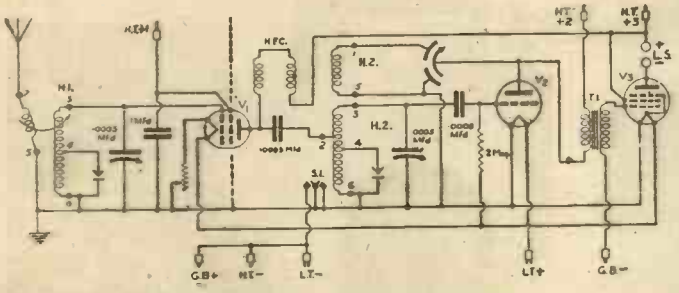
THE 1931 MULLARD ORGOLA



Makers: **Mullard Wireless Service Co., Ltd.**
Price: **£8 for complete kit and valves.**

ALTHOUGH I have not had a chance to build the new Mullard Orgola, the makers recently supplied me with a completed model, so that I could substantiate their claims by actual tests.

As the Mullard people say, valves are available to-day of an efficiency undreamed of a few short years ago. With such progress in valves, modifications and improvements are constantly being called for. So while we all thought that, in last year's Orgola, the makers had reached the peak of efficiency for a three-valver, this year's model proves that still more could be done to simplify tuning, to improve selectivity, and still further to reduce the number of constructional processes.



The circuit of the 1931 Mullard Orgola

Let me run through the main points of the 1931 Orgola. Of the three valves, the first is a screen-grid high-frequency amplifier, preceding the second valve, which is a leaky-grid detector, in turn coupled by means of a Mullard transformer to the power or pentode output valve.

While there is nothing original in such a sequence of valves, which, indeed, statistics would probably reveal as the most popular among constructors, the practical interpretation of it is peculiarly Mullard's. What then, is there "different" about a Mullard design? Firstly, I think they aim at the last word in a clean and efficient layout of the components. The mounting of the two tuning coils and the screen-grid valve between them is a masterpiece of simplicity combined with efficiency.

The two dual-range coils are mounted on a small square of baseboard screening. Between the two coils is erected a simple vertical screening partition. The screen-grid valve is mounted horizontally, so that the anode terminal on top projects through the vertical screen to make contact with the coupling tuning coil.

For tuning, a two-gang condenser is employed. Although designed for one-dial operation, this condenser has a thumb adjustment to correct the aerial tuning. In this way simplicity of control is achieved without loss of efficiency.

Looking at the circuit diagram, I find every evidence of modern practice. The screen-grid valve is choke condenser-coupled to the detector grid-tuning circuit. Differential reaction is employed in the anode circuit of the detector valve. The aerial is variably coupled by means of a small aperiodic rotor inside the aerial tuning coil.

When we come to look at the completely assembled Orgola, the well-planned layout of the components is proved. Right in the middle of the cabinet front is the tuning control—a knob rotating a clearly-engraved scale. On the left and right are pairs of knobs and switches, making a symmetrical layout.

The switch on the left operates a very simple wave-changing mechanism. Next to it is the volume control, a rheostat in the filament circuit of the screen-grid valve. The switch on the right is for switching the set on or off. Next to it is the reaction control knob.

Valves Recommended

To work this set, the makers recommend a Mullard PM12 for the high-frequency stage, a Mullard PM2DX for the detector and a Mullard PM2 power valve, Mullard PM252 super-power valve, or Mullard PM22 pentode for the output stage.

I tested the completed set with a pentode output valve and the other valves were as specified. My biggest impression of the set was gained during the first five minutes, when the enormous power of several foreign stations convinced me that the set is a winner.

Single Tuning Control

The single tuning control was much appreciated after the initial matching up of the aerial tuning had been accomplished. Then stations simply rolled in. Thanks to the variable coupling of the aerial coil, the selectivity was good enough to enable me to cut out the Regional and National stations within a few degrees.

With my linen-diaphragm loud-speaker, the pentode output valve gave a fine, crisp rendering of speech and music.

Now I am going to give details of my log. Starting at the top of the tuning scale, I got Budapest at 87. Munich, a station I have not heard lately, came in at 85, quite strongly. Vienna, at 82, was still stronger, as was Milan, at 80. Then came the Midland Regional, at 77.

Rather to my surprise, Langenberg at 76 was quite clear of the Midland station. Lyons la Doua at 75 was very strong. So was Rome at 70 and Stockholm at 69. Katowice at 65 was very clear. So was the lady announcer of Bucharest at 61.

Frankfurt at 60, Toulouse at 59, and, biggest surprise of all, Manchester at 58 were the last three stations before London Regional at 54. Then followed Barcelona at 50, not very good, and Breslau at 46. Göteborg at 45 was tremendous. And Cardiff at 43 was quite good. Another strong station was Bordeaux at 41, above the British relays at 36.

Then I got Lyons at 35.5, followed by Bratislava, very strong at 34, and Rennes, equally strong, at 32.5. The National 261-metres transmitter was at its maximum at 29. Below it was Hörby at 28, and Leipzig at 26.

SET TESTER.

The design of the Mullard Orgola has many distinctive features as will be observed from this photograph of the interior

BROADCAST ARTISTES IN PICTURE

SEYMOUR DOSSOR.—This well-known tenor has a wide following throughout the provinces, and appeared on October 13.

ELSIE GRIFFIN.—An artiste noted for her choice of works, Miss Griffin was heard in a recital from the Belfast station on October 13.

JOHN BUCKLEIGH.—Originally commencing professional life as an artist, luckily Mr. Buckleigh discovered he possessed a fine baritone voice.

MAY BLYTH.—A magnificent oratorio singer, as witness her performance in "Elijah" (Mendelssohn), when relayed from the Town Hall, Birmingham, on October 16.

VIVIAN LAMBELET.—The famous daughter of a famous father, Napoleon Lambelet, the composer.

EDITH ATHEY. — A soprano often heard in the provinces, Miss Athey is noted for her wide range of songs.

HAROLD CASEY.—An early assistant director of Birmingham station, this fine singer was known for long as "Uncle Pat."

ISOBEL BAILLIE. — Heard from nearly all stations, Miss Baillie is a favourite broadcast artiste by reason of her clarity of diction.

ARNOLD TROWELL.—One of the foremost 'cellists. His broad "singing" tone is especially noticeable and ever welcome when he gives a recital.

PAUL MOLCHANOFF.—One of the finest of Russian singers, M. Molchanoff was heard to special advantage in the first week of October in a recital of Russian songs.

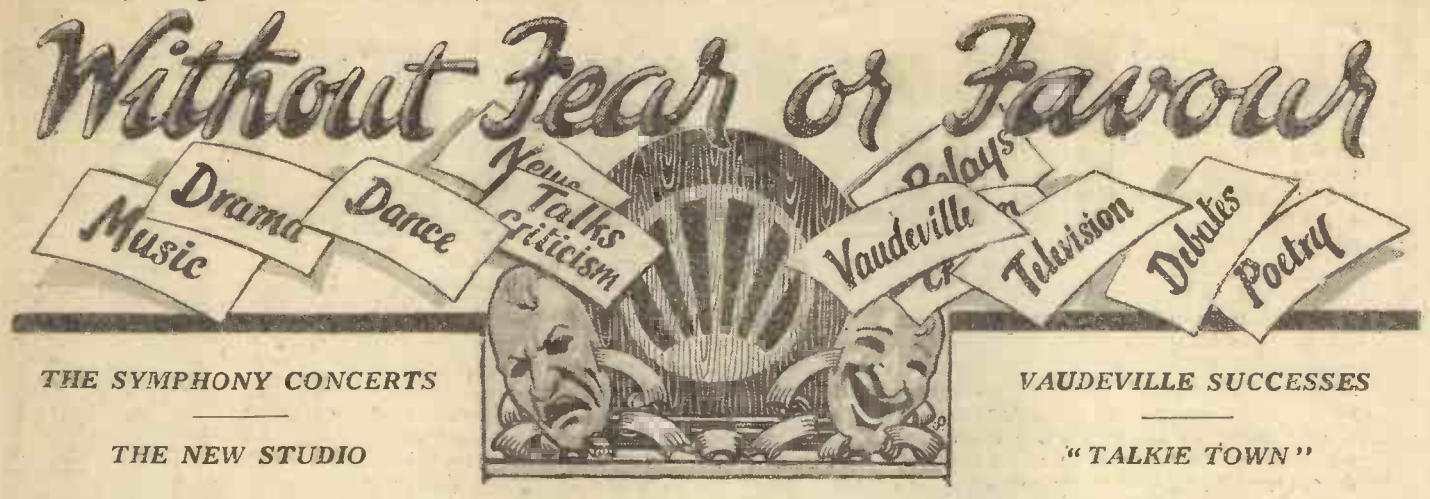
JOSEPH SLATER.—One of the first "star" artistes to join the B.B.C. concerts, Mr. Slater, has played in public since the age of twelve.

LILLIAN HARRISON.—A clever young actress often heard from London. She played the title role of the Nurse in "Nurse Henrietta," on October 24.

DAME ETHEL SMYTH.—Composer, conductor, musician, and keen politician, there are very few roles in life that Dame Ethel Smyth has not essayed and achieved success.

A Weekly Programme Criticism—By SYDNEY A. MOSELEY.

Without Fear or Favour



THE SYMPHONY CONCERTS

THE NEW STUDIO

THE first B.B.C. Symphony Concert at the Queen's Hall rather alters some views I proposed to express this week. I was going to write, after some experiences in Paris and Berlin, that there was only one way of enjoying music in any shape or form—and that was via wireless.

The audiences, particularly at the opera, simply distract one, and it is impossible to concentrate. I had some irritating examples of this during a week-end visit to Paris when I went to the Opera House, and in order to get the right atmosphere—as the announcer puts it—got a seat in the front row. When my neighbours on my right and left were not whispering to each other, members of the orchestra themselves were talking, and I vowed never to go to the opera again.

But on my return to London I thought I would go to the first performance of the B.B.C. Symphony Orchestra at the Queen's Hall, and it well repaid a visit.

◆ ◆ ◆

Adrian Boult is a real worker, and, what is more, a finished worker.

The B.B.C. is right in getting hold of a man with more ability than "side."

And, my, doesn't the orchestra know how to play "God Save the King"! You would have thought it was an Empire Free Trade orchestra playing it—a challenge emphasised by the conductor who sent in straight rights from the shoulder again and again. No wonder poor Adrian had to put on a new collar after the interval.

◆ ◆ ◆

As I say, a great evening; but, nevertheless, millions of listeners can console themselves with the fact that in most transmissions they can settle down quietly without being disturbed by irksome and restless neighbours. That is why I am dead against studio applause. If I had my way, I would have no public performances of the orchestras at all. Noise and music do not blend well.

◆ ◆ ◆

As it happens, I was invited to the first Sunday concert which was given in the new B.B.C. studio. I went, because I like to see at first hand things that I may have to criticise.

◆ ◆ ◆

Less than a dozen of us were privileged to visit the new studio, which is still called Big Tree Wharf, which is on the other side of Waterloo Bridge; and what an eerie scene the place presented.

I tried to find the steps leading from the bridge to the somewhat squalid surroundings below, and was only stopped in time from walking right down into the river itself!

◆ ◆ ◆

But it was worth all the excursions and alarms. The wharf had been transformed as thoroughly and effectively as could possibly be conceived.

Then, the air of informality! Members of the Symphony Orchestra taking off their coats, and the example was followed by Adrian Boult, who is a very human fellow.

Kate Winter sang with her back towards me, but I imagine her voice is more suited to broadcasting than to the concert platform.

◆ ◆ ◆

I hope listeners enjoyed the concert as much as I did.

◆ ◆ ◆

The entertainment side has certainly not been neglected of late. The extracts from the new Cambridge Theatre show, Charlot's "Masquerades," were successful, although I think that the three little episodes were rather more suitable for the studio than for the stage.

Beatrice Lillie's personality came over well. Each episode had a central idea which, although not always original, was certainly humorous, which is the main thing.

◆ ◆ ◆

What was irritating was the fact that the listener was given the impression that this was a continuous broadcast from 10 o'clock, with interludes by the B.B.C. Dance Orchestra, whereas it was really the dance orchestra with interludes from the theatre. Those of us who had no desire to listen to Jack Payne found it rather uninteresting to hear dance tunes which sounded so much alike.

◆ ◆ ◆

Gillie Potter provides entertainment, and his patter is quite good. I advise him, however, not to speak too quickly when he is broadcasting. Even with the best set, it is more difficult to listen when one has not sight as well; very often I find him difficult to follow.

◆ ◆ ◆

How not to arrange your programme :—

6.45. "Midsummer Night's Dream" (Mendelssohn).

9.0. "Midsummer Night's Dream" (Mendelssohn).

◆

As against the vaudeville successes mentioned above, Leslie Weston had the dullest material I have listened to for a long time.

"Algy met a tiger, the tiger was bulgy, the bulge was Algy" was quite funny during the time of Noah. And "Is your husband insured? I hope you won't have as much trouble in collecting his insurance as we have had in collecting him" is not funny at all—not even in Grand Guignol.

◆ ◆ ◆

A Sister to Assist 'Er, on the other hand, was as funny as it always is. The good things can always bear revival.

By the way, I wonder if Doris Emney is related to the redoubtable Fred, who made such a hit as "Mrs. May"?

◆ ◆ ◆

Suggia must be *seen* to be believed.

◆ ◆ ◆

I didn't see anything in *Talkie Town* to merit its being dug up and re-presented on two nights running. It started off fairly well, but degenerated into the usual concoction of songs, strung together with would-be humorous stuff. The plot was, as usual, silly.

Jack Payne and his B.B.C. Dance Orchestra

VAUDEVILLE SUCCESSES

"TALKIE TOWN"

THE CHALLENGE THREE

: ONE-KNOB CONTROL :

BY THE "A.W." STAFF

THE "Challenge" has set a challenge among sets! A free blueprint was given away three weeks ago of the "'A.W.' Challenge Four," a set designed by Mr. W. James, and this proved to be one of the most popular receivers ever described in AMATEUR WIRELESS. Readers were quick to realise that in this new series of "Challenge" receivers there is a real attempt to produce something out of the ordinary, for there still *is* a great deal which is yet to be tried in radio receiver design and of which many set users are not aware simply because set designers are afraid to break away from conventionality.

Outstanding Points

Well, here is a worthy successor to the first "Challenge" set: it is the "'A.W.' Challenge Kit Three." There are two things about this which you must observe. First, it is a "three," which means that it is slightly cheaper to build and maintain than the "Challenge Four"; you need have no qualms about the running costs of this new set. Second, it is a "kit" set. This needs a little explanation. All the receivers which are described in "A.W." can be made up without difficulty, particularly if advantage is taken of the fact that full-size blueprints are available for a small sum. "A.W.'s" guides to the home constructor, in the way of photographs, blueprints, wiring diagrams, components list, and descriptive matter make set building an extremely easy task.

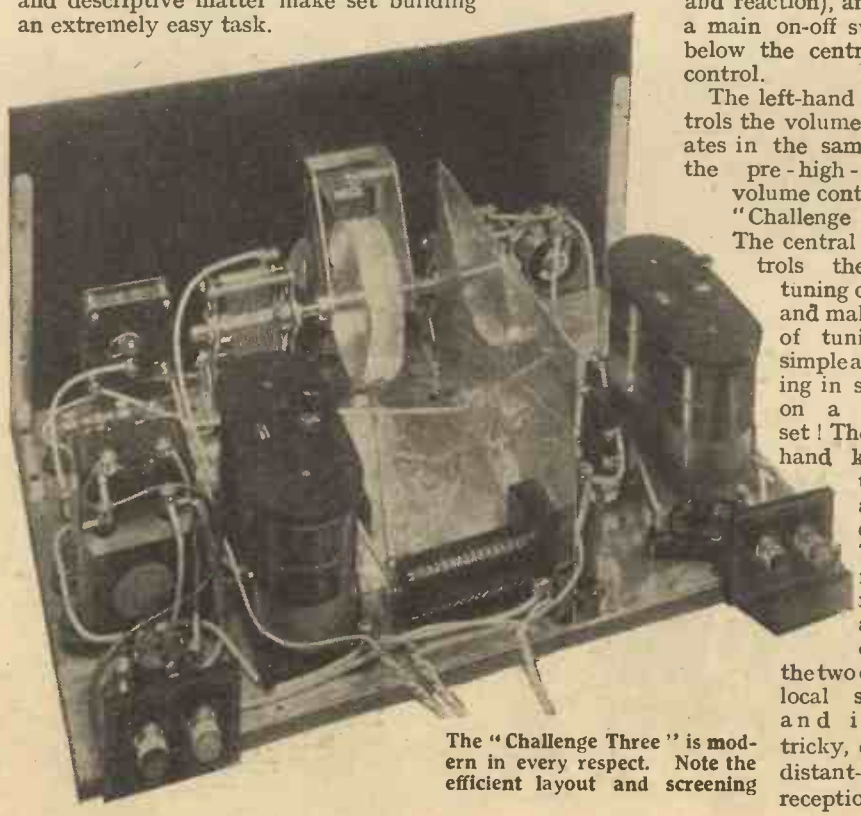
Here, however, is still further simplification. Blueprints and photographs show you how to mount the components and they indicate where the connections are made; but they do not show exactly each lead in detail, nor do they give the exact length of each wire. In an accompanying panel you will see a list of all the wires needed for this set (there are only 33), and against each you will find the length of the insulated sleeving of each.

What could be easier? With the aid of this panel you can cut each piece of sleeving to its exact length, slip a slightly longer piece of wire through it, and then, using the blueprint as a guide, you can put the wire in its correct place, from terminal to terminal. This does away with all possibility of a wrong connection being made, and consequent short-circuits.

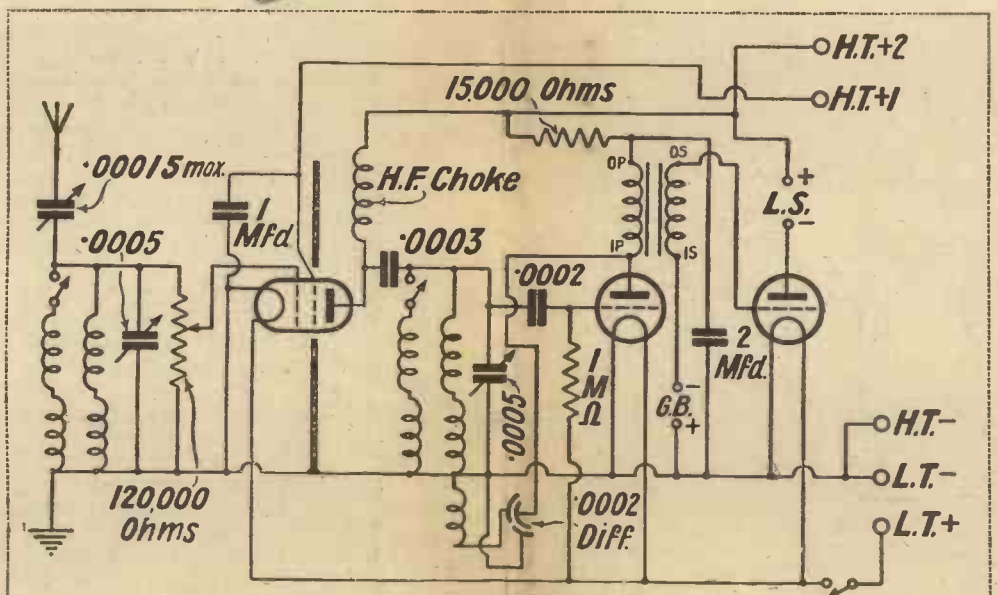
A Simple Layout

But before we go any further into the details of construction, just a word about the set and its circuit. Take a glance at the panel. It could not be designed on more straightforward lines. There appear to be only three knobs (one only of which is used for tuning, the others being volume and reaction), and there is a main on-off switch just below the central tuning control.

The left-hand knob controls the volume and operates in the same way as the pre-high-frequency volume control in the "Challenge Four." The central knob controls the ganged tuning condensers and makes the job of tuning as simple as bringing in stations on a crystal set! The right-hand knob is the reaction control. This need not be adjusted for the two or three local stations and is not tricky, even on distant-station reception.



The "Challenge Three" is modern in every respect. Note the efficient layout and screening



The circuit of the "Challenge Three." Features are the novel volume control which does not affect tone or tuning, differential reaction and efficient L.F. filtering

COMPONENTS REQUIRED FOR THE "CHALLENGE THREE"

Cabinet (Clarion, Camco, Pickett).

Ebonite panel, 16 in. by 8 in. (Becol, Trelleborg).

Baseboard, 16 in. by 10 in. (Clarion, Camco, Pickett).

Two-gang .0005-mfd. condenser with drum dial (Lotus, Polar, Formo, J.B., Burton).

.0002-mfd. differential reaction condenser (J.B., Polar, Lotus).

120,000-ohm variable resistance (Regentstat, Igranic, Rotorohm, Lissen, Varley).

Piece of aluminium foil, 12½ in. by 10 in. (Parex, Readi-Rad, Wearite, Peto-Scott).

Screen, 7½ in. by 6 in. (Parex, Readi-Rad, Wearite, Peto-Scott).

Panel brackets (Bulgin, Readi-Rad, Camco, Keystone, Parex).

Pair of "Challenge" coils, one aerial, one anode with reaction (Tunewell, Atlas, Wearite, Readi-Rad, H. & B.)

Universal valve holder (Junit, W.B., Parex).

Two valve holders (Telsen, Lotus, W.B., Junit, Benjamin, Burton, Brownie, Wearite, Lissen).

.0003-mfd. fixed condenser (Lissen, T.C.C., Telsen, Dubilier, Graham-Farish, Watmel, Atlas).

.0002-mfd. fixed condenser (Lissen, T.C.C., Telsen, Dubilier, Graham-Farish, Watmel, Atlas).

One megohm grid-leak (Lissen, Dubilier, Graham-Farish).

Grid-leak holder (Lissen, Bulgin, Dubilier).

2-mfd. fixed condenser (Lissen, T.C.C., Dubilier, Igranic).

1-mfd. fixed condenser (Lissen, T.C.C., Dubilier, Igranic).

Low-frequency transformer (R. I. "Hypermu," Lissen, Ferranti, Varley, Lewcos, Telsen, Igranic, Lotus, Burton, British General).

High-frequency choke (Lewcos, Readi-Rad, Telsen, Lissen, Watmel, Tunewell, Sovereign, Igranic).

Filament switch (Readi-Rad, Bulgin, Benjamin).

Pre-set aerial condenser, .00015 mfd. max. capacity (Igranic, Formo, Sovereign).

Two terminal blocks (Junit, Belling-Lee, Lissen).

Four terminals marked; Aerial, Earth, L.S.+, L.S.— (Belling-Lee, Clix, Eelex, Igranic).

Twelve feet of 20 s.w.g. tinned copper connecting wire (Lewcos).

Five lengths of insulated sleeving.

Five wander plugs, marked: H.T.—, H.T.+1, H.T.+2, G.B.+, G.B.— (Belling-Lee, Igranic, Clix).

Two spade tags, marked: L.T.+, L.T.— (Belling-Lee, Clix, Eelex).

E KIT SET

EASY TO BUILD :

The back-of-panel arrangement of the "Challenge Kit Three" is on exactly the same straightforward lines. The special "Challenge" coils are used, which can be bought complete or which you can wind yourself, and there is just sufficient screening in the high-frequency and detector stages to make the whole set quite stable in working. Too much screening tends to damp the performance of the set, while too little makes it tricky to adjust. In the "Challenge Kit Three" there is just the right amount of metal.

Easy Connections

Terminals are used only for the aerial and earth and for the loud-speaker output connections. The connections to the accumulator, high tension, and grid bias are made by means of twisted flex cables. This is a much cheaper and simpler idea than the use of terminal strips; furthermore, there is no possibility of bad contacts occurring after the set has been in use for some time. Of course, this "Challenge Kit Three" can be either battery or mains driven. A large-capacity dry high-tension battery is used or, alternatively, practically any medium output direct or alternating current mains eliminator may be used. The type of eliminator needed depends mainly on the size of the power valve; but more will be said of this in the final operating notes, when full details will be given of suitable valves and "juice" supplies.

The circuit shows the salient features of the set. Aerial tuning is carried out with one of the new "Challenge" coils shunted by a .0005-microfarad condenser—one section of the ganged tuning condenser.

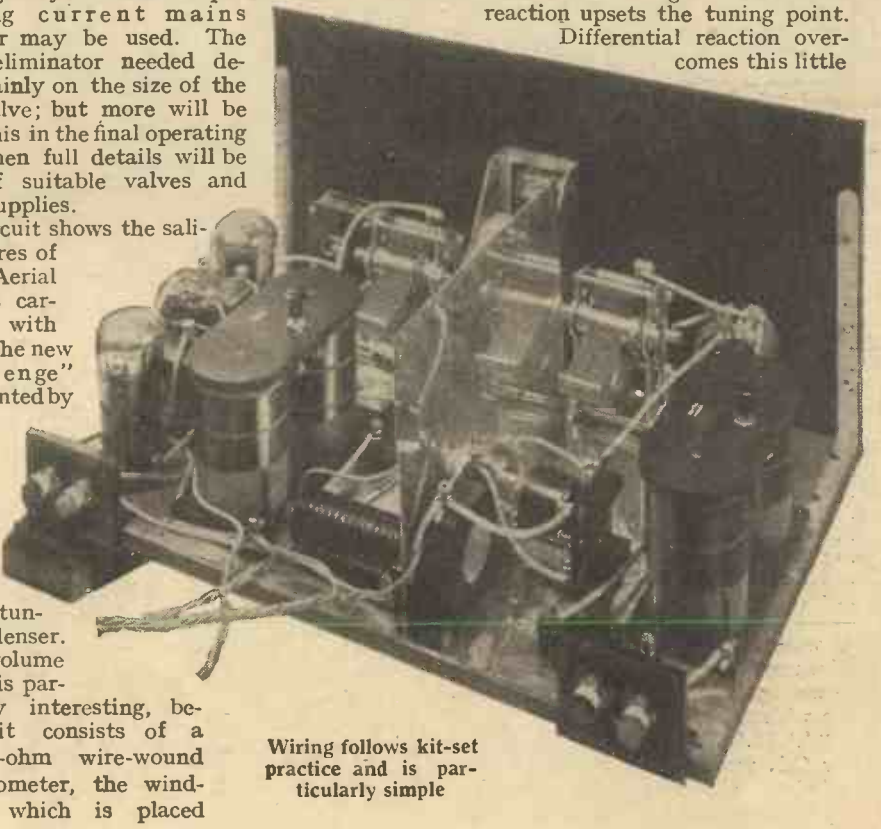
The volume control is particularly interesting, because it consists of a 120,000-ohm wire-wound potentiometer, the winding of which is placed across the aerial coil and the slider of which is taken to the grid of the high-frequency amplifying valve. This makes a very convenient form of strength control, because it actually regulates the amount of voltage applied to the receiver and is equivalent to altering the sensitivity of the aerial itself—and this without the difficulties that usually attend the alteration of aerial characteristics by normal methods, such as the use of pre-set condensers.

Screen-grid Amplification

The screen-grid valve is connected in a quite straightforward circuit, and its efficiency and stability (which makes for easy tuning) are the result of the careful disposition of parts and the arrangement of the screening. The detector is a grid-leak rectifier, and a notable good point is the use of a differential reaction circuit.

Differential reaction is a most satisfactory arrangement, and has been incorporated in the design of the "Challenge Kit Three" because it results in particularly easy tuning, which is most appreciated when the set is being used for the reception of the foreigners.

As you doubtless know, turning the reaction knob in an ordinary set affects tuning, and this is rather disconcerting when you are straining to get the utmost out of a set and the slight variation of reaction upsets the tuning point. Differential reaction overcomes this little

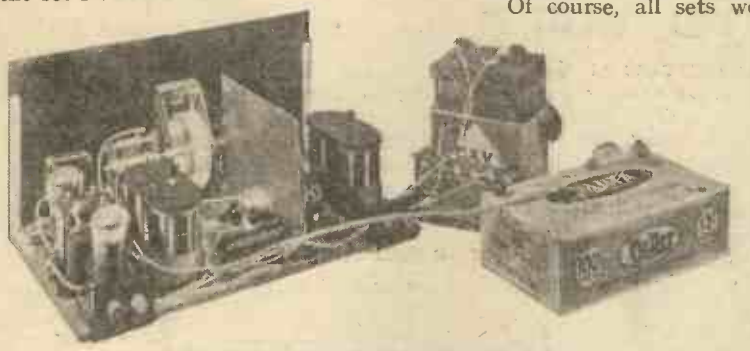


Wiring follows kit-set practice and is particularly simple

"THE 'CHALLENGE THREE' KIT SET" *(Continued from preceding page)*

trouble, and also makes for very smooth regulation of oscillation.

The power valve is coupled with the detector with one of the new special alloy core transformers, and there is a filter circuit to prevent any motor-boating. This may be very useful if you intend working the set from the mains.



The "Challenge Three" ready for testing

Now for the constructional work. In an accompanying panel you will see a list of the parts needed, the first mentioned components being those actually used in the set illustrated here, the others being alternatives which you may use. Of course, some small rearrangement of the set layout may be needed with the alternatives.

Wiring

A full-size blueprint has been prepared for the "Challenge Kit Three," and this can be obtained, price 1s., post free, from the Blueprint Department, AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4. This shows all parts in their correct positions and full size, and it also gives the wiring, each lead being numbered. These numbers correspond with those given in the panel below showing the lengths of the insulated sleeving.

LENGTHS OF SYSTOFLEX REQUIRED

Wire	*Length*	*Wire*	*Length*
No. 1	1 in.	No. 18	5½ in.
No. 2	2¾ in.	No. 19	7½ in.
No. 3	1 in.	No. 20	3 in.
No. 4	5½ in.	No. 21	3 in.
No. 5	4 in.	No. 22	2½ in.
No. 6	2½ in.	No. 23	1 in.
No. 7	1 in.	No. 24	6 in.
No. 8	4½ in.	No. 25	1 in.
No. 9	8 in.	No. 26	3½ in.
No. 10	1 in.	No. 27	3¼ in.
No. 11	11½ in.	No. 28	7 in.
No. 12	7½ in.	No. 29	½ in.
No. 13	3 in.	No. 30	1 in.
No. 14	1½ in.	No. 31	1½ in.
No. 15	2 in.	No. 32	4 in.
No. 16	2 in.	No. 33	¾ in.
No. 17	2¼ in.		

Next week it will be shown how easy it is to wire up the parts, using the blueprint (or the wiring diagram given here) in conjunction with the wire-length panel.

The "'A.W.' Challenge Kit Three" is on view this week in the Radio Department windows of Messrs. Selfridge & Co., Ltd., of Oxford Street, London, W. The Radio Department is in Somerset Street, parallel with Oxford Street.

DIRECT BATTERY LEADS

THERE are some sets which would be more convenient to handle if the terminals were omitted, and connections taken direct by flexes from the respective components to the batteries.

Of course, all sets would not be convenient in this way, but the average homeset, which is tinkered with only occasionally, is better off with positive connections from the "juice boxes."

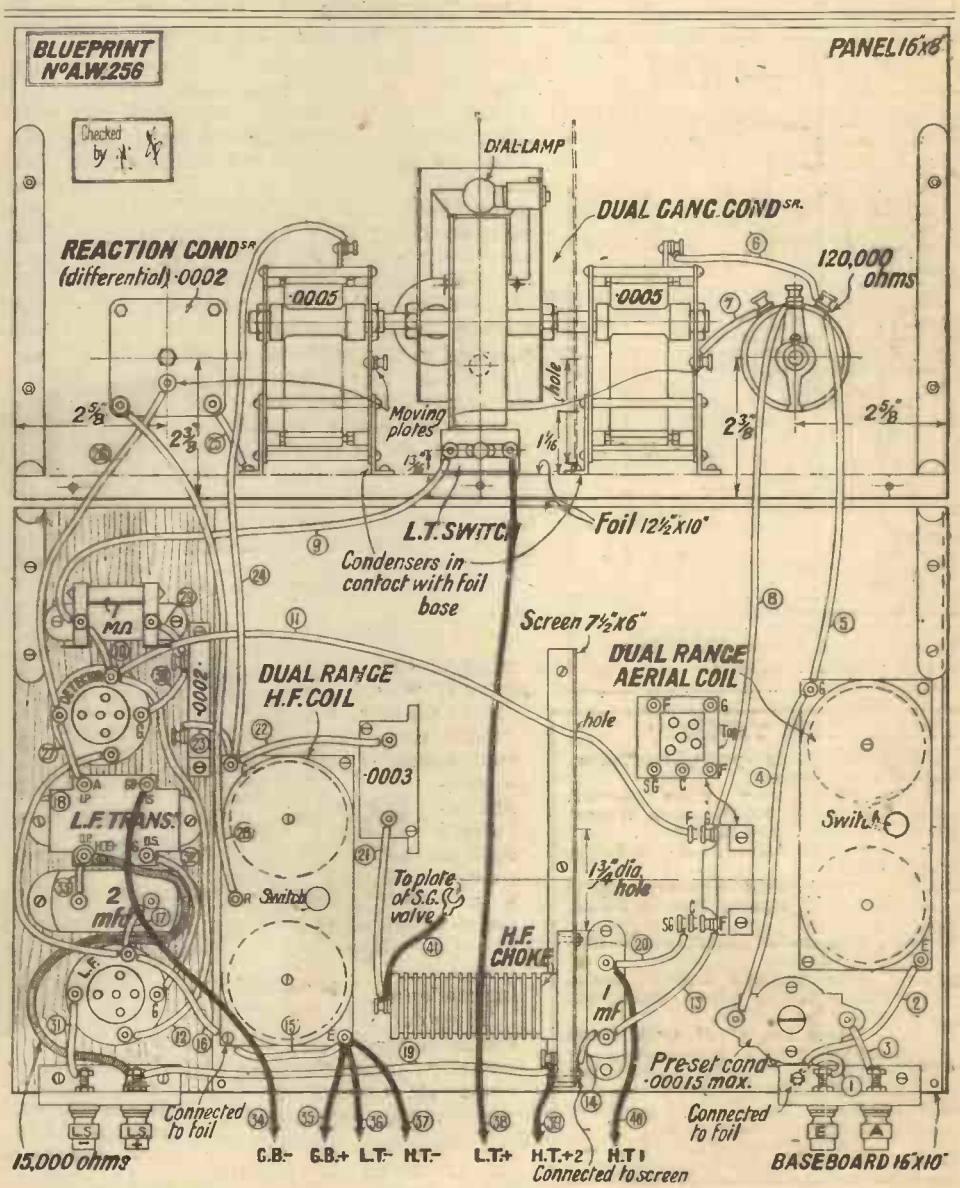
Nor can all terminals be dispensed with. Well-spaced terminals on a strip are really necessary for the aerial and earth, and multi-connection sockets are a great convenience for the loud-speaker output.

If the set is mains driven, too, the actual leads to the eliminator section should be taken via a safety plug. Direct flexes in such a case are often not at all convenient.

The ordinary H.T., L.T., and G.B. leads can frequently be made direct. They should be twisted in groups, and it is advisable to keep the G.B. leads separate from the H.T. leads. The bunches of leads can be secured at the edge of the baseboard by clamps, and here, again, the G.B. leads should be clamped separately.

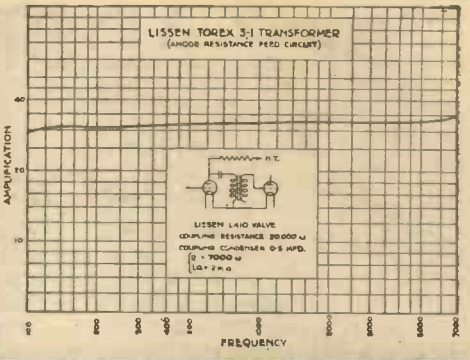
Most important of all, clearly mark the ends of the flexes. Engraved wander plugs are best used. Simply tying knots in the positive wires is an old tip, but rather confusing.

K. U.



The wiring diagram. **A full-size blueprint, which is a great help in constructing, can be obtained, price 1/-**

A MIGHTY good TRANSFORMER WITH A CURVE!



for 5/6

THIS new Lissen Torex Transformer enables you to make a big cut in the cost of building amplifiers. It is a high-grade silicon-steel core transformer, with remarkably even amplification over the whole band of audible frequencies (see curve). It is a neat, compact component; moulded bakelite case which is hermetically sealed and completely insulates the windings. Proof against shorting, leakage or moisture.

WHERE TO USE IT

Use this Lissen Torex Transformer for the first L.F. stage of any amplifier. Use it where big amplification is desired at small cost. Use it for all temporary "hook-ups"—you can change it from set to set because it is a "general purpose" transformer.

Particularly fine results are obtainable when this transformer is used in an anode resistance feed circuit.

LISSEN

TOREX TRANSFORMER

LISSEN LIMITED, Worple Road, Isleworth, Middlesex

Please Mention "A.W." When Corresponding with Advertisers

ADDING A PICK-UP TO THE "CHALLENGE FOUR"

IT is easy to add pick-up connections to both models of the "Challenge Four."

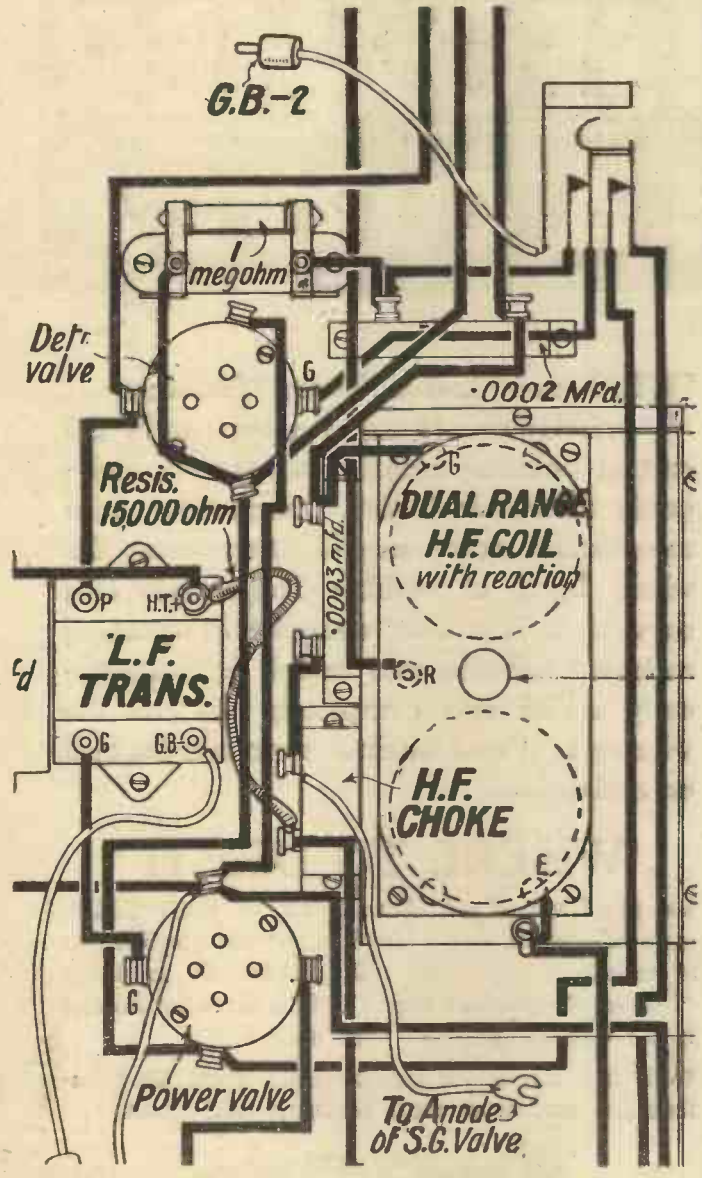
In the battery model we arrange a pair of switch or jack contacts in the grid lead to the detector and a further pair in the filament circuit of the two screen-grid valves.

The diagram (Fig. 1) shows the actual connections, from which it will be seen that when the plug, having the pick-up connected to it, is inserted into the jack, one end of the pick-up goes to the grid of the detector, whilst the other side joins with the grid bias. The second pair of contacts break the filament circuit of the two screen-grid valves.

This jack should be mounted on the panel, with the object of keeping the grid-circuit wires as short as possible. Ample volume will be obtained from normal records and the grid bias may be —1.5 volts applied at G.B.—2.

For controlling the volume a 100,000-ohm potentiometer may be placed across the pick-up in the usual way or, as an alternative, the 100,000-ohm adjustable resistance could be connected across the primary coil of the intervalve transformer.

When used in this position, the volume of both radio and gramophone records may be adjusted, and no doubt many will prefer this control to the alternative. A smooth variation in the volume is obtained by both methods, but when the resistance is placed across the primary coil of the transformer we have the benefit of the control for radio as well.



Here is a section of the wiring of the battery-operated set showing the necessary pick-up connections taken to the jack

The Mains Set

Fig. 2 shows the pick-up jack joined to the A.C. set. Contacts are arranged in the grid circuit of the detector valve, as in the battery model. To remove the high frequency completely the high-frequency volume control should be set at zero. The aerial and earth may, of course, be allowed to remain on the set, there being no object in disconnecting them.

To add a volume control to the pick-up or low-frequency amplifier make connections exactly as described in the battery model.

Nothing would be gained by cutting out the high-frequency valves in the mains set as the current comes from a mains unit and the circuit voltages would, in fact, be disturbed were these two valves switched in or out.

If long pick-up wires are used a hum may be heard. Therefore, keep the wires short and also the grid-circuit wires in the set. When a potentiometer is connected across a pick-up, but fairly near the valve, the chances of hum occurring are greatly reduced.

Normally there is no need to place a transformer between the pick-up and the first amplifying valve, as sufficient magnification is obtainable without. Given a pick-up of an insensitive type, however, a transformer may be used, a suitable ratio for most types being about 7 to 1. The volume obtained from normal pick-ups may be adjusted to a certain extent by fitting different needles. The tonal quality, unfortunately, will also change, but this may be a matter of secondary importance.

It is to be expected that more volume will be obtained from the A.C. model, as the valves are bigger and better than those which normally will be used in the battery type. At the same time interesting results

(Continued on page 717)

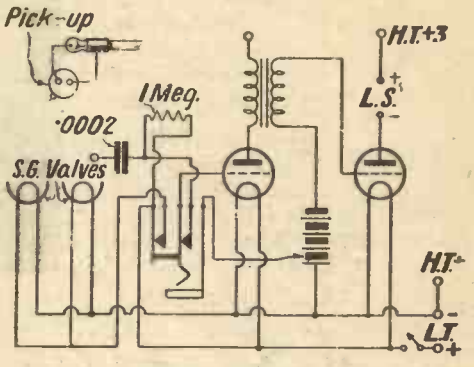
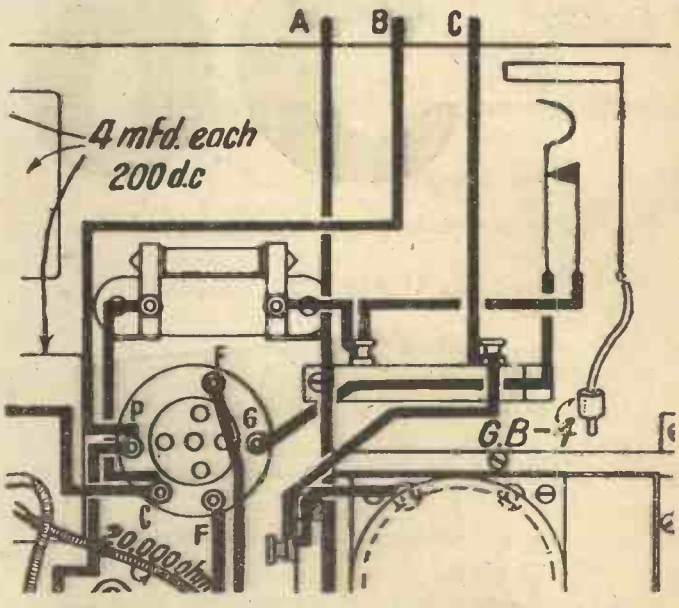


Fig. 1. Circuit of battery-operated set showing pick-up connections



These are the alterations required in the mains model. In both cases comparison should be made with the original wiring

USE READY RADIO APPROVED KITS FOR EVERY CIRCUIT

TROUBLE-FREE SET BUILDING

USE READY RADIO APPROVED NON-SOLDERING KITS ONLY

USE JIFFILINKS FOR WIRING UP

IMMEDIATE DISPATCH

CASH OR EASY PAYMENTS

"CHALLENGE THREE"

	£ s. d.
1 Permcol ebonite panel 16"x8"x3/16"	6 0
1 Hand polished cobinet with baseboard	1 5 0
1 J.B. two gang condenser, ·0005 mfd. condenser with drum dial	1 6 6
1 J.B. ·0002 differential reaction condenser	4 0
1 Regenstat 120,000 ohm type "A"	9 6
3 Valves as specified by Mullard or Cossor	1 19 0
1 Screen 7½"x6" and aluminium foil 12½"x10"	4 0
1 Pr. ReadiRad panel brackets	10
1 Set Challenge coils (aerial and anode with reaction)	1 1 0
1 W.B. Universal valve holder	1 3
2 W.B. sprung type valve holders	2 6

	£ s. d.
1 ReadiRad ·0003 fixed condenser	10
1 ReadiRad ·0002 fixed condenser	10
1 ReadiRad 1 meg. grid leak and holder	1 4
1 T.C.C. 2 mfd. condenser ...	3 10
1 T.C.C. 1 mfd.	2 10
1 R.I. Hypermu L.F. transformer	1 1 0
1 Readi-Rad H.F. choke ...	4 6
1 Readi-Rad filament switch ...	10
1 Formodenser, type F ...	1 6
2 Junit terminal blocks ...	1 8
4 Belling-Lee terminals "B" ...	2 0
1 Set ReadiRad Jiffilinx ...	2 6
5 Wander plugs H.T. −, H.T.+1, H.T.+2, G.B.+, G.B.− ...	1 6
2 Spade tags, wire, flex, screws, etc.	1 0

TOTAL (including Valves and Cabinet) £9 : 5 : 9

ANY OF THE ABOVE COMPONENTS CAN BE SUPPLIED SEPARATELY, IF DESIRED

"CHALLENGE FOUR"

KIT A less valves and cabinet **£8 : 6 : 9**
or 12 equal monthly payments of 15/3

KIT B with valves less cabinet **£11 : 5 : 9**
or 12 equal monthly payments of 20/9

KIT C with valves and cabinet **£12 : 18 : 3**
or 12 equal monthly payments of 23/9

RECOMMENDED ACCESSORIES

	£ s. d.
2 Fuller 60-v. H.T. batteries, super capacity	1 7 0
1 Fuller 2-v. 30-amp. L.T. accumulator ...	11 0
1 Fuller 9-v. grid bias battery	1 6
1 Amplion cone loudspeaker	1 19 6

TO OVERSEAS CUSTOMERS.
Your goods are very carefully packed for export and insured, all charges forward.

TO INLAND CUSTOMERS.
Your goods are dispatched post free or carriage paid.

Ready Radio

159, BOROUGH HIGH STREET, LONDON BRIDGE, S.E.1.

Telephone: Hop 5555 (Private Exchange) Telegrams: READIRAD, SEDIST.

Advt. of READY RADIO (R.R. LTD.), 159, Borough High Street, London, S.E.1.

THE HOW AND WHY OF RADIO

VIII—HOW YOUR BATTERIES WORK

If you are a beginner in wireless, now is your chance to gain a clear conception of its theory and practice. In this series of articles, specially prepared for the beginner, no previous knowledge of wireless is assumed. Every aspect of the subject will be dealt with in ensuing issues, and the whole series will endow the beginner with sufficient knowledge to enable him to derive the greatest possible interest from the fascinating hobby of wireless

THERE are two entirely different batteries in every valve receiving set—the high-tension battery and the low-tension battery. A battery consists of two or more cells. A high-tension battery usually consists of primary cells and a low-tension battery of secondary cells. The big difference between them will be seen when their actions are explained.

Let us start with the primary cell. Fig. 1 will help. Take a look at the chief features of its construction—the carbon rod, the zinc container, and the paste electrolyte.

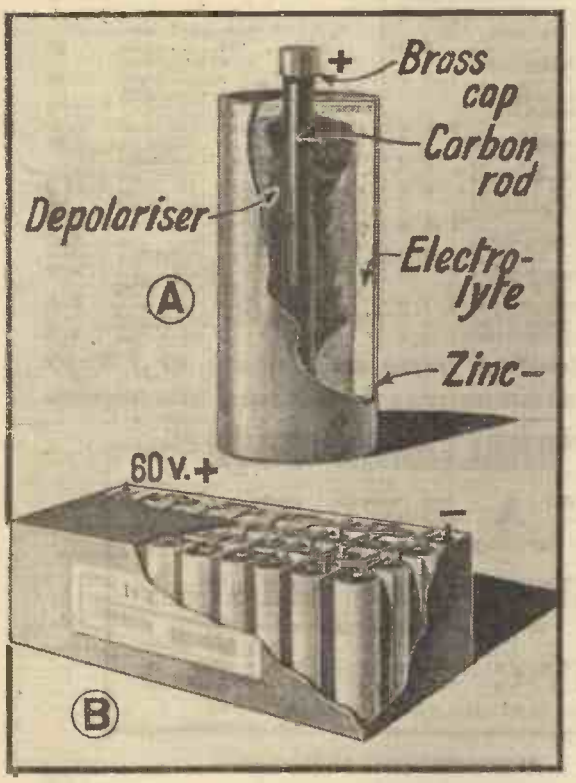


Fig. 1. This picture shows the features of a dry cell and the assembly of a H.T. battery

In theory, the current always flows from the carbon to the zinc in a circuit completed outside the cell, and for this reason the terminal on the carbon is always spoken of as the positive and that on the zinc as the negative.

It is unnecessary to discuss here the chemical action which takes place in the cell and by which the current is produced, beyond explaining the purpose of the substance marked depolariser in the diagram. When the cell is in action, hydrogen gas is liberated, and this collects as minute bubbles on the carbon rod and acts as a resistance to the current flowing within the cell. If too great a current is taken from the cell for the size of elements employed, the hydrogen is produced at such a rate that the result is the current falls off very quickly, and may in extreme cases cease to flow almost entirely. Now, the purpose of the depolariser is to absorb this hydrogen and therefore permit the cell to continue its action. This it can only do with partial success, and polarisation, as a matter of fact, is liable to take place in any primary cell from which an excessive amount of current is taken.

We speak of an ordinary cell of the dry type as having a potential difference between its terminals of 1½ volts. The voltage of the cell is not determined by its size, but by the nature of its elements.

The High-tension Battery

A high-tension battery consists of a large number of these 1½-volt cells. The positive of the first forms the positive of the battery Its negative is connected to the positive of the second cell, whose positive is connected to the negative of the third cell, and so on until the final negative is reached. In a word, the cells are connected in series. The total voltage is therefore the sum of the individual voltages of the cells. In a 60-volt battery there are forty cells.

While the voltage of the battery is very important, the current it can deliver is no less so. That brings us to the second part of the story. The size of the elements in the cell, and their distance apart, and the resistance of the electrolyte, all affect the current output. For they all affect the internal resistance of the cell.

The larger the elements, the lower the resistance. For the fairly heavy current drain exerted by modern valves on the high tension battery, the large size of cell has been specially developed.

If a valve maker specifies a voltage on the anode of 120 volts and the current taken by the valve at that voltage is too much for the cell, the voltage actually applied to the valve will fall and the valve will not operate efficiently. Most battery makers appreciate the need for specifying the current output as well as the maximum voltage. But many listeners do not fully appreciate this point, and the result is that the battery lasts only a very short time.

The Low-tension Battery

Now consider the low-tension battery. Many misnomers apply here. It is not even a battery, as a rule, but just one cell. Accumulator and storage battery are two of the most common names for the secondary cell or battery used to heat the filaments of the valves in the set.

Neither term conveys the real action of this cell, which really stores energy in chemical form. The diagram Fig. 2 will save much description. A positive lead plate and a negative lead plate are immersed in the electrolyte, a solution of sulphuric acid and water.

The big difference between this secondary cell and the primary cell is that its chemical action is reversible. The secondary cell delivers current through chemical action between the lead plates and the acid solution. But current passed through the cell by the application of an external source of potential difference reverses the chemical action, and so prepares or "charges" the cell for a further delivery of current.

The elements of a secondary cell are not consumed. They are the agents whereby initial electrical energy is transformed into chemical energy, which then reappears as electrical energy when the cell is discharged. These cells are so efficient that almost as much energy can be taken out as is put in.

The voltage of the secondary cell is nominally 2 volts, but it rises to as much as 2.5 during the "putting in" or charging process. During discharge the voltage drops towards the end to 1.85 volts, at which re-charging is imperative for the preservation of the cell.

As in the primary cell, the current output of a secondary cell depends primarily on the size of the plates. To obtain the greatest possible current for a given size of battery, the positive and negative plates are inter-leaved so as to obtain a large area of plate surface (Fig. 2).

Within reasonable limits, it is possible to tell whether a secondary cell is charged (capable of delivering current) or discharged (incapable of further current delivery) by the colour of the plates. When fully charged the negative plates are a characteristic slate grey and the positive plates are a rich chocolate. But when the cell is discharged the positives turn much lighter and assume a greyish cast.

A more reliable way of telling the state

(*Continued on page 712*)

NEXT WEEK: IX—HOW TO CHOOSE THE RIGHT VALVES

"HOW YOUR BATTERIES WORK"

(*Continued from page 710*)

of the cell is by testing the specific gravity of the electrolyte. During discharge the specific gravity falls. Assuming the acid is 1.22 when the cell is fully charged, as it should be, the indication that the cell requires recharging will be the drop in specific gravity to 1.17. With a hydrometer the exact specific gravity can be read as required.

If the capacity of the battery is known, (and this is usually stated on the case), and the filament current consumption is also known, it is a simple matter to work out how long the cell will last per charge. The capacity is stated in ampere hours. The filament consumption is reckoned in amperes or fractions of an ampere. So by dividing the ampere-hours of the cell by the total amperes consumed by the filament, the quotient will be the number of hours the cell will last before needing another charge.

Candour in advertising, as found in a Scottish shop window: "Prepare for long, dreary evenings with a wireless set."

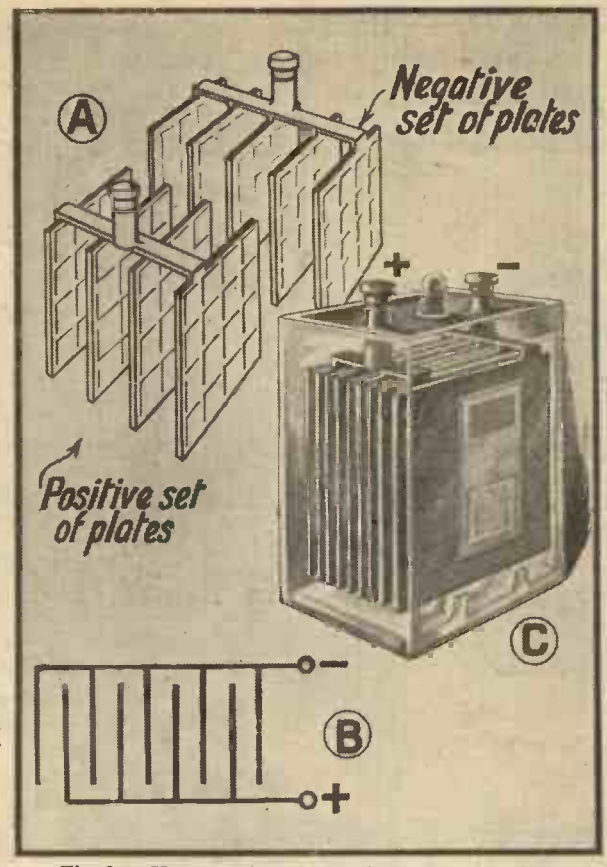


Fig. 2. Here are the constructional features of the accumulator. Note how the positive and negative plates are interleaved

FIRST SCOTTISH NATIONAL RADIO EXHIBITION

ARRANGEMENTS for the first Scottish National Radio Exhibition, to be held in the Waverley Market, Edinburgh, from November 12 to 22 next, are now practically completed.

The exhibition is to be opened at 2 p.m. on the 12th by the Right. Hon. Thomas B. Whitson, the Lord Provost of Edinburgh, with David Cleghorn Thomson, Esq., the B.B.C. Scottish regional director, in the chair.

The B.B.C. exhibit is to take the form of a complete studio, from which actual broadcasting will take place every day in full view of the visitors.

Practically all the available space in the hall has been allocated.

In view of interference by the Oslo transmitter, Hilversum has abandoned the 1,071-metre wavelength for the present and transmits throughout the day on 299 metres. Scheveningen-Haven, for commercial purposes, still works on 1,071 metres.

NEW PAROUSSI ELIMINATOR

IT should be noted that the eliminator shown in the Paroussi advertisement on page 637 of "A.W." No. 437 is for direct-current mains supplies only. The address of Messrs. E. Paroussi is 10 Featherstone Buildings, High Holborn, W.C.1.

TUNEWELL COILS

DESIGNED and SPECIFIED BY MR. W. JAMES FOR THE "CHALLENGE 3"

Sets which employ Tunewell Coils are invariably noted for their selectivity. Experts have proved TUNEWELL performance in many sets. Now they are specified in the "Challenge Three"—designed by Mr. W. James, exactly to whose specification these TUNEWELL COILS are made. Use Tunewell Coils—they are your guarantee of reliability and efficiency. Price **10/6** **EACH**

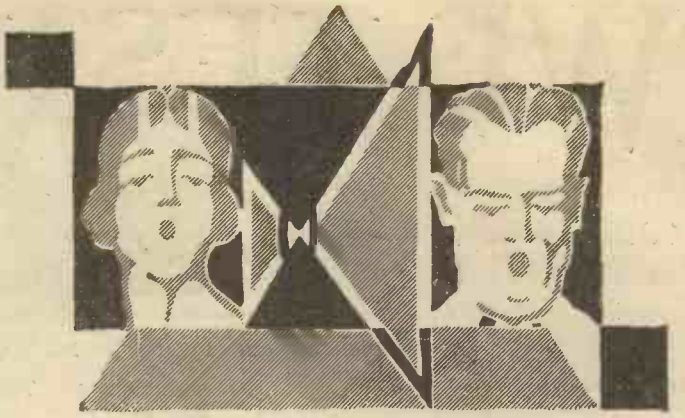
Aerial and Anode. Bakelite moulded top and bottom plates.

Brookman's By-Pass wave-trap coils complete with fixing brackets. 3/3 each	Tunewell Transformer. Ratios 3 to 1 and 5 to 1. 12/6	Two-pin coils. Plain, Centre-tapped and X type. BRITAIN'S FAVOURITE. Prices from 1/6
New dual range coil for Reinartz circuits. X-tapped on both high and low waves. Super-selective. 10/6	Tunewell range of Speakers, including plaque types from 28/6 to 42/-	Condensers, .0005, .0003 and .00015. 3/11 each. H.F. Chokes — 97% efficient. Price 6/6

Send for Lists.

TURNER & CO.

54 STATION RD., LONDON, N.11



WATES

"DOUBLE CONE" PRINCIPLE OF SOUND REPRODUCTION PROVIDES AN INDEPENDENT MEDIUM FOR HIGH AND LOW NOTES

with astonishing realism of speech and music

THE Wates Universal Chassis to which you can fit your present unit in fifteen minutes, employs two cones of special quality paper, scroll cut to obviate a direct line through the sound waves, and treated to ensure constant crispness.

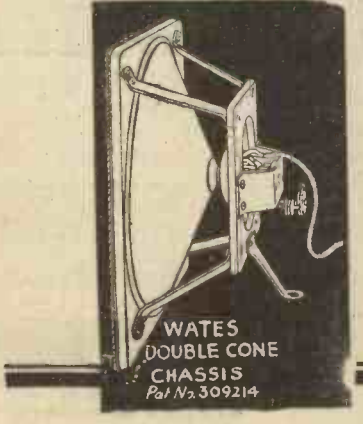
The large cone responds to the lower frequencies and the small one to the upper registers, with a purity and fidelity that immediately transforms your speaker into a superb instrument, with a range of tonal quality that will amaze you.

Buy the Wates Chassis now, and for a few shillings enjoy fifty per cent better results. Supplied complete with screws, extension piece and fully detailed instructions for fitting to all popular units.

READ THE EXPERT'S REPORT ON PAGE 714 IN THIS ISSUE.

This report is your assurance of the high performance that is claimed for this fine chassis.

From all Radio Dealers or if any difficulty write direct for particulars to :—



The Standard Battery Co.
(Dept. A.W.) 184-188 SHAFTESBURY AVENUE,
LONDON, W.C.2.

PRICES :	£ s. d.
Wates Chassis, 12" ..	11 6
14" ..	12 6
20" ..	17 6
Wates 14" Star Speakers complete. Oak ..	3 10 0
Mahogany	3 15 0
Universal bracket (only) for fitting various units to speakers ..	2 0
Wates 20", complete Oak	4 10 0
Mahogany	4 15 0
Silk-lined fret for 12" Chassis	4 0
For 14" Chassis ..	5 0

WE TEST FOR YOU

A weekly review of new components and tests of apparatus.

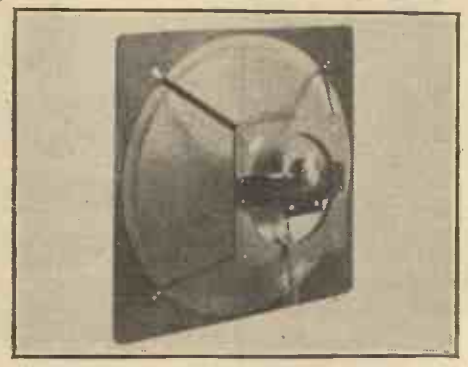
Conducted by our Technical Editor, J. H. REYNER, B.Sc., A.M.I.E.E.

Wates Double-cone Speaker

THERE are some who consider that the normal cone speaker has now been fully developed, and that further improvements must be sought from other speakers such as the moving-coil type. In view of great improvements made in the design of certain cone speakers during the past few months, it is very doubtful if this theory is correct. It seems more logical to presume that the moving-coil speaker has set a standard which normal cone loud-speakers are struggling to reach.

We were agreeably surprised on testing the latest Wates double-cone chassis fitted with the Wates four-pole unit. The diaphragms in this chassis are made of a stout material, and the one received for test has a large diaphragm of 17½ in. diameter, the smaller being 7½ in. diameter. The apexes are clamped together to the armature spindle of the four-pole unit, and a double adjustor is provided with suitable stops. The framework is of wood, held together by metal strips.

On testing this speaker on a normal two-



A fine speaker—the new Wates double-cone

valve set and on our super-power amplifier, we were impressed with the sensitivity and, secondly, with the volume obtainable without distortion. The general tone is fairly low-pitched, but it is not in the last "boomy." The speaker having passed these tests satisfactorily, we applied some two watts of undistorted power to it. The volume under these conditions was such that on the lowest notes the armature had a certain tendency to touch the pole pieces with a violent rattle, and it was necessary to remove one of the stops on the control to prevent such an occurrence. After this had been done, it was found that the volume was astonishingly great, without any predominating resonance. On first impressions one could easily mistake the results as coming from a moving-coil speaker, while the actual volume output was greater than our standard moving-coil loud-speaker. We have no hesitation in recommending this speaker which sells in chassis form for £2 2s. 6d.

(*Continued on page 716*)

"WE TEST FOR YOU"

(*Continued from page 714*)

Exide Unspillable Accumulator

THE widespread popularity of portable sets in this country has resulted in the design and gradual perfection of special parts for such sets. Of particular importance is the unspillable accumulator, since the escape of acid is detrimental in the extreme.

There is no doubt that Exide Unspillable Accumulator model C.P.2 is a very efficient article of its kind. During the time this article was in our hands, we did all that was reasonably possible to persuade the acid to spill, happily without success. It was carried for distances upside down, was tossed up, and was even dropped on the

For transportable-set users, the Exide non-spill accumulator

ground, without any sign of acid leakage.

This particular portable model has a capacity of 16 ampere hours actual.

On test at a rate of ½ an amp. discharge, we obtained somewhat over the capacity rating of 16 ampere-hours, indicating that the accumulator is conservatively rated.

R.I. Varicap Condenser

ONE of the neatest preset condensers that we have tested is the Varicap, made by Messrs. Radio Instruments, Ltd.,

It occupies a baseboard space of 1¼ in. by ¾ in., and is fitted with an insulated adjusting knob and locking nut. The two terminals are arranged diagonally.

The plates contained within are made of phosphor-bronze, with mica separation. The top plate is of considerably greater thickness, and is fitted with an inlaid steel bearing to take the pressure of the adjusting screw. The top plate has considerably more movement than the other plates, and therefore provides a fine variation of capacity at

The R.I. Varicap—a well-made preset condenser

the minimum values. The component, which was rated to have a capacity of .0003 microfarad, exceeded this value on test. The capacity was measured on the laboratory bridge, and was found to range from .000033 to .00049 microfarad. The price is 2s. 6d.

"ADDING A PICK-UP TO THE CHALLENGE FOUR"

(*Continued from page 708*)

will be obtained from the battery set and a pick-up is well worth trying if you play gramophone records. The cost is not very great and the wiring is straightforward.

A good jack should, of course, be used, as should a fault occur after a time repairs

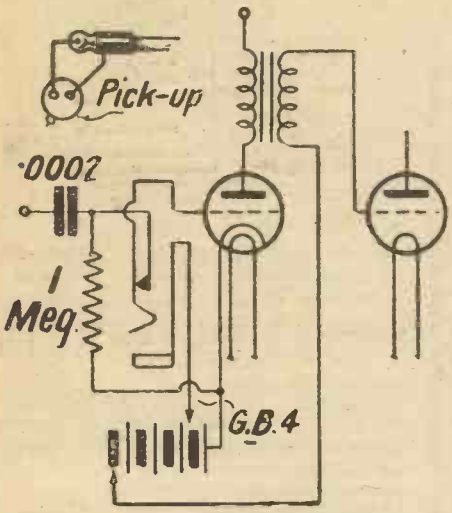


Fig. 2. Circuit showing connections of pick-up for mains model

would be difficult without taking the front panel off. When wiring the jack follow the general instructions given when building the set and first join the wires to the jack. Afterwards, when the jack is in position in the set, the ends of wire can easily be taken to the various parts on the baseboard.

A record will be created at the B.B.C. Symphony Concert at the Queen's Hall on November 12, when Bach's six Brandenburg Concertos will be performed, all in one evening. Harold Samuel, Keith Falkner, Arthur Catterall, Alec Whittaker, Ernest Hall, and Aubrey Brain will be the soloists and Sir Henry Wood will conduct.

In the Kolster Brandes advertisement in our issue of November 1 the price of the K.B.232 attracted-armature type cone speaker should have read £3, and not £3 3s., as printed.

When Asking Technical Queries

PLEASE write briefly

A Fee of One Shilling (postal order or postage stamps) must accompany each question and also a stamped addressed envelope and the coupon which will be found on the last page. Rough sketches and circuit diagrams can be provided for the usual query fee. Any drawings submitted should be sent on a separate sheet of paper. Wiring plans and layouts cannot be supplied.

Queries cannot be answered personally or by telephone.

Postcard Radio Literature

For Set-builders

IF you want to save trouble in making up your new set, and in fitting it with a cabinet, then you should get in touch, through my free catalogue service, with Messrs. F. Digby, the cabinet people. Cabinets can be supplied to match furniture, and panels can be cut to fit. An illustrated catalogue is available. **86**

Ekco Easy Payments

You can now purchase practically any Ekco mains unit on very easy hire-purchase terms. I have just been glancing through the form which you have to fill in, and it is one of the simplest of this kind which I have seen. The whole business is quite straightforward. **87**

The Lively "O."

It is not often that one sees anything really new in accumulators these days, but the Oldham Lively "O" series surprises me as having some interesting new features. These new accumulators have some very commonsense points about them. **88**

The Dawn!

Under the title of "The Dawn of Better Radio" is produced a very attractive catalogue of the sets manufactured by Electrical & Radio Products, Ltd., of Horley, Surrey. The E.R.R. range includes portable sets, transportables, table models, and radio gramophones. This is worth seeing. **89**

Coil Problems

Many people have their coil problems these days owing to the need for sharper tuning. On this account the new Colvern booklet is well worth seeing, because not only does it tell of all the new Colvern coils, but it shows how provision is made for a special degree of selectivity. If you are bothered with Brookmans Park get this booklet. **90**

New Parts

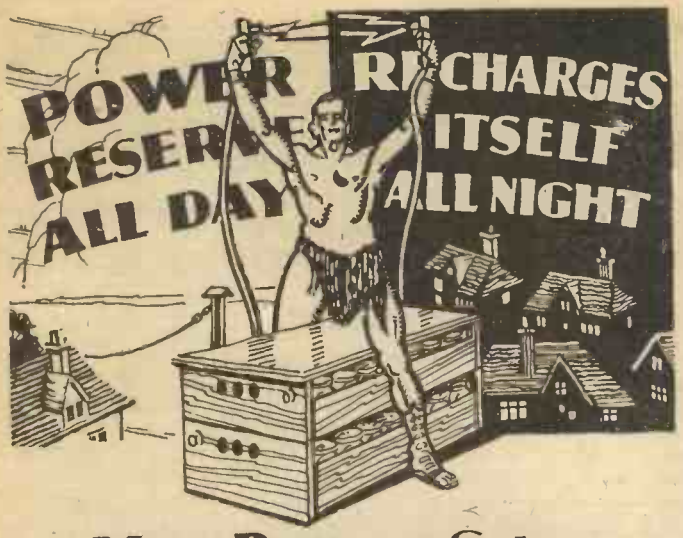
A little booklet well worth having for your file is that produced by Ediswan. This gives details of sets, R.K. speakers, handy small components and gramo radio apparatus. **91**

Connections

My friend, Mr. E. M. Lee, of Belling and Lee, Ltd., has written a useful booklet on terminals This is not just a catalogue of Belling-Lee products, but it gives some really useful advice. **92**

GET THESE CATALOGUES FREE

Here "Observer" reviews the latest booklets and folders issued by well-known manufacturers. If you want copies of any or all of them FREE OF CHARGE, just send a postcard giving the index numbers of the catalogues required (shown at the end of each paragraph) to "Postcard Radio Literature," "AMATEUR WIRELESS," 58/61, Fetter Lane, E.C.4. "Observer" will see that you get all the literature you desire.



Your Battery Set as TROUBLE FREE as an "all mains" yet smoother-steadier and safer

Though mains supply for your set may not be available in your district, you can enjoy trouble-free H.T. supply for twelve months or more with the added benefit of the smooth, unfluctuating flow of power from a Standard Cartridge type Wet H.T. Battery. Millions of Standard Cells are in daily use with thousands of users who were determined to stop wasting money on costly dry batteries. Why continue to suffer the inconvenience of wasteful dry batteries! Install the Standard for **7/6** down and get wonderfully improved reception—without trouble.

From Radio dealers, Curry's & Halfords

WATES STANDARD

SAC LECLANCHE

PERMANENT H·T· BATTERY

This large-capacity Battery for 7/6 down.

SPECIAL OFFER FOR TWO-VALVE SETS

To STANDARD BATTERY COMPANY (Dept. A.W.) 131/183 Shaftesbury Avenue, London, W.C.2

Please send booklet and details of 2-tray battery (as illustrated) No. 2 cells, 9½ Volts, for 7/6 DOWN and five monthly payments of 7/6. Cash £2 2 11.

Spare No. 2 cells, 1½ Volt, 5/6 per doz. Batteries of any voltage supplied.

FREE BOOK

the valve of unfailing quality and long life

FROM **5/6**

The valve that has behind it endless experimenting and years of laboratory research. The valve that has brought better reception to thousands of Radio enthusiasts. The valve that, although cheap in price, leads the way in value, construction and perfect reproduction.

Twenty-five different types to suit the requirements of every type of radio receiver and within reach of every pocket.

Trade Mark

fotos

CONCERT VALVES

THE HEART OF EVERY SET

CONCERTON RADIO AND ELECTRICAL CO., LTD.

256/7 Bank Chambers, 329 High Holborn, W.C.1

'Phone: Holborn 8667

Sponsored Programmes

SIR,—In Mr. Alan Hunter's article in a recent issue of AMATEUR WIRELESS he refers to the Continental programmes of the "sponsored" type as being on the "wrong lines"; jazz and light music not being up to B.B.C standard (whatever that is), and too much advertising clap-trap. He also says the orchestras are mediocre.

I cannot possibly agree with Alan Hunter in his statements, as I find the jazz is generally the same—foxtrots, waltzes, etc.—as our old friend Jack Payne gives us, or else records by H.M.V., Columbia, etc., as played to us by Chris Stone (long may he "play").

As to the advertising clap-trap, in two hours' broadcast this evening I timed the announcements, and the total time was 9 min. 36 sec.; this included the final announcements and a request for a post-card to the firm sponsoring the programme containing criticism and suggestions for

its improvement. All this in two languages, mark you! Is this so terrible?

R. H. (Hereford).

"A.W." Linen-diaphragm Speaker

SIR,—*Re* "A.W." Linen-diaphragm loud-speaker, there is no doubt it is the finest ever. I made one, 22 in. inside frame. I have heard moving-coil speakers, but none with the happy medium that your design furnishes. I have had a set since pre-broadcasting B.B.C., and I am only just hearing music as it ought to be. I have made an alteration in the means of fastening wire by using a washer with a hole drilled at each side, through which the wire is passed. E. W. (Alfreton).

Talkie Speakers

SIR,—Having charge of a talkie installation, I was surprised, on reading "Thermion's" notes on speakers in use in cinemas, to find that he omitted to mention the directional baffle which is used on R.C.A. equipment.

On a recent test this type of speaker was proved to have a wider frequency range than the exponential horn, which results in a more natural tone without any metallicness.

Using an 8-in. cone (moving coil) with a 6-ft. deep directional baffle, one gets crispness of speech without losing the tone in music, which happens when an exponential horn is used.

For the exponential horn it must be said that it gives greater volume than the directional baffle for a given input.

"Thermion" states that frequencies above 5,000 are usually lost. This is due in the majority of cases to ineffective type of photo cell employed.

There are only two types of P.E. cells, potassium and casium having a straight-line response, the others having a peak of about 2,500 cycles.

With most talking films (sound film or disc) the bass is over recorded, making it necessary to use a tone control to by-pass some of the bass, to render speech intelligible. This is most important when a cone speaker is being used.

G. E. D. (Gravesend).

THE B.B.C. CONCERTS

I WALKED under the Waterloo Road to the converted warehouse that the B.B.C. is using as a studio, to watch the first of the new Sunday night concerts. It is a big room, below the surface of the river, capable of holding at least two full orchestras, and simply but very effectively decorated with a vast green carpet, green painted girders, and cream walls.

The concert itself was well planned, but so far the orchestra, under Dr. Adrian Boult, has not quite got into its stride. The "Unfinished Symphony" was a tame affair, and so was "Fingal's Cave," at the second Queen's Hall concert.

The "Eighth Symphony" at the Queen's Hall, was dull, both in its fast and its slow periods, but there was life in the Tchaikowski B-flat minor concerto. Rubinstein puts the fascination of doom into his Tchaikowski. It was a tremendous performance. L. R. J.

RADIOGRAMS

A TOC H message by the Rev. P. B. Clayton will be relayed from the Albert Hall to the National transmitters on December 6.

Three new musical productions are in preparation for the microphone. *Mizzi*, a musical romance by John Watt, owes its melody to Viennese composers of the Strauss type; *Phi-Phi*, with book and lyrics by Holt Marvell, will include numbers from the delightful opera of the same name; *Evelyne*, adapted by John Watt from a German play, is syncopation up to date.

One of the most important series of talks that the B.B.C. has yet undertaken will be opened on November 10 by Professor Arnold Toynbee, his title being "World Order or Downfall?"

The Birmingham Grand Opera Society is an old friend at the Midland Regional station. Its performance of Gounod's *Faust* on November 13 will remind many listeners of the company's presentation several years ago of *Faust* in modern dress. Faust was a modern young man, while Margherita still had a Victorian coyness, although her frock was short! Some of the cleverest members have been chosen for the performance on November 13.

The "Duds" Concert Party, which is to broadcast for Midland Regional listeners on November 15, was formed by members of a battalion of the King's Liverpool Regiment. After the War the party was reorganised and at least four of the original members will be heard.

Jack Venables, who is frequently heard in Midland Regional vaudeville as a syncopated pianist, will give a recital for Midland listeners on November 18. He was one of the first artistes in syncopation to broadcast from the old Witton station.

"Stars of the Past" is the title of a Midland Regional programme to be given by Sara Sarony and Sydney Lester on November 17. Miss Sarony has done a good deal of broadcasting since she left the stage a few years ago. She has made a name among listeners for her imitations of famous personalities.

The National Orchestra of Wales concert at the Park Hall, Cardiff, on November 16, will be relayed. The vocalist will be Percy Heming.

On November 18 the third relay for the season of the Scottish Orchestra will be taken from St. Andrew's Hall, Glasgow, and broadcast to the Scottish Region. The programme consists of the Overture, *The Siege of Corinth*, by Rossini, the Symphonic Poem, *In A Summer Garden*, by Delius, and the *Jupiter* Symphony, by Mozart. Again the Orchestra will be under the direction of the British conductor, John Barbirolli. The relay will be preceded by a short song recital given by Philip Malcolm.

The Post Office direction-finding van is visiting the Cardiff area at present and is having a very busy time!

(*Continued on next page*)

The eve of Armistice Day is a suitable time for a short concert of music which was popular during the war years. The Northern Wireless Orchestra will play selections from some of the most popular revues of the day in the North Regional programme on November 10.

Chamber music will be the order of the day at the Manchester Tuesday Mid-day Society's concert on November 11. The artistes are Johan C. Hock, 'cellist, and Tom Bromley, pianoforte.

On November 11, the Rev. E. C. Tanton will give the last of his series of talks for North Regional listeners on "The Northern Region in Famous Books."

The Black Dyke Mills Band is one of the greatest Yorkshire Brass Bands. On November 13 a concert will be given by the Band from the Leeds studio.

On November 15 the Northern Region will hear a talk on "Gliding" by Mr. Norman Sharpe.

The Birmingham Grand Opera Society will visit the studio of the Midland Regional station to broadcast a performance of Gounod's *Faust* on November 13.

Beginning with the New Year a new style of vaudeville entertainment will be introduced into broadcast programmes. For this purpose three or four artistes will be specially engaged, their ever-changing material being prepared for them in the B.B.C. offices. These repertory artistes will be supported by leading "stars" from the music-halls.

The Czechoslovakian broadcasting stations, with a view to economy, have decided to specialise in their transmissions. Prague, with its studio orchestra of forty-two musicians, in future will provide all symphony concerts. Dance melodies will be supplied by Morabska-Ostrava, and Brno and Bratislava will hold themselves responsible for the light and popular musical broadcasts.

Neuilly-Plaisance, a small transmitter in the immediate neighbourhood of Paris, broadcasts musical entertainments every Sunday morning between 10 a.m. and midday on 308 metres.

Exactly on the Leeds wavelength, a private transmitter at Roubaix (France) puts over gramophone records every Saturday between 6 and 8 p.m., and again on Sundays between 11 a.m. and midday. The call, given out between items, is as follows: "*Ici station d'emissions du Radio Club du Nord de la France, 55 rue du Marechal Foch, Roubaix.*"

As an opening and interval signal, Brussels No. 2 has adopted a few bars of the Preludium of the Malines Cathedral carillon.

The new Velthem (Louvain-Belgium) broadcasting station now tests every Tuesday afternoon from midday until 2 p.m. G.M.T. Transmissions are carried out both on 338.2 metres and on 508.2 metres.

Radio Strasbourg, at present testing on 346 metres, is to be officially inaugurated by the French State authorities on Armistice Day (November 11). The broadcast will be relayed simultaneously to all French State transmitters.

See important announcement on page 723.

CHARGING FROM D.C. MAINS

TRANSPORTABLE and portable-set users who have direct-current mains will be interested in a new mains unit, the CPD2, just produced by the Tulsmere Manufacturing Co., of 1-7 Dalton Street, West Norwood.

The Tannoy unit for trickle charging and H.T. supply from D.C. mains

This unit, illustrated here, delivers a useful supply of high tension and, by means of a charging lamp (external to the unit), trickle-charges the set's accumulator. The price is only £3 15s.

The construction of the new 60-kilowatt German transmitter at Durrmenz-Muehlacker is rapidly nearing completion, and it is hoped to bring it into regular operation in the course of this month. It will work on the Stuttgart wavelength.

The Dundee Town Council has refused an application for permission to install a radio-relay service in the city. The erection of private lines across the street was the principal cause of objection.

The establishment of the Institut National de Radiodiffusion in Belgium is now an accomplished fact, and the Belgian State Ministry of Posts and Telegraphs will shortly take over the two new broadcasting transmitters now under construction at Velthem, near Louvain. Two wavelengths —namely, 338.2 and 508.5 metres—will be used, the transmissions being put out with a power of 15 kilowatts in the aerial.

B.B.C. NEWS FROM THE NORTH

THE North Regional Director, Mr. Liveing, has been making out forthcoming programme arrangements for the northern stations, and, following his broadcast talk on this subject recently, he explained these schemes in greater detail.

While it is not expected that Slaithwaite will be in full operation before March or April, a fair degree of group broadcasting would be continued during the winter. In particular, the linking together of the Manchester and Leeds transmissions will result in a frequent interchange of programmes between these centres, and as a result of this it is hoped to "tap" the resources of the West Riding far more fully than in past winters.

For instance, the relay of the Huddersfield Choral Society's Concert on November 7 will be the start of a policy for offering listeners an opportunity of hearing some of the famous Yorkshire choirs.

Arrangements have been made for relaying a considerable number of the Hallé Society's concerts on the National and northern wavelengths, four of the Liverpool Philharmonic Society's concerts, and three by the Leeds Symphony Orchestra. In addition, listeners will continue to hear studio performances by the Northern Wireless Orchestra. Thirty of the Manchester Tuesday Mid-day Society's concerts are again being relayed this season.

Among the plays chosen for next season may be mentioned Vincent Douglas's Lancashire play, *The Partners*, Harold Brighouse's *Hobson's Choice*, and *The Northeners*, St. John Ervine's *The Ship*, and J. L. Hodson's war play, *Red Night*.

Durham, Manchester and Liverpool Cathedrals and St. Sebastian's Dominican Priory at Pendleton figure among places of worship from which services will be relayed in the near future.

A competition in connection with the North Regional Children's Hour is open to all schools in the Region who will be invited to submit pageants written specially for broadcasting around any such subjects as towns, castles, or famous personalities of the North.

In addition to music by Bertini's Dance Band, relayed from the Empress Ballroom, Blackpool, dance music by Henry Hall's Gleneagles Hotel Dance Band is also to be relayed regularly from the Midland Hotel, Manchester.

K. U.

"Amateur Wireless and Radiovision." Price Threepence. Published on Thursdays 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.

FULL-SIZE BLUEPRINTS

EACH BLUEPRINT SHOWS THE POSITION OF EVERY COMPONENT AND EVERY WIRE, AND MAKES CONSTRUCTION A SIMPLE MATTER.

WHEN ORDERING, PLEASE SEND A POSTAL ORDER, NOT STAMPS, TO BLUEPRINT DEPT., "AMATEUR WIRELESS," 58/61 FETTER LANE, LONDON, E.C.4

CRYSTAL SETS

All these 6d. each, post free.

B.B.C. Brookman's Park Set	AW206
Regional Crystal Set	WM176

ONE-VALVE SETS

All these 1s. each, post free.

B.B.C. Official One	AW208
A.1	WM153
Hartley Single-valver	WM198

TWO-VALVE SETS

All these 1s. each, post free.

Ace of Twos (D, Pentode)	AW143
All Mains Two (D, Trans)	AW180
Loud-speaker America Two (D, Pentode)	AW190
Talisman Two (D, Trans)	AW194
Hyper-selective Two (D, Pentode)	AW198
Pentector Two (P. det., RC)	AW213
British Broadcast Two (D, Trans)	AW215
Easy-tune Two (D, Trans)	AW226
Wavelets Two (D, Trans)	AW229
No-battery A.C. Mains Two (D, Trans)	AW230
No-battery Gramo-radio 2 (D, Trans)	AW238
1930 Talisman 2 (D, Trans)	AW239
Easy Tune Short-wave 2 (D, Trans)	AW242
Searcher Two (D, Trans)	AW245
Arrow Two (D, Trans)	AW249
Forty-five Shilling Two (D, Trans)	AW250
Q-coil 2 (D, Trans)	WM62
Crusader (D, Trans)	WM69
Flat-dweller's 2 (HF, D)	WM76
Tetrode Short-wave Two (SG, D)	WM99
Key-to-the-Ether Two (D, Pentode)	WM107
Clipper Two (D. Trans)	WM135
Twinflex (Reflex)	WM138
Continental Two (D, Trans)	WM143
Stay-put Two (All AC, D, Trans)	WM155
Ether Ranger (D, Trans)	WM156
A.B.C. 2 (D, Trans) with copy "W.M." 1s. 3d.	WM160
Brookman's Two (D, Trans)	WM168
A.C. Two (D, Trans)	WM175
Programme Two (D, Trans)	WM177
New Crusader (D, Trans)	WM182
Radio-Record Two (SG, D)	WM187
Gleaner Two (D, Trans)	WM201
Music Monitor (D, Trans)	WM208
Merlin Two (A.C. Set)	WM213

THREE-VALVE SETS

All these 1s. each, post free.

Three-valve Mains Receiver (HF, D, Trans)	AW109
British Station Three (HF, D, Trans)	AW122
Simplicity Screen-grid Three (HF, D, Trans)	AW132
All-purpose Short-wave Three (D, RC, Trans)	AW147
All-Round Three (D, RC, Trans)	AW155
All Britain Three (HF, D, Trans)	AW158
Bantam Three (D, RC, Trans)	AW160
Binowave Three (D, RC, Trans)	AW172
Clarion Three (SG, D, Trans)	AW175
Broadcast Three (SG, D, Trans)	AW192
James dual-range Three (HF, D, Trans)	AW196
Knife-edge Three (D, RC, Trans)	AW201
Talisman Two-three (D, RC, Trans)	AW203a
Wide World Short-wave Three (HF, D, Trans)	AW207
Everybody's Three (SG, D, Trans)	AW209
1930 Ether Searcher (SG, D, Trans)	AW211
New All-Britain Three (HF, D. Trans)	AW214
Best-by-Ballot Three (SG, D, Trans) Price 4d. free with copy of "A.W."	AW217
Brookman's By-pass Three (D, 2 Trans)	AW220
Everybody's All-electric Three (SG, D, Trans-A.C.)	AW221
1930 Clarion Three (SG, D. Trans)	AW223
Auto-Coupler Three (D, 2LF)	AW225
Beginner's Regional Three (D, 2LF)	AW233
Britain's Favourite Three 1930 (D, 2 Trans)	AW243
Car Three (D. RC. Trans)	AW244
The "A.W." Exhibition 3	AW247
"A.W." Challenge Kit Three (SG, D, Trans)	AW253
Britannia (D, RC, Trans)	WM67
All-wave Screened-grid Three (HF, D, Pentode)	WM110
Standard Coil Three (HF, D, Trans)	WM117
Festival Three (D, 2 LF-Dual Imp)	WM118
The Q3 (D, RC, Trans)	WM124
Lodestone Three (HF, D, Trans)	WM131
Simple Screen Three (HF, D, Trans)	WM136
Dynamic Three (A.C.—SG, D, Trans)	WM142
Short Wave Link (D, RC, Trans)	WM152
Binowave S.G. Three (SG, D, Trans)	WM157
Fanfare (D, 2 Trans)	WM161
Brookman's Three (SG, D, Trans)	WM164
Community Three (D, RC, Trans)	WM167
New Q 3 (SG, D, Pentode)	WM170
Brookman's Push-Pull Three (SG, D, Trans) 1/6	WM173
Celerity Three (SG, D, Trans)	WM178
All-nations Three (D, 2 Trans)	WM179
Inceptordyne (SG, D, Pentode)	WM184
Brookman's A.C. Three (SG, D, Trans) 1/6	WM190
Music Marshal (D, 2Trans)	WM196
Gramo-Radio D.C. Three (SG, D, Trans)	WM205
Concert Three (D, 2 Trans)	WM209
New Lodestone Three (HF, D, Trans)	WM212
De-luxe Three (D, RC, Trans)	WM217
Five-point Three (SG, D, Trans)	WM218
Falcon Three (A.C. Set)	
New Brookman's Three (SG, D, Trans)	

FOUR-VALVE SETS

All these 1s. 6d. each, post free.

Explorer Four (HF, D, RC, Trans)	AW120
Facility Four (HF, D, 2 RC—Q-coil)	AW154
Broadcast Picture Four (HF, D, 2RC)	AW163
The Orchestra Four (D, RC, Push-pull)	AW167
All Europe Four (2HF, D, Trans)	AW173
Stability Four (HF, D, RC, Trans)	AW182
Clarion All-electric Three (SG, D, Trans A.C, Rectifier)	AW200
Music-lover's Gramo-radio (SG, D, RC, Trans.)	AW202a
Horizon Four (SG. D, 2 Trans)	AW237
Challenge Four (2SG, D, Trans) with copy of A.W. 4d. post free	AW251
Challenge Four (2SG, D, Trans) Mains operated with copy of A.W. 4d. post free	AW252
Touchstone (HF, D, RC, Trans)	WM109
Standard-coil Four (HF, D, 2RC)	WM122
Dominions Four (2SG, D, Trans)	WM134
Drum Major (HF, D, RC, Trans)	WM137
Music Player (HF, D, RC, Trans)	WM144
Arrow (SG, HF, D, Trans)	WM154
1930 Monodial (2SG, D, Trans)	WM158
Electric Four (All AC.—SG, D, RC, Trans)	WM162
Outpost Four (SG, D, 2 Trans)	WM165
Brookman's Four (2 SG, D, Trans)	WM174
Transportable Four (SG, D, 2 RC)	WM180
Super Q (SG, D, 2 Trans)	WM189
Lodestone Four (HF, D, RC, Trans)	WM193
Searcher's Four (SG, D, RC, Trans)	WM194
Invitation Four (SG, D, RC, Trans)	WM200
Regional Band-pass Four (SG, D, RC, Trans)	WM211
Five-Point Four (SG, D, RC, Trans)	WM216

FIVE-VALVE SETS

All these 1s. 6d. each, post free.

James Quality Five (2 SG, D, RC, Trans)	AW227
All-wave Lodestone Five (HF, D, RC, Push-pull)	WM146
1930 Five (2 HF, D, RC, Trans)	WM171
Dual-screen Five (2SG, D, RC, Trans)	WM185
Radio-Record Five (SG, D, Trans-parallel)	WM188
Overseas Five (3SG, D, Trans)	WM191

PORTABLE SETS

House Portable (SG, D, RC, Trans)	AW168 1/6
£5.5.0 Portable (D, Trans)	AW181 1/-
Holiday Portable Three (D, RC, Trans)	AW188 1/-
Music Leader (SG, D, RC, Trans) with copy "A.W."	AW203 -/4
Merry-maker Portable (D, 2Trans)	AW228 1/-
Sunshine Three (SG, HF, SG, D, Trans)	AW235 1/-
Continental Portable (SG, D, Trans)	AW241 1/-
Wayfarer Portable (Super-het)	WM139 1/6
1929 Chummy (SG, D, Trans, RC)	WM145 1/6
Picnic Portable (D, RC, Trans)	WM148 1/-
Pedlar Portable Two (D, Trans)	WM195 1/-
Pedlar Portable Three (D, 2 Trans)	WM197 1/-
James Portable SG3 (SG, D, Trans)	WM203 1/-
Foursome Portable (SG, D, 2 Trans)	WM206 1/6

AMPLIFIERS

All these 1s. each, post free.

Utility (RC, Trans)	AW68
Hook on Short-waver	AW104
Purity Amplifier	AW108
Add-on Distance-getter	AW117
Screened-grid HF Amplifier	AW138
Searcher Unit (HF)	AW176
"A.W." Gramophone Amplifier	AW205
Beginner's Amplifier (1v.) 9d.	AW210
Brookman's Separator (HF Unit)	AW212
Two-valve Amplifier	AW216
"Mag." Gramo Unit	AW224
Auditrol Amplifier	WM132
Concentrator (HF, Unit)	WM169
Radio-Record Amplifier (D.C. Mains)	WM183
Selecto Amplifier (H.F. Unit)	WM210

MISCELLANEOUS

Arcadian Linen-diaphragm Loud-speaker (full-size)	AW177a 1/-
Short-wave Adaptor (1 v.)	AW183 1/-
Gramophone Amplifier (3-v.)	AW187 1/-
High-tension Battery Charger	AW191 1/-
Mains Unit for S 8 Valves	AW193 1/-
Simplest H.T. Unit	AW197 1/-
B.P. Wavetrap	AW204 -/6
By-pass Unit (Wave Trap) with copy "A.W."	AW218 -/4
Home-constructor's pleated paper Loud-speaker	AW219 1/-
"Twin" Brookman's By-pass	AW222 -/6
"A.W." Paper Loud-speaker	AW231 1/-
James H.T. and L.T. Charging Unit	AW232 1/-
Simplest H.T. Eliminator for D.C. Mains	AW234 1/-
Simplest H.T. Eliminator for A.C. Mains	AW236 1/-
Choke Output Unit	AW240 1/-
Simple Tester Unit	AW246 -/6
"A.W." Improved Linen-diaphragm Speaker	AW248 1/-
James H.T. Unit for D.C. Mains	WM133 1/-
Short-wave Adaptor for Dominions Four	WM140 1/-
Two Ampere Low-tension Unit	WM147 1/-
A.C. Mains Amplifier	WM149 1/-
A.C. Mains Unit for All-wave Lodestone Five	WM151 1/-
H.T. Unit for A.C. Mains	WM159 1/-
"W.M." Linen-diaphragm	WM172 1/-
Trimmer (Selectivity Unity)	WM181 -/6
Brookman's "Wipe-outs"	WM186 1/-
Short-wave adaptor for Overseas Five	WM192 1/-
Staminator Unit for A.C. Mains	WM202 1/-
Universal Push-pull Amplifier	WM204 1/-
Outspan Short-wave Adaptor	WM207 1/-
"W.M." Standard A.C. Unit	WM214 1/-
"W.M." Standard D.C. Unit	WM215 1/-
Falcon A.C. Unit	WM219 1/-

Copies of "Amateur Wireless" and of "Wireless Magazine" containing descriptions of any of these sets can be obtained at 4d. and 1s. 3d. respectively, post free. Index letters "A.W." refer to "Amateur Wireless" sets and "W.M." to "Wireless Magazine" sets.

BROADCAST TELEPHONY

Broadcasting stations classified by country and in order of wavelengths. For the purpose of better comparison, the power indicated is *aerial energy*.

Metres	Kilo-cycles	Station and Call Sign	Power (Kw.)
GREAT BRITAIN			
25.53	11,751	Chelmsford (GSW)	15.0
200	1,500	Leeds	0.16
242	1,238	Belfast	1.2
261	1,148	London Nat.	68.0
288.5	1,040	Newcastle	1.2
288.5	1,040	Swansea	0.16
288.5	1,040	Stoke-on-Trent	0.16
288.5	1,040	Sheffield	0.16
288.5	1,040	Plymouth	0.16
288.5	1,040	Liverpool	0.16
288.5	1,040	Hull	0.16
288.5	1,040	Edinburgh	0.4
288.5	1,040	Dundee	0.16
288.5	1,040	Bournemouth	1.2
288.5	1,040	Bradford	0.16
301	995	Aberdeen	1.2
309.9	968	Cardiff	1.2
356	842	London Reg.	45.0
376.4	797	Manchester	1.2
398.9	752	Glasgow	1.2
479	626	Midland Reg.	38.0
1,554	193	Daventry (Nat.)	35.0
AUSTRIA			
246	1,220	Linz	0.6
246	1,220	Salzburg	0.6
283.6	1,058	Innsbruck	0.6
352	851	Graz	9.5
453	666	Klagenfurt	0.6
517	578.5	Vienna	20.0
BELGIUM			
206	1,460	Antwerp	0.4
212	1,415	Binche	0.2
216	1,391	Chatelineau	0.25
243	1,235	Courtrai	0.1
244.7	1,226	Ghent	0.25
251.4	1,194	Schaerbeek	0.5
338.2	887	Brussels (No. 2)	15.0
509	590	Brussels (No. 1)	1.2
CZECHO-SLOVAKIA			
263	1,139	Moravska-Ostrava	11.0
279	1,076	Bratislava	14.0
293	1,022	Kosice	2.5
342	878	Brunn (Brno)	3.0
487	617	Prague (Praha)	5.5
DENMARK			
281	1,067	Copenhagen	1.0
1,153	260	Kalundborg	10.0
ESTONIA			
401	748	Reval (Tallinn)	0.7
FINLAND			
221	1,355	Helsinki	15.0
291	1,031	Viipuri	15.0
1,796	167	Lahti	54.0
FRANCE			
172.5	1,739	St. Quentin	0.3
200	1,500	Radio Roubaix	0.2
210	1,430	Radio Touraine	0.2
222.9	1,346	Fécamp	0.7
235.1	1,275	Nimes	1.0
244.7	1,226	Béziers	0.6
249.5	1,202	Juan-les-Pins	0.5
256	1,171	Toulouse (PTT)	1.0
265	1,130	Lille (PTT)	1.0
272	1,103	Rennes (closed)	1.2
286	1,049	Montpellier	2.0
287.2	1,044.6	Radio Lyons	0.5
296.4	1,012.1	Limoges (PTT)	0.08
299.5	1,001.3	Paris Experimental and on 40.9 m.	0.3 / 3.0
300	1,000	Strasbourg	0.35
304	988	Bordeaux (PTT)	35.0
308	973	Neuilly (Paris)	0.3
309	970	Natan-Vitus	0.5
316	950	Marseilles (PTT)	1.5
328.2	914	Grenoble (PTT)	1.2
329	911	Caen (Normandy)	0.6
329.5	910.3	Poste Parisien	1.2
345.2	869	Strasbourg	15.0
369.3	812.2	Radio LL (Paris)	0.5
385	779	Radio Toulouse	8.0
447	671	Paris (PTT)	1.0
466	644	Lyons (PTT)	2.3
1,446	207	Eiffel Tower	15.0
1,725	174	Radio Paris	17.0
GERMANY			
31.38	9,560	Zeesen	15.0
218	1,373	Flensburg	0.6
227	1,319	Cologne	1.7
227	1,319	Münster	0.6
227	1,319	Aachen	0.31
232.2	1,292	Kiel	0.3
239	1,256	Nürnberg	2.3
246.4	1,217.2	Cassel	0.3
253.4	1,184	Leipzig	2.3
259.3	1,157	Gleiwitz	5.6
270	1,112	Kaiserslautern	0.25
276	1,085	Königsberg	1.7
283.6	1,058	Magdeburg	0.6
283.6	1,058	Berlin (E)	0.6
283.6	1,058	Stettin	0.6
316.6	947.6	Bremen	0.3
318.8	941	Dresden	0.3
325	923	Breslau	1.7
360	833	Stuttgart	60.0
372	806	Hamburg	1.7
390	770	Frankfurt	1.7
419	716	Berlin	1.7
452.1	662	Danzig	0.25
473	635	Langenberg	17.0
533	563	Munich	1.7
560	536	Augsburg	0.3
566	530	Hauover	0.35
570	527	Freiburg	0.3
1,635	183.5	Zeesen	35.0
1,635	183.5	Norddeich	10.0
HOLLAND			
31.28	9,599	Eindhoven (PCJ)	30.0
299	1,004	Hilversum	3 3
299	1,004	Radio Idzerda (The Hague)	0.6
1,071	280	Scheveningen-Haven	5.0
1,875	160	Huizen	8.5
HUNGARY			
210	1,430	Budapest (Csepel)	1.0
550	545	Budapest	23.0
ICELAND			
1,200	250	Reykjavik (shortly testing)	16.0
IRISH FREE STATE			
224.4	1,337	Cork (1FS)	1.5
413	725	Dublin (2RN)	1.5
ITALY			
25.4 and 80		Rome (3RO)	9.0
247.7	1,211	Trieste	3.0
295	1,013	Turin (Torino)	8.5
332	905	Naples (Napoli)	1.7
379.5	790	Genoa (Genova)	1.5
441	680	Rome (Roma)	75.0
453	662	Bolzano (1BZ)	0.2
501	599	Milan (Milano)	8.5
LATVIA			
525	572	Riga	12.0
LITHUANIA			
1,935	155	Kaunas	7.0
NORTH AFRICA			
363.4	825.3	Algiers (PTT)	13.0
416	721	Radio Maroc (Rabat)	10.0
1,350	222.2	Tunis Kasbah	0.6
NORWAY			
364	824	Bergen	1.0
366	819.5	Frederiksstad	0.7
453.2	662	Porsgrund	1.5
453.2	662	Nidaros	1.2
1,071	280	Oslo	0.5
POLAND			
214.2	1,400	Warsaw (2)	1.9
234	1,283	Lodz	2.2
244	1,229	Cracow	1.5
313	959	Wilno	0.5
338.1	887.1	Poznan	1.9
381	788	Lvov	2.2
409.8	732	Katowice	16.0
1,411	212.5	Warsaw	14.0
PORTUGAL			
240	1,247	Oporto (Teatro Apollo)	0.25
320	937.6	Lisbon (CTAA)	0.25
ROMANIA			
394	761	Bucharest	16.0
RUSSIA			
720	416.6	Moscow (PTT)	20.0
800	375	Kiev	20.0
824	364	Sverdlovsk	25.0
938	320	Kharkov	25.0
1,000	300	Leningrad	20.0
1,060	283	Tiflis	10.0
1,103	272	Moscow Popoff	40.0
1,304	230	Moscow-Stchelkovo (C.C.S.P.)	100.0
1,380	217.5	Bakou	10.0
1,481	202.5	Moscow (Kom)	20.0
SPAIN			
251	1,193	Barcelona (EAJ15)	0.5
266.7	1,125	Barcelona (EAJ13)	10.0
349	860	Barcelona (EAJ1)	8.0
368	815	Seville (EAJ5)	1.5
424	707	Madrid (EAJ7)	2.0
460	652	San Sebastian (EAJ8)	0.5
SWEDEN			
135	2,222	Motala	30.0
231	1,301	Malmo	0.75
257	1,166	Hörby	15.0
300.2	999.3	Falun	0.65
322	932	Göteborg	15.0
436	689	Stockholm	75.0
542	554	Sundsvall	15.0
770	389	Ostersund	0.75
1,223.5	244	Boden	0.75
1,348	222.5	Motala	40.0
SWITZERLAND			
318.8	943	Basle	0.65
403	743	Berne	1.1
459	653	Zurich	0.75
678.7	454.6	Lausanne	0.6
760	395	Geneva	1.5
TURKEY			
1,200	250	Istanbul	5.0
1,958	153	Ankara	7.0
YUGOSLAVIA			
306.8	978	Zagreb (Agram)	0.7
430.7	696.5	Belgrade	3.0
577.1	519.9	Ljubljana	2.8

LOUD-SPEAKERS

THE new moving-coil speakers of the permanent-magnet type require no extra current to energise the field-windings, and for this reason are specially suitable for music lovers who do not happen to have access to electric supply mains. The special cobalt-steel magnets give an enormously powerful "field." Though somewhat weighty, the latest models are conveniently compact, the cone being only 6 inches in diameter.

The inductor-dynamic is an interesting newcomer to the moving-armature type of speaker. Instead of moving up and down between the poles, the armature is mounted so that it vibrates to and fro in a direction parallel to the pole faces, the restoring force being purely magnetic. In this respect it resembles the moving-coil action rather than the "springy" return of the ordinary reed or armature movement.

M. A. L.

A PICK-UP PROBLEM

IT is sometimes convenient to be able to locate the "record" turntable and loud-speaker in a different room from the wireless set, when this is being used as an amplifier. A long lead, however, usually produces trouble, especially when the pick-up is of the high impedance type. A good plan in these circumstances is to insert a coupling transformer between the pick-up and set, and to earth the primary winding.

M. B.

Easy Terms

We supply the following Radio Apparatus on deferred terms. We carry adequate stocks and can give prompt delivery.

NEW HEAYBERD ELIMINATOR KIT C.150.—Complete Kit of Parts for building an H.T. Eliminator including steel case. Output 25 m.a., 150 volts, 3 H.T. Tappings, one variable.
Cash Price, £3/16/-
or 7/6 with order and 11 monthly payments of 7/-

NEW EPOCH PERMANENT MAGNET MOVING COIL UNIT PM66.
Cash Price, £5/15/-
or 11/- with order and 11 monthly payments of 10/6.

LISSEN 2-VALVE SET.—Battery Model, including valves. A Reliable Regional Receiver.
Cash Price, £3/10/-
or 5/6 with order and 11 monthly payments of 6/6

NEW OSRAM MUSIC MAGNET 4 KIT.—A first-class long-distance Receiver, incorporating 2 H.F. stages, single-dial tuning.
Cash Price, £11/15/-
or 10/- with order and 11 monthly payments of 21/-

NEW MULLARD ORGOLA 1931 3-VALVE KIT.—A high-grade complete kit of parts, including valves and cabinet.
Cash Price, £8
or 10/6 with order and 11 monthly payments of 14/6

NEW COSSOR EMPIRE 3 KIT.—A considerable advance on last season's 3-valve Kit and at a lower price.
Cash Price, £6/17/6
or 10/- with order and 11 monthly payments of 12/6

N.K. FARRAND INDUCTOR LOUD-SPEAKER UNIT.—Quality of reproduction almost equal to a moving-coil speaker.
Cash Price, £3/10/-
or 5/6 with order and 11 monthly payments of 6/6

G.T.H. PICK-UP AND TONE ARM.—One of the best pick-ups available.
Cash Price, 45/-
or 5/- with order and 9 monthly payments of 5/-

GAMBRELL NOVOTONE.—Greatly improves reproduction from records when connected between Pick-up and Amplifier.
Cash Price, £3/3/-
or 5/- deposit and 8 monthly payments of 8/-

NEW BLUE SPOT 66R UNIT.—The finest balanced-armature movement on the market. Complete with large Cone and Chassis.
Cash Price, £2/10/-
or 5/- with order and 10 monthly payments of 5/-

LONDON RADIO SUPPLY CO.
11 OAT LANE, NOBLE STREET, LONDON, E.C.2
Telephone: National 1977

SENSITIVE MICROPHONES
Latest Improved Types Only
(NOT Government surplus, NOR second-hand)

For DEAF AIDS, DETECTAPHONES, PUBLIC ADDRESS, SPEECH AND MUSIC TRANSMISSION, ANNOUNCEMENTS THROUGH LOUD-SPEAKER (with or without Valve Amplifier), WIRELESS TRANSMISSION, LOUD-SPEAKING TELEPHONE, CRYSTAL AMPLIFIER, BABY ALARM or INVALID CALL from Bedroom through distant Loud-speaker, HOME-RECORDING of GRAMOPHONE RECORDS, Experiments

BRITISH MADE THROUGHOUT.
Illustrated Lists of Modern Microphones Free.
FREDK. ADOLPH, Actual Maker,
27 Fitzroy St., London, W.1. *Phone: Museum 8329*

"A.W." Solves your Wireless Problems

"PURATONE"
RADIO VALVES.
H.F. L.F., DET. or R.C. 3/9

Power	5/3.
Super-Power	6/3.
Screen-Grid	7/6.

2, 4, or 6 Volts.
BRITISH MADE. FULLY GUARANTEED.
SOLE MAKERS:—
Rubon Ltd., 189 New Kings Road, London, S.W.6.

You MUST Hear This SPEAKER
"GRASSMANN" MOVING COIL

is spoken of by the Technical Press as being definitely superior to nearly every other make. Confirm this yourself by asking your dealer to demonstrate. You will immediately appreciate its sensitivity, even response, ability to handle volume, richness of tone and absolute fidelity. Its price and performance sets a world standard of sound reproduction.

PRICES
6 v, 110 v., 240 v., D.C., £4 : 17 : 6
Universal A.C. 110 v., 125 v., 220 v., £8 : 5 : 0

ROTOR ELECTRIC LTD.,
2/3, Upper Rathbone Place, London, W.1.
Telephone: Museum 2611-2

REPAIRS
Any make of L.F. Transformer, Loud-speaker or headphones repaired and dispatched within 48 Hours—TWELVE MONTHS' GUARANTEE with each repair. 4/- Post Free.
Terms to Trade
TRANSFORMER REPAIR CO.
"Service" Dept.
953, GARRATT LANE, TOOTING, S.W.17.

For YOUR SET or RADIO-GRAM

Radio Furniture de luxe!
Gives style to the home.
Nothing cheap or shoddy.
Advantages also of PIANO-TONE baffle enables BETTER REPRODUCTION (3,000 clients and Leading Experts.)
DIRECT from makers, APPROVAL 7 days FREE. 75/- to £15, Cash or EASY PAYMENTS. Photographs FREE.
PICKETTS, Radio Furniture Works (A.M.) Albion Road, Bexleyheath, Kent.

DX THE STANDARD PLUG-IN COIL
Sold everywhere from 1/-
DX COILS Ltd, London, E.8

High-Grade
SET & SPEAKER CABINET
Constructed of finely figured Oak on carved ball and claw legs, hand french polished.
The Acme of Craftsmanship £8.8.0, carriage paid.
Radio - Gramophone Cabinet £10.0.0, carriage paid.
Models from £2.2.0 to £20. Thirty-page illustrated catalogue, post free.
GILBERT, Cabinet Maker, *Established* 1866. SWINDON

PREPAID ADVERTISEMENTS

Advertisements under this head are charged THREEPENCE PER WORD, minimum charge THREE SHILLINGS. DEPOSIT SYSTEM

As the Publishers cannot accept responsibility for the bona fides of advertisers in this publication, they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom double fees are charged.

The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to "AMATEUR WIRELESS" ADVERTISEMENT DEPARTMENT 58/61 FETTER LANE, LONDON, E.C.4

ENGINEERS.—IMPORTANT NOTICE.—Results now to hand show that 93 per cent. of our candidates pass their Exams. at the first attempt, a remarkable record, unapproached by any other organisation and showing why we alone guarantee "NO PASS—NO FEE." If 93 out of every 100 ordinary men can succeed, why should you remain in the ranks? Now is the time to "get busy" and investigate. Our handbook, "ENGINEERING OPPORTUNITIES," explains the most simple and successful home-study methods of passing B.Sc., A.M.I.Mech.E., A.M.I.C.E., A.M.I.E.E., A.M.I.A.E., G.P.O., C. & G., Matric., etc., Exams. This book outlines Courses in all branches of Civil, Mech., Elec., Motor and Wireless Engineering, shows the unique advantages of our Appointments Dept. and includes a brilliant foreword by Prof. A. M. LOW, in which he shows clearly the chances you are missing. Send for FREE HANDBOOK now (state branch, post, or Exam.). — BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY, 109 Shakespeare House, 29-31 Oxford Street, London.

MAINS TRANSFORMERS AND CHOKES for Radio and Sound Systems, totally enclosed in cast aluminium plates, guaranteed. Write for Lists. Manufacturers' and traders' Inquiries invited.—Eric Cookson & Co., 14 Cambridge Road, Blackpool.

ALEXANDER BLACK, Wireless Consultant, will call and cure your set. (London and Home Counties). Radio Association appointed representative. Components and McMichael Portables on hire.—55 Ebury Street, S.W.1. Sloane 1655.

EVERYTHING FOR THE CONSTRUCTOR.—Instrument Wire, Coil Formers, Nuts, Bolts, Foil, etc.—Frost, 132 St. John Street, E.C.1.

WE WILL ACCEPT YOUR SURPLUS APPARATUS, (making you a high allowance) in part payment for any new apparatus; your inquiry will be dealt with promptly. —Bostock & Stonnill, 1 Westbourne Terrace, S.E.23.

WIRELESS NOTES.—For all those who want the best in Radio, Gramophone, or Television.—Post card for particulars to Capt. Robinson, Langmead, Pirbright, Surrey.

ELIMINATOR KITS from 28/-. Mains Transformers, 10/-; Chokes, 7/-. Guaranteed. Write for Lists.—Clearvolt Engineering, 148 New Cross Road, S.E.14.

CORRESPONDENCE COURSES OF INSTRUCTION IN WIRELESS.—Write for free particulars to the Correspondence Course Dept. of the R.M. College, 26-27 St. Mary Street, Cardiff.

PIANO-TONE BAFFLE.— Will improve your Blue Spot or any Speaker Unit. Cheaper than a Cabinet. Better than anything you have ever heard. Size 22 in. by 22 in. Popular, 9/6 (De Luxe, 12/6). Sent FREE TEST for seven days, on receipt of Postcard. Pickett's Radio Furniture Works, Bexleyheath.

ELIMINATOR TRANSFORMERS for Westinghouse H.T. 5, 6, and 7 rectifiers, 15/6. "Challenge Four" Coils, 10/6. Approval. Lists Free.—Edwards, 5 Bradford Street, Chelmsford.

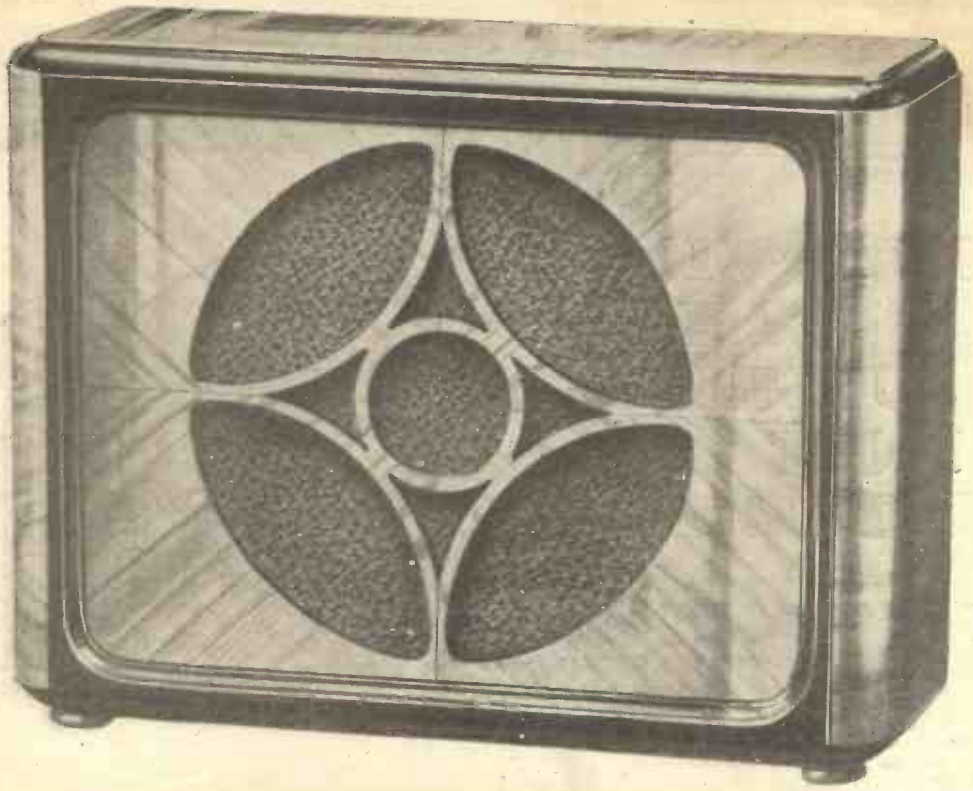
BANKRUPT BARGAINS. List Free. Easily cheapest for quality goods. Let me quote for anything wireless. Telsen A.C.E., 6/6; Radiogrand, 9/6; .0005 variable, 2/6; Polar .0001, 2/-; Bullphone Dual Coils, 8/6. D.C. Eliminators, 22/6. A.J.S., 1/9. Get my price for any type of valve or set. Cone Units: Bullphone, 6/6; Blue Spot, 66K. 18/6. Everything wireless—Butlin, 143b Preston Road, Brighton.

YOU CAN BUILD A £40 GRAMOPHONE WITH OUR SCALE DRAWINGS FOR 40/-

Book of instructions 3d. Catalogue of Motors, Tonearms, Soundboxes, latest internal amplifiers Gramophones and Cabinets Free. Cash or Terms.
W. BURT, 185 High St., Deptford.

TAYLEX WET H.T. BATTERIES
New Prices: Jars 1/3. Sacs 1/2. Zincs 10d. Sample doz. 18 Volts complete with bands and electrolyte 4/1 post 9d. Sample unit 6d. Illus. booklet free. Bargain list free. AMPLIFIERS, 30/- 3 VALVE ALL-STATION SET £5 A. TAYLOR, 57, Studley Road, Stockwell, LONDON.

Amateur Wireless COUPON
Available until Saturday NOVEMBER 15, 1930



BLUE SPOT 71R

A magnificent speaker. From its beautiful walnut cabinet 71R reproduces clearly and faithfully every sound the microphone receives. Ask at your dealer's to see and hear Blue Spot 71R for yourself. You'll be astonished how good it is.

PRICE 95/-

Blue Spot TRADE MARK

• THE BRITISH BLUE SPOT COMPANY LTD. •

BLUE SPOT HOUSE, 94/96 ROSOMAN STREET, ROSEBERY AVENUE, LONDON, E.C.1

'Phone: CLERKENWELL 3570 'Grams: "BLUOSPOT, SMITH, LONDON."

Distributors for Northern England, Scotland and Wales: H. C. RAWSON (Sheffield and London), LTD., 100 London Road, Sheffield; 22 St. Mary's Parsonage, Manchester; 183 George Street, Glasgow.

Printed in England. Published by Bernard Jones Publications, Ltd., 58/61 Fetter Lane, London, E.C.4
Sole Agents for South Africa: CENTRAL NEWS AGENCY, LIMITED. Sole Agents for Australasia: GORDON & GOTCH, LIMITED. Saturday, November 8, 1930.

OUR "CHALLENGE THREE" KIT SET—A GREAT SUCCESS

CHOOSING VALVES FOR BEST RESULTS

Amateur Wireless and Radiovision

Every Thursday 3d

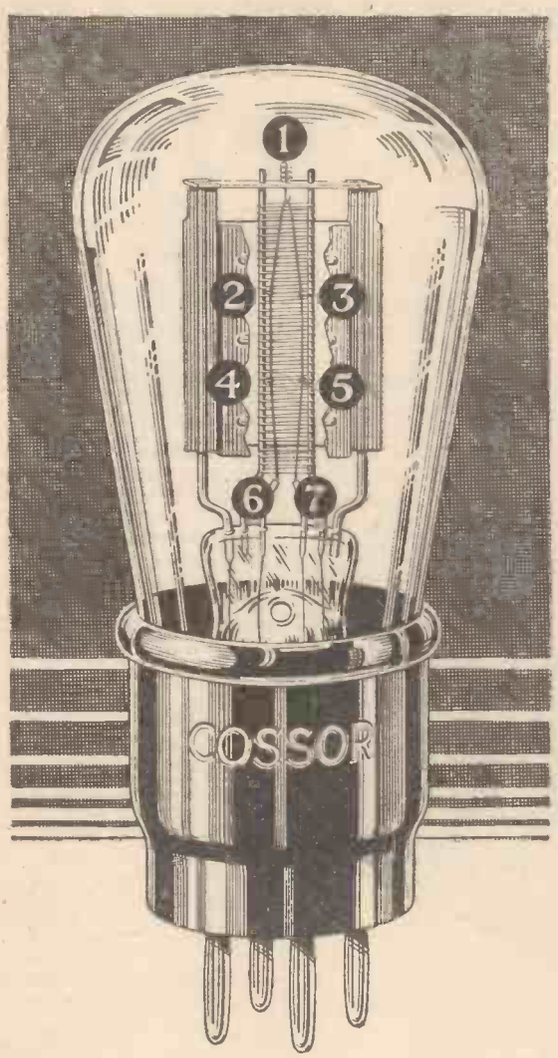
Vol. XVII. No. 440 Saturday, November 15, 1930

BUILD OUR CHALLENGE THREE KIT SET

FULL DETAILS IN THIS ISSUE

Registered at the G.P.O. as a Newspaper

Seven point suspension *definitely prevents* microphonic noises



—*by eliminating filament vibration*

Microphonic noises in a Receiving Set are usually traceable to the Detector Valve. Nine times out of ten the cause is filament vibration. Look at the illustration alongside. This shows the internal construction of the new Cossor Detector Valve. See how the filament is held—not only top and bottom—but also by four insulated hooks spaced at intervals throughout its length. The purpose of these hooks is to damp out any tendency for filament vibration. Therefore by using this "steep slope" Cossor Detector Valve in your Receiver the possibility of microphonic noises is definitely eliminated and you are assured of greater volume with absolute tonal purity.

We have just issued a novel, circular Station Chart which gives identification details of nearly 50 stations and space is provided for entering your own dial readings. Price 2d. each they are obtainable from any Wireless Shop. In case of difficulty write us, enclose 2d. stamp and head your letter "Station Chart A.W."

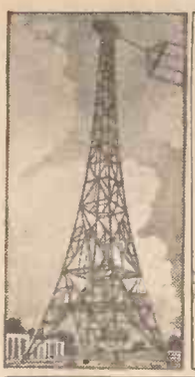
Cossor 210 DET., 2 volts, .1 amp. Impedance 13,000. Amplification Factor 15. Mutual Conductance 1.15 m.a./v. Normal working Anode Voltage 90-150. *Price* **8/6**

THE NEW COSSOR DETECTOR VALVE

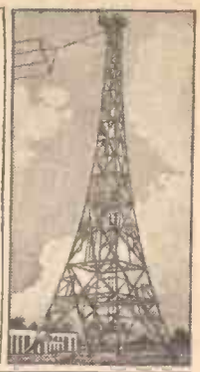
DEFINITELY FREE FROM MICROPHONIC NOISES

♡6563

No. 440. Vol. XVII. NOVEMBER 15, 1930



Amateur Wireless and Radiovision



EDITOR: BERNARD E. JONES.
TECHNICAL EDITOR: J.H. REYNER, B.Sc., A.M.I.E.E.
THE LEADING RADIO WEEKLY FOR THE CONSTRUCTOR, LISTENER & EXPERIMENTER.
RESEARCH CONSULTANT: W. JAMES.
ASSISTANT EDITOR: H. CORBISHLEY.

NEWS · & · GOSSIP · OF THE · WEEK

MORE ABOUT THE "CHALLENGE"

WHAT are you doing about the new "Challenge" series of sets? If the "Challenge Four," designed by Mr. W. James, was a little too big for you, there is the "Challenge Kit Three," first details of which were given in last week's issue. Full constructional information is given in the middle pages this week. "A.W." is doing something specially good in these "Challenge" sets. Why not investigate, and get busy in improving your reception.

PRISON FOR OSCILLATORS!

STEPS are being taken to make radio interference and "howling" a criminal offence. The police at Cossel, in Germany, have just issued regulations stating that all persons using sets that cause interference will be prosecuted. They are also placing restrictions on the sale of sets that have not been made non-interfering. It sounds rather hard on the "plain detector" man who has a set with no high-frequency stage to prevent aerial oscillation.

NOTABLE DX "FANS"

IF proof of the popularity of DX short-wave listening were lacking it would be found in the amazing interest taken by amateurs and professionals in the experiments that are at present being conducted at PCJ with different aerial systems. The response to the invitation to send in reports has exceeded all expectations, and interesting and useful letters have been received from the Heinrich Hertz Institute, The Rajah of Secundarabad, and from the Viceregal Office of India.

Speakers at St. Paul's. Engineers are now busy installing speakers so that the services will be audible in every corner and the annoying echo will be overcome

THE "MURDERED MINISTER"

AN astonishing rumour was circulated in Berlin recently to the effect that Dr. Curtius, the minister of Foreign Affairs, had been murdered. It is thought to have originated in a radio play entitled *The Minister Murdered*. In this play an announcement of the murder is made, and listeners switching on at this point must have thought it a genuine announcement.

THE NIT-WITS!

NIT-WIT is the latest Americanism for "senseless." A party of Nit-Wits has been formed at one American station, and they give fill-in comedy items, rivalling the famous "Amos and Andy" in popularity. Their theme song runs as follows:—

The night was dark and rainy,
The snow was falling fast,
And the moonshine warmed the cockles
Of a nit-wit drifting past.
It lashed its poor steed madly,
It shouted loud Hosannas,
And whispered to the noonday breeze
The catchy strains of—

NO BANANAS!

A fruit company grew weary of hearing this theme song, and sent the company three whole stems of bananas, which kept them quiet for a while!

RANGES COMPARED

THE difference in reception of Brookmans Park is due to the greater attenuation in the 261-metre transmission compared with the 356-metre transmission. The B.B.C. engineers have, with the usual reservations, supplied us with what they consider to be the minimum service range of the National and Regional transmitters. For crystal sets the National should be heard well up to forty miles and with a valve set up to fifty miles. The Regional should be heard well on a crystal set up to fifty miles and on a valve set up to eighty miles. The engineer consulted asked us to stress the fact that the attenuation is

PRINCIPAL CONTENTS

A ONE-VALVE LOUD-SPEAKER SET—Full Details Next Week

NEWS & GOSSIP OF THE WEEK —*Continued*

greater to the south than in other directions. Also that these ranges are for well-nigh perfect reception. At night listeners may find sideband interference on the National, especially if the set is very sensitive. Further afield it appears that the National station is more strongly received than the Regional.

GROWING DAILY!

THOSE who pass by the Queen's Hall must have noticed how rapidly the superstructure of Broadcasting House is rising. When we saw it the other day we must confess to being a little disappointed. The building seems much smaller than was anticipated by a study of the artist's drawing. How many readers know that 100 ft. below this building is a very old sewer which had to be avoided during excavations? Or that very close by the foundations runs the Bakerloo tube from Oxford Circus to Regents Park? We can visualise some scope here for future "Diversions"!

B.B.C. AND AMATEURS

WE recently asked B.B.C. engineers why they do not consider monthly series of technical tests for the benefit of radio societies and individual wireless amateurs. We suggested that different depths of modulation and frequency notes would serve as useful material for experiments on a nation-wide scale. The answer: "This suggestion has been considered, but we do not think a sufficient number of listeners would be interested to warrant us doing the tests. It is not the B.B.C.'s policy to broadcast matter of interest only to a very small section of the audience. Moreover, the tests would be misleading unless properly conducted at the receiving end." There is also a feeling at Savoy Hill that if they gave way to a small technical section of listeners they would have to cope with Esperanto societies and other similar sections of the community.

MORE AMERICAN EAVESDROPPING

SAVOY HILL must be feeling pleased with the attention its activities are being given by the N.B.C. of America. On November 19 the Symphony Orchestra, conducted by Sir Henry Wood, will be heard in America through all N.B.C. stations. This will be the first time American listeners will hear the new combination. It is the B.B.C.'s boast that their Symphony Orchestra is the most rehearsed in the world. It has three rehearsals for each Sunday programme and four rehearsals for the Wednesday concerts at the Queen's Hall.

NO MONEY TO SPARE!

THERE is a popular belief among many organisations and societies that the B.B.C. is simply rolling in excess revenue. The latest suggestion is that the B.B.C. should help to endow and support a national theatre. Quite apart from the fact that the B.B.C. would not be able to broadcast many, if any, of the plays done by a national theatre, owing to the special dramatic technique required by radio, the B.B.C. simply has not the money. It is true that it helps to support the National Orchestra of Wales and the Hallé Orchestra in Manchester. But money spent in these directions is really payment for broadcasting facilities. If the B.B.C. had any spare cash it would need it for programme development.

FERRING CHURCH RELAY

THOSE who know the south coast fairly well must have come across the quaint little church in the village of Ferring, between Worthing and Angmering. Its normal congregation of a hundred will be considerably augmented when the radio audience of the B.B.C. joins in the service to be given on November 16. On that occasion the Bishop of Chichester will be taking charge of the service.

WHAT'S IN A NAME?

EARLY in the new year we expect to learn the official title of the B.B.C.'s new Symphony Orchestra. Many suggestions have been made, but, judging by the examples quoted, we can sympathise with the B.B.C. in its difficulty. Broadcasting Symphony Orchestra, British Symphony Orchestra, and "Broadestra" are three of the suggestions. With these and many others the B.B.C. is not satisfied. Still, for publicity purposes, a good name would be an asset to this fine combination, especially if it is going to be in demand by other countries.

DUTCH NATIONAL PROGRAMME

ON November 21 the B.B.C. proposes to broadcast a Dutch National Programme. This will involve a land-line relay from Hilversum. With regard to this series of national programmes, the B.B.C. states that it will do them only when it is possible to take a programme from the country forming the subject of the broadcast. There should be no difficulty in relaying Hilversum, if one may judge by the experience of the Salzburg relay.

FARTHER AFIELD

NOT content with stopping at Salzburg, the B.B.C. has cast its relay net as far away as Poland. On December 17 it is confidently expected that a half-hour programme will be relayed by land-line from Warsaw, for the Polish National programme. The land-line will be well over 1,000 miles in length. Its route from Warsaw will be via Posen, Berlin, Hanover, Cologne, Aachen, Brussels, Ostend, through Dumpton Gap to Canterbury, and finally to Savoy Hill. The B.B.C. engineers are to be congratulated on their enterprising co-operation with European broadcasting organisations.

QUEER SUGGESTIONS

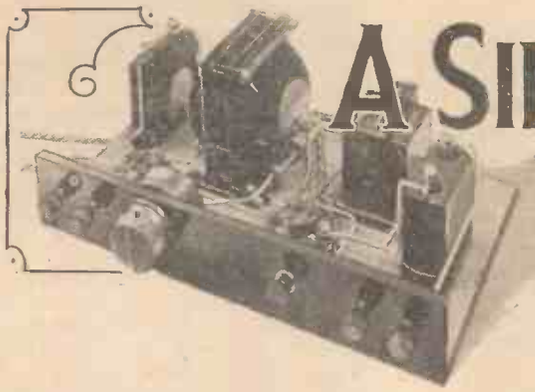
SAVOY HILL receives some very queer suggestions as to outside broadcasts. One of the latest is that the adventurous parachutist who proposes to drop from a height of 20,000 feet should bring down with him a miniature transmitter, giving listeners his impressions as he hurtles through the air. One can understand why the B.B.C. rejected this admittedly novel suggestion. The weight of the transmitting apparatus would be an extra hazard for which broadcasting authorities would not care to be responsible.

The "Roosters" before the microphone. This popular war-time concert party broadcast recently, and in a letter appearing in our feature "Readers Ideas and Questions," they explain how the "effects" of drilling and marching are obtained in the studio

DO YOU KNOW—

that at Brookmans Park the huge 12,000-volt generators which supply the high tension are fitted with an automatic device which switches off the power if a fault should develop?

that even when a transformer follows the detector it is sometimes advisable to use a high-frequency valve in the detector stage? With some sets it is even possible to use a resistance coupling valve with advantage in this position. The maximum advisable current through the primary of the low-frequency transformer affects the type of valve which it is best to use as a detector.



A SIMPLE GRAMOPHONE AMPLIFIER

Why not make the simple amplifier described below and play your records electrically?

"HOW can I improve my gramophone reproduction, using a pick-up, without having to pay too much for the improved results?"

That is the sort of question which many amateurs are asking themselves after they have had a chance to hear some modern sets, in which provision is made for the use of a gramophone pick-up, or when they have heard an up-to-date radio gramophone the quality of reproduction of which is infinitely better than that which they can get with their present gramophones.

Most people admit nowadays that, provided you have sufficient high tension (as much as is given by the average mains unit, or a super capacity battery), you can, with a pick-up, get greater volume than can be had direct with the normal acoustic system of the gramophone. At the same time, by judicious arrangement of values, you can improve the quality and, of course, you have the inestimable advantage of being able to control volume.

Better Than Using the Receiver

Many sets have provision made in them for gramophone reproduction, and if your set is at least a three-valver, then you may find it quite convenient to convert it in this way and to use the low-frequency side as the amplifier stage for the gramophone pick-up.

Often, it will be found easier to make up a separate little amplifier for this work, because there is then no need to change the connections of the low-frequency side of the set to allow the addition of a pick-up.

There is no need to have anything elaborate for this work. The amplifier described here and illustrated by the photographs is a simple two-valver which, used in conjunction with a gramophone pick-up and with your existing batteries (or mains unit) and speaker, will give results equal in quality and volume to those which can be had from quite expensive radio-gramophones.

The Circuit

The circuit arrangements in this little unit are just the same as those used in quite expensive instruments. The amount of volume you will get will depend entirely on the valves and high tension you can employ. This point will be explained later.

An accompanying panel shows the components needed, and constructors who want to make the job of building up the amplifier as simple as possible would be well advised to get a copy of the full size blueprint, which can be obtained, price 1/-, post free, from the Blueprint Department, AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4.

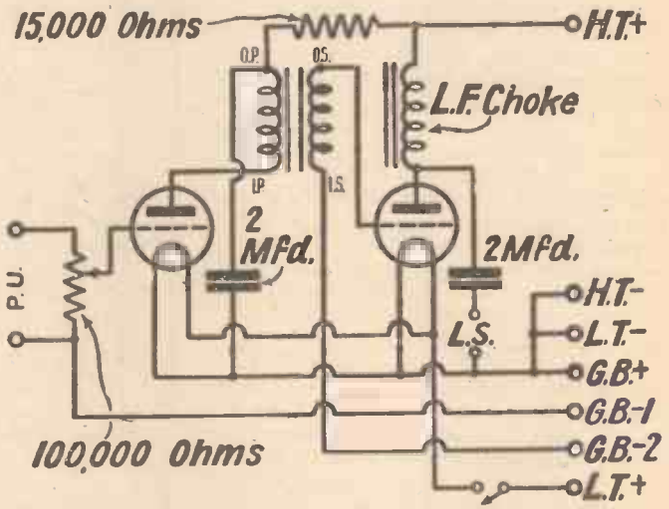
There is no complicated constructional work or panel drilling in this unit. The only ebonite used is a strip for supporting the pick-up and speaker terminals, the on-off switch and the volume control. The blueprint shows all the wiring and gives the exact positions of each of the components.

You will find it quite an easy matter to mount the parts in their correct positions by using the blueprint as a mounting template, pricking the screw holes through it on to the baseboard.

The ebonite strip may be drilled in the same way, using the blueprint as a drilling guide. However, the wireless dealer from whom you purchased the parts for this amplifier will generally be prepared to undertake the small amount of drilling needed.

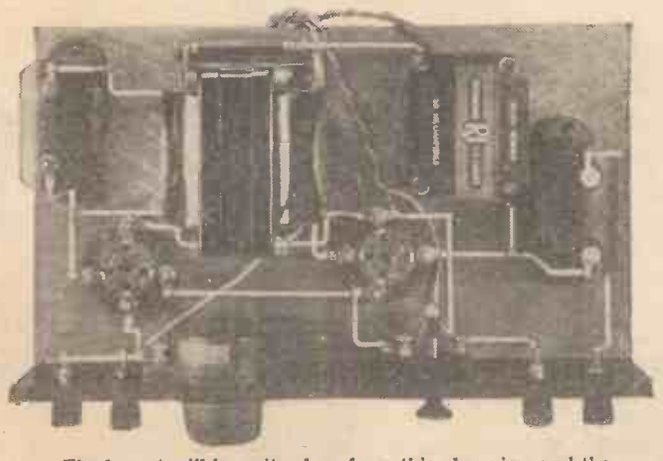
A glance at the circuit diagram shows that the amplifier is a straight-forward two-valve transformer-coupled unit, and there is a choke and condenser output arrangement in the last valve which insulates the speaker from the high-tension current. This is a point which will be particularly appreciated if a mains unit is used for providing high tension.

There is a low-frequency filtering arrangement in series with the primary of the coupling transformer. The purpose of this is to prevent motor-boating. You will find the amplifier very stable in working with practically any valves and high-tension supply.



Here is the circuit; note the volume control and choke output

Wiring should be carried out with rigid insulated wire, while the connections to the batteries are made by means of lengths of flex, terminating in wander plugs. The wires are shown and numbered on the

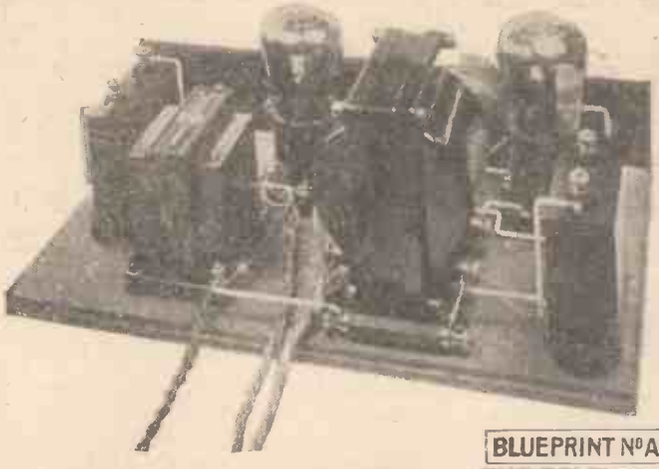


The layout will be quite clear from this plan view and the wiring diagram on the next page

COMPONENTS REQUIRED

Baseboard, 10½ in. by 6 in. Pickett, Camco, Clarion).
Two valve holders (Telsen, Lissen, W.B., Benjamin, Lotus, Burton, Igranic, Junit).
Low-frequency transformer (Ferranti A.F.5, Telsen, R.I., Lissen, Igranic, Burton, Lewcos, Varley).
Low-frequency choke, 20 henries (R.I. Hypercore, Lissen, Ferranti, Varley, Igranic, Bulgin, Wearite).
Two 2-mfd. fixed condensers (Lissen, Dubilier, T.C.C., Formo, Igranic.)
15,000-ohm resistance (Graham-Farish, Bulgin, Ready-Radio).
100,000 variable resistance (Sovereign, Igranic, Rotor, Varley, Lissen, Wearite, R.I.).
Push-pull filament switch (Ready Radio, Bulgin, Lotus).
Four terminals, marked: Pick-up (2), L.S.—, L.S.+ (Belling-Lee, Clix, Eelex, Igranic)
Terminal strip, 10½ in. by 2 in. (Becol).
Two yards of thin flex (Lewcoflex).
Five wander plugs, marked: H.T.—, H.T.+, G.B.+, G.B.—1, G.B.—2 (Belling-Lee).
Two spade terminals, marked: L.T.+, L.T.— (Belling-Lee).
Connecting wire (Glazite).

blueprint and the wiring diagram reproduced here. These numbers show the best order in which to carry out the process of wiring.



A rear view of the gramophone amplifier

Suitable Valves

So far as valves are concerned the first valve should be of the ordinary low-frequency type and the following two-volters are suitable: Cossor 210F, Marconi L210, Osram L210, Six-Sixty 210LF, Mullard PM1LF, Mazda L210, Lissen L210, Dario Univ.

Either a small power or a super power valve can be used in the last stage, depending on the amount of high-tension current available. Some good two-volt small power valves are the following: Cossor 220P, Dario SP, Marconi P2, Osram P2, Six-Sixty 220P, Mullard PM2, Mazda P220A, Lissen P200,

Among the larger two-volt power valves which are suitable, provided there is sufficient high-tension current available to work them, may be mentioned the following in addition: Cossor 230XP, Marconi P240, Osram P240, Six-Sixty 230P, Mullard PM252.

When fitting the unit to your gramophone, remember to keep the pick-up leads as short as possible, particularly if working with a mains unit. Long pick-up leads have a tendency to receive hum from the mains.

Ample grid bias must be used, the exact values depending on the types of valves used. With an ordinary small power valve in the last stage and with a low-frequency valve in the first stage, grid bias values of 4½ and 15 volts approximately are suitable.

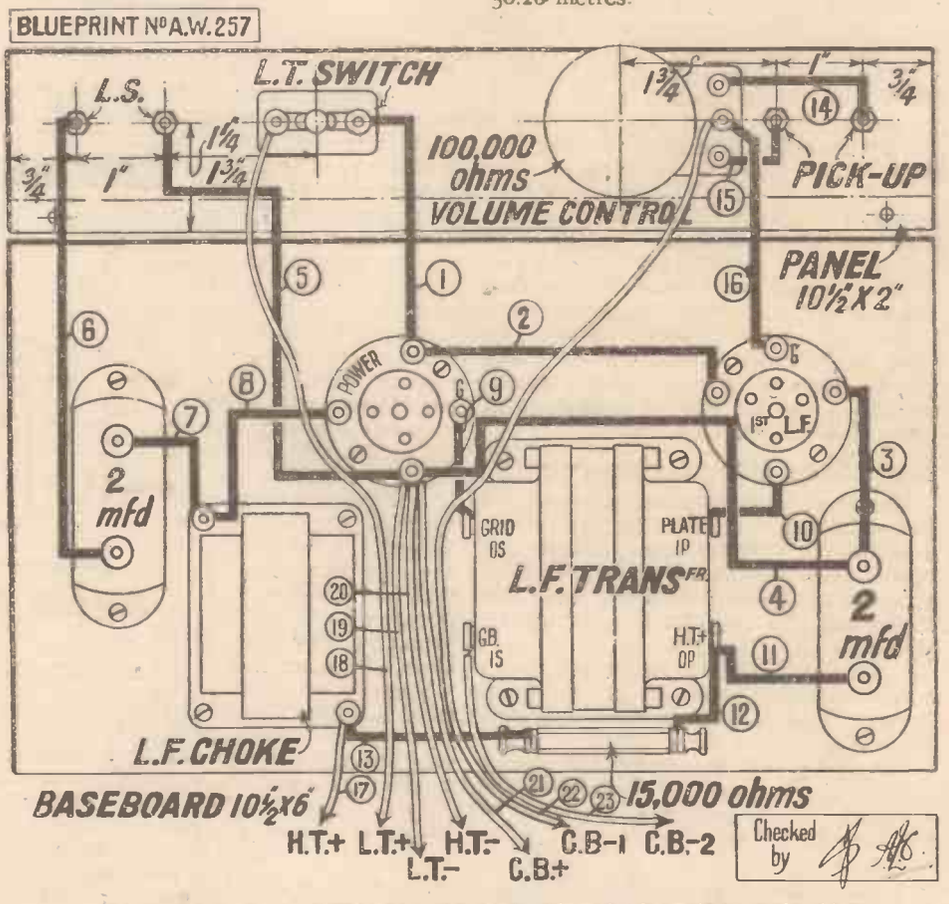
If you have a milliammeter it is worth while connecting this temporarily in the anode lead to check up the high-tension current supply. Adjust the grid bias until the least high-tension current is flowing, consistent with good results. You will find that the volume delivered by the amplifier will vary according to the type of pick-up and gramophone needle used.

Some pick-ups are very sensitive to needle types, and you should try needles of various kinds until you get satisfactory tone.

BARRETTERS

A BARRETTER is a device for obtaining a constant output current from a fluctuating service of supply. It usually consists of an iron-wire filament, mounted in a glass bulb containing hydrogen gas, and inserted in series with either the input or output circuit, say of a battery-charger. Its action depends upon the fact that the resistance of the iron wire increases with temperature, so that it automatically tends to stabilise the value of the current passing through it. For instance, if the current increases, the rising value of the series resistance tends to cut it down, and vice versa. This ensures a steady output provided the supply fluctuations are not excessive. M. B.

The new Vatican station will use a power of 12 kilowatts, operating on 19.84 and 50.26 metres.



The layout and wiring diagram. A full-size blueprint is available, price 1/-

RADIO SETS FOR CARS

THE American craze for motor-car wireless is spreading across the Atlantic. One effective system of screening the set from magneto interference was shown at the recent Paris Exhibition. High resistances are inserted in the lead to each of the sparking-plugs, whilst condensers of 2 microfarads are shunted across all make-and-break contacts to absorb H.F. oscillations. The controls of the set are mounted on the dashboard, the connecting leads being bound together in groups and screened by flexible metal tubing, which is earthed. M. A. L.

It was revealed, as a result of the Third Police Congress just concluded in Antwerp, that a huge international network of police radio-telegraphy to bring about the rapid apprehension of international criminals has been organised in Europe.

NEXT WEEK

"THE TRUTH ABOUT THE B.B.C. LANDLINES"

An Article of special topical interest

General Electric and Westinghouse, two of the largest radio broadcasting companies in the United States, have asked the Federal Radio Commission for an alteration in their experimental relay broadcasting licence in order that they may charge fees for relaying European broadcasts. These have hitherto been handled gratis.

According to Mr. M. H. Aylesworth, president of the National Broadcasting Company in America, it will cost approximately ten million dollars to provide talent for the sponsored programmes which will be broadcast over the company's networks during 1931.

A Comment upon the Broadcasting Suitability of Large Orchestras

REALISM IN SYMPHONY BROADCASTING

By ALAN HUNTER

WITH appropriate heralding and ceremonial, the new B.B.C. Symphony Orchestra has made its bow; in the flesh to those at the Queen's Hall and in the spirit to the vast audience of wireless listeners. Leaving the final assessment of its musical value to those more musical than I, the larger question of broadcast reception of big orchestral combinations can be discussed here and now.

Trying out a new all-electric three-valve set the other evening, I came upon the London National—and stopped the dial there to listen to Arthur Rubinstein playing, in masterly fashion, the Concerto in B Flat Minor by Tchaikovsky. I heard the piano and the harp to perfection. So realistic was the reproduction that I could easily imagine the artistes performing to a spell-bound audience in the Queen's Hall.

And as the theme was taken up by the strings, the effect was still profoundly realistic, still eminently satisfying. Rubinstein had come into the home, through an all-electric three-valver. Tchaikovsky himself could not have cavilled at that piano rendering.

Then the whole mighty blast—there is no other word so accurately descriptive—of the united one hundred and fourteen players, reached a crescendo—and spoilt the whole illusion. Gone were the clear-cut notes of the piano, the delicate fluting and stringing. Instead, an indistinguishable blurr of noise, a mushy blast of musical sounds. All of which was directly due to the inability of the average set to handle crescendo parts in the broadcast orchestral score. If readers think I exaggerate, let them mark this series of B.B.C. Symphony concerts as an opportunity for an extended test. But the result of a careful study is inevitable—that the technical limitations of radio as installed in the average home render the *realistic* reception of really big broadcast orchestral programmes well-nigh impossible.

The set I was using at the time was not a cheap model. It worked from the A.C. mains, with 250 volts on the anode of the super-power output valve. The loud-speaker was one of the best permanent-magnet moving-coil models available, quite capable of taking an enormous input without overloading.

Nor am I basing my contention on this one set. In the course of my work I have on test practically every type and make of commercial and home-built sets. But I cannot realistically reproduce on these sets a broadcast orchestra of one hundred and fourteen players.

Where Our Receivers Fail

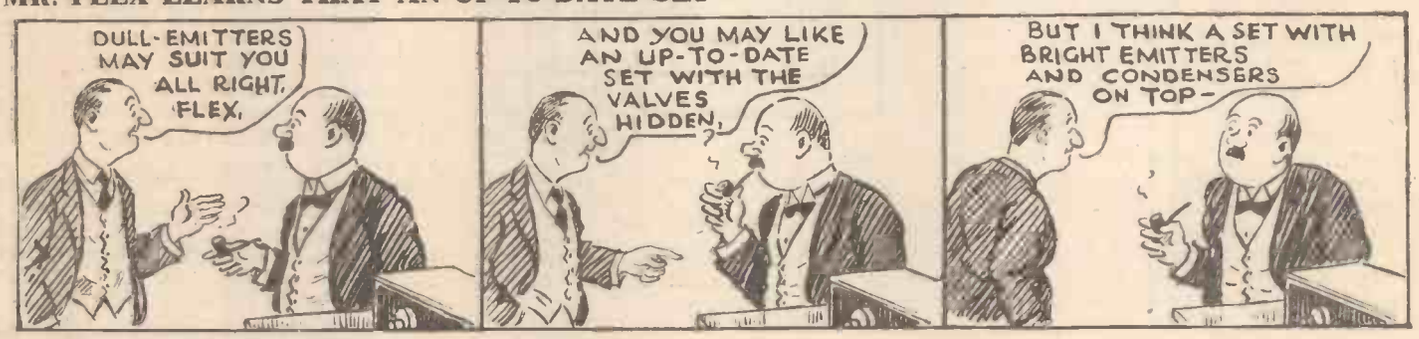
If a symphony orchestra cannot be reproduced with symphonic reality on the big sets, how can the average small sets do so? I am referring to battery-operated three-valvers, having say 120 volts on the anode of a small power valve.

The fact of the matter is you lose reality as soon as the volume of sound from the loud-speaker becomes appreciably different from the volume of sound you would hear if listening to the artiste or orchestra. That seems to me to be why a solo artiste can, on a really good set, be heard with such striking realism, simply because the volume of sound coming from the loud-speaker is approximately the same as the volume of sound created by the instrument in the studio.

In this question of realism there is another important point to be considered. Four or five microphones are carefully placed in different parts of the Queen's Hall so that the broadcast of the orchestra can be properly balanced. When the orchestra is playing, sounds are coming from many different sources and are picked up at two or three points. But the sound that comes from the loud-speaker has only one source. Again I see a reason why a

(*Continued in 3rd column of next page*)

MR. FLEX LEARNS THAT AN UP-TO-DATE SET—



—HAS ITS DISADVANTAGES

IN MY WIRELESS DEN

WEEKLY TIPS— CONSTRUCTIONAL AND THEORETICAL

By W. JAMES.

Those Handy Pre-sets

ONE of the most useful of parts is the pre-set condenser. Most of us connect one in the aerial in order to improve the selectivity.

We set it at a low value when the sharpest tuning is required and increase the capacity when more volume is needed.

There are two other uses, however, which may not have occurred to some readers. I often connect one between the anode of the detector and the filament instead of a fixed type and then adjust its capacity for the finest results. Sometimes a fixed .0001 is recommended, but although this may have proved a good average value, it cannot be denied that with a pre-set type we stand a chance of getting even better results.

The second use which I have in mind is in the grid circuit, in place of the usual grid condenser, in fact. We use here a value of .0002 or perhaps .0001 microfarad. With a pre-set type we can obtain just that value of capacity which best suits the set. An interesting hour can be spent in trying these two uses.

Resistance-coupled Advantages

Resistance-coupled low-frequency amplifiers are not used to any great extent these days I know, but I often wonder whether their advantages are fully appreciated when good quality is required.

All iron-cored apparatus distorts. Transformers and chokes distort, the amount depending upon the quality of the iron and the design generally of the part. Distortion varies with the amount, if any, of the steady anode current; on the other hand, loud-speakers also distort and one need not go too far in designing an amplifier for purity.

The resistance amplifier, properly used, distorts little indeed, but the magnification per stage is limited to, perhaps, 75 per cent. of the amplification factor of the valve. Most of us use a transformer when there is only a single stage of magnification after the detector and the quality may be quite acceptable. For the finest results with a big amplifier, however, resistance couplings have advantages.

Volume and Tuning

It is now generally realised, I think, that the amount of the magnification which we can usefully employ depends to a great extent upon the selectivity.

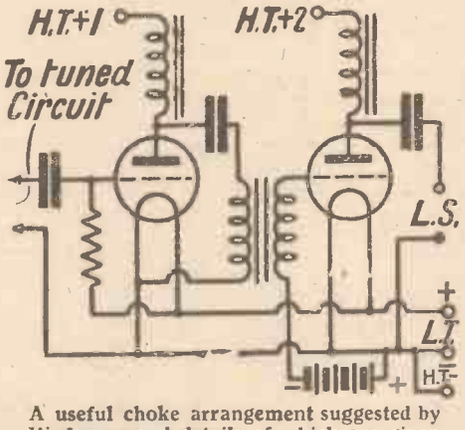
If we had a filter circuit tuning so well that only a band of frequencies, say, of 15 kilocycles wide was passed, then we could use all the magnification that was needed for the weakest of signals. Actually, of course, over-tuned circuits pass a wider band of frequencies and we find that if the magnification is pushed beyond a certain point interference results.

The ordinary three-valve set, with its screen grid, detector and power stages, usually magnifies a little too well for the selectivity. That is, the limit to the number of stations receivable is imposed by lack of selectivity.

Sets with two screen-grid stages, on the other hand, seem more nearly balanced. That is why, I believe, four-valve sets, such as the "Challenge Four," will soon be far more popular than the older three-valve sets.

A New Choke Arrangement

A disadvantage of the resistance-fed transformer arrangement is the voltage lost in the resistance itself, which results



A useful choke arrangement suggested by W. James, and details of which are given in the accompanying paragraph

in the voltage of the anode of the valve being much less than that of the high-tension supply.

With too low an anode voltage a valve easily overloads. This is to be avoided, as overloading distorts the signals. I was interested to note the other day an announcement that a special choke for this type of circuit was available.

The circuit of the arrangement is shown here, the choke being joined between the anode of the valve and the high tension. There is the usual coupling condenser connecting the anode and the end of the primary coil of the transformer. This circuit is a useful one, but we depend upon the choke for results. If this is poor we get distortion. Only a good component should be used here, therefore, and it must be capable of carrying the full anode current without approaching the saturation point.

Cheap Flex and Bother!

Little things like connecting wires are likely to cause an amount of trouble if they are neglected.

I have a case in mind of a mains unit which had a length of rather cheap flex on the mains side. After a while the insulation broke away and one day the fuses went, but only after the wires had become hot and burnt away more of the covering.

Poor quality flex ought not to be used for joining mains apparatus to the supply. The best is relatively not costly and is easily cheaper in the long run.

Prepare for Storms!

With the bad weather coming on, the lead-in may well need a little attention. A leakage here may cause not only a loss in signal strength, but noises as well.

When a switch is included the danger is greater, as there is the possibility of a leakage from the aerial to earth. A little attention to this part of the aerial circuit may well be worth while.

"REALISM IN SYMPHONY BROADCASTING"

(*Continued from preceding page*)

solo instrument can sound so real while a large orchestral combination cannot.

I believe there is a big tendency on the part of those responsible for the musical direction of the B.B.C. to overlook technical limitations. One feels that the B.B.C. Symphony Orchestra is much more at home at the Queen's Hall than coming through the average loud-speaker.

Perhaps that is a little beside the point. But it does seem that some form of stereoscopic reception will have to be invented before listening in the home to the B.B.C. Symphony Orchestra is at all comparable with the result achieved in the Queen's Hall.

Meanwhile, one of the best schemes I have yet tried during my search for something approaching realism is to use two or three loud-speakers at once. These are placed at different points in the room and then I listen to the combined output in the next room. I commend the idea to those who have the necessary selection of loud-speakers and room enough to indulge in such a large-scale experiment.

Prato Smeraldo, the Rome short-wave station, appears to have abandoned definitely the 25-metre wave and from October 28 has broadcast nightly on 80 metres.

TWO BUMPER NUMBERS WITH SUPPLEMENTS

WIRELESS MAGAZINE

for November 1/-

Full of good things, some of which are :—

16-page supplement "Easy Steps to Radio," which tells the whole story of the practical side of radio —Is Television at a Standstill, by Bernard E. Jones— A New Brookman's Three for £7, a revised edition of a famous Screened-grid Receiver—Your Loud-speaker and where you want It, by W. James— Making your own Records, by J. H. Reyner, B.Sc., A.M.I.E.E., etc., etc., etc.

Special Christmas Number

WIRELESS MAGAZINE

for December 1/-

Contents include a splendid 16-Page Supplement :—

"135 Loud-speakers to choose from," which describes the latest types of speakers, and W. James tells you how to get the best results.

SPECIAL SETS FOR CONSTRUCTORS. A mains version of the Regional Band Pass Four, by W. James —The "Hyperdyne," a new style super-het, by J. H. Reyner—The "Five Point Two," a dual range set with plug-in coils.

Secrets of the Gramo-radio Set, by Capt. H. T. Barnett, M.I.E.E.—Choosing Your Christmas Records—the War against the B.B.C.—Solving some Mains Mysteries —The Stenode Circuit, explained by Thermion of "Amateur Wireless," etc., etc., etc.

140 PAGES

The November Number is now on Sale. The December Number will be on Sale on November 20th. You can get a copy from any Newsagent or Bookstall

On Your Wavelength!

NUMBER TEN

"NUMBER TEN," the huge B.B.C. studio south of the Thames, has been on the air a good deal during the last week or so. And I'm not at all sure that I like the results that are at present being obtained with this studio compared with the normal Savoy Hill or Queen's Hall broadcasts. For one thing, there is a very noticeable echo which seems to "mush" the music and give to it a peculiar hollowness, reminiscent of orchestral transmissions from half-empty provincial town halls. There is an echo on the Queen's Hall broadcasts, we know, but this is of such a character as to make individual instruments quite audible at the same time as it adds a mellow reverberation. Much the same kind of echo is added to studio transmissions from Savoy Hill by means of echo rooms. At any rate, the individual characteristics of instruments placed far away from the microphone in "Number Ten" are quite lost; and the total efforts of fine orchestras are made to sound almost like distant echoes reverberating around the passages of a concert hall.

REMEDIES

NUMBER TEN studio is a very large room in a wharf warehouse, and is used as temporary accommodation for the largest orchestras, pending the completion of Broadcasting House. Naturally, the B.B.C. will not spend a great deal in structural or other alterations, in order to give the hall the correct acoustics. But it should be an easy matter to drape parts of the studio with curtains or thick chunks of felt; a rough-and-ready method for reducing reverberation. An interesting case of the successful elimination of echo effects came to my notice the other day. A large cinema studio at Cricklewood had been converted for talkie work by the building of an inner shell of brick; this was to exclude traffic and other noises from outside. Naturally, the bare brick walls of the inside of this studio gave it a colossal echo. The echo was entirely eliminated by the hanging of huge chunks of hair felt on the walls and draping the ceiling. The curious part of the experiment was that a considerable expanse of bare brick wall still uncovered gave no echo. Probably, by the time you read this paragraph, the B.B.C will be carrying out experiments on these lines with Number Ten.

SUNDAY PROGRAMMES

"SUNDAY Programmes" as subject matter in my columns is becoming quite hackneyed. But that is because the B.B.C. seems to make no move in response to what has become a universal grouse. I venture to suggest that the time allotted to religious transmissions is still far too great, and that the remaining part of the programmes is invariably "stodgy" to a degree. And then, to try still further the patience of long suffering listeners, the last items of the short evening orchestral programmes are cut short frequently, to make way for the Epilogue. It was in this way that listeners lost the last (and best) item of a fine symphony concert broadcast from London Regional station a couple of Sundays ago. If the orchestra had played the piece, Delius' "Dance Rhapsody," the concert would have finished about three minutes over time. But the Epilogue must not be held up! And so the announcer decided to cut out this last item, leaving a blank interval of ten minutes before the Epilogue commenced. Needless to say, the majority of listeners switched off and went to bed. I have heard more unparliamentary language used about the Sunday programmes than about all the programmes of the rest of the week put together, which is regrettable, considering the high ideals of the B.B.C. in this matter. The trouble is that the B.B.C. deals out its "uplift" with such a heavy hand that it seems more like a kick.

THEATRE BROADCASTS

FROM time to time, excerpts from revues and musical comedies are relayed from B.B.C. stations. Presumably, the theatre people look upon such broadcasts as being good advertisements for their shows, in the same way as the advance "trailers" of future films are shown at cinemas. But, like some of the less successful film trailers, some of these broadcasts serve to give bad impressions of what are really good shows. I happen to know, for instance, that *Charlot's Masquerade* is an excellent revue. But the broadcast excerpts most certainly did not give that impression. The items broadcast were nearly all those least suited to broadcasting, and the intelligibility of the voices was marred by a bad echo and the rumbling of scenery being moved behind the stage, not to mention several unrehearsed remarks from stage hands, such as "Black out, you idiot! *Black* out!" Demonstrations of the mechanics of backstage may be quite interesting in themselves, but in this case the engineers would have been better advised to have placed their microphones in positions which picked up the voices of the artistes only, or employed a directional microphone.

A "MICROPHONIC" PENTODE

IT takes some little time to get thoroughly used to all the little peculiarities of pentode valves. Although my pentode stage is now behaving very nicely, the other day I happened to disconnect the loud-speaker from the set in order to make some minor adjustment. Just then I was called away for a few moments, and on returning, thoughtlessly switched on at once. Instead of getting the usual full-bodied response, I was amazed to hear a faint, elf-like parody of the local dance music. After a few seconds bewilderment, I realised I had not connected up the loud-speaker. As it is a foolish thing to run a pentode on open circuit I promptly switched off. With an amplification factor in the neighbourhood of a hundred, very high voltages are set up on the plate if the valve is run on no load—in fact, this should never be done unless you have money to burn. The "fairy" music I heard must have been due to these abnormally high plate voltages, which caused the valve electrodes to function as a small "electrostatic" speaker.

BROADCAST DEBATING CIRCLES

I SHOULD like to commend a suggestion recently made by Dr. Holmyard, writing in *Nature* apropos of the series of B.B.C. talks to be given during the autumn season. In praising both the quality and quantity of the intellectual fare to be provided, he points out that many of the items would form an excellent basis for debate by "group listeners" assembled in the local club-room, particularly in the smaller towns and villages where it is often difficult—or too expensive—to secure the services of eminent speakers in person. There is no doubt that the desire for knowledge is surprisingly wide-spread, even among the younger members of the community—and in spite of the counter-attractions of cinema and dance-hall. By means of the loud-speaker one can now introduce into any local club, Sir James Jeans, for instance, speaking on the "Stars in their Courses," or Lord Moynihan on "The Future of Medicine." No debating society could wish for a better "lead," given a suitable chairman to direct the course of the subsequent discussion.

FINE CONDITIONS

CONDITIONS for listening to distant stations are extraordinarily good just now, and I hope that readers are not failing to take advantage of the excellent reception that is obtainable. The number of stations receivable is quite big, though when I say receivable I don't mean necessarily that all of them come through completely free from interference and, therefore, in such a way that they are genuinely worth listening to. Unfortunately, the increase in signal strength is having an effect that I rather thought would occur this winter. Heterodynes, which were so faint a little time ago that they were almost, if not quite, inaudible, are now coming up in strength. This means that the number of signals accompanied by whistles is much larger than it was. Don't imagine, though, that the whole broadcast band is now reminiscent of a nocturnal argument between pussy-cats. It is only in patches here and there that the whistles are found. There are heaps of stations which are coming through well, and the man who has a good stage of H.F. amplification at his command has now a big choice.

SOME OF THE BEST

HERE is a selection that the DX-minded reader may find useful when he goes out in search of alternative programmes. On the long waves the two Dutch stations are coming in well, though in the daytime the 1,071-metre transmission suffers rather often from morse interference. Kalundborg is generally a fine

On Your Wavelength! (continued)

signal and Motala is showing much better strength. Radio-Paris remains as reliable as ever and the Eiffel Tower is often well heard. Zeesen is always worth going for if your set is selective enough to cut out 5XX, or if it isn't at times when the long-wave Daventry transmitter is not working. On the medium band Budapest is coming in better and better, while Milan and Vienna at the upper end are often worth attention. Rome, for some reason, has become a week-end station. I don't know whether he is using reduced power during the early days of the week, but he always seems to be at his best on the Friday, Saturday, and Sunday. Stockholm is generally pretty powerful. Of the German stations, Nuremberg, Cologne, Leipzig, and Breslau are the pick. Hamburg and Frankfurt are sometimes strong and sometimes quite the reverse. Don't omit to try for Kattowitz, usually a fine signal. Gothenburg is showing fine strength, whilst Bratislava is on most nights a good signal. Turin is not, perhaps, quite so strong as he was, for the new wavelength does not seem to suit him quite so well as the old.

SOME DAY WE WILL

I THINK I have remarked before that we are a queer nation. One of our peculiarities is that we produce legislation on all kinds of silly little points that really don't matter in the least, but often defer making regulations about highly important things, though everyone knows that they are eminently desirable. A case in point is the matter of interference with reception of broadcasting, whether caused by flashing signs, electric motors, and so on, or by re-radiation from oscillating aerials. With regard to this source of interference the B.B.C. people have investigated the matter pretty thoroughly, and their development department has found that almost any kind of electrical apparatus can be rendered innocuous from the broadcast reception point of view by various simple methods. Ham-handed Henry and Oscillating Oswald could easily be kept in check if a simple Act were passed, making it illegal for manufacturers to produce any receiving set that was not of a non-radiating type.

In many foreign countries it is now by law a misdemeanour to install machinery that may cause interference, and in Germany new regulations provide penalties for all those who use radiating receiving sets. I could not help wishing that similar sound rules were enforced the other night. There was a fine concert in progress from London, but I could not receive it, since some neighbour of mine had tuned to the "silent point" with reaction pushed right up and completely spoilt the whole programme. Everyone living within a radius of several miles of his aerial must have had a similar experience.

THANKS TO THE S.G.

LUCKILY, outrageous interference of this kind with the broadcast programmes by re-radiation is nowadays much less common than it was a few years ago. One of the chief reasons why this is so is that so many people nowadays use receiving sets incorporating a screen-grid high-frequency amplifier. Owing to the remarkably small capacity between grid and plate, particularly in the latest types of S.G. valve, little or no feed-back can take place from plate circuit to grid circuit. In the vast majority of sets reaction is arranged between the plate and grid circuits of the detector valve, and even if this valve is in oscillation, radiation from the aerial, if it exists at all, will be of a very feeble type. But this statement, though, applies to thoroughly well designed S.G. sets with proper screening. Those of poor design can radiate literally to beat the band (the band in the broadasting studio, I mean), since feed-back effects take place not through the valve itself, but between coils or H.F. transformers in the circuits of different valves.

ONE UP TO US——

BEFORE he left for America I asked Dr. Robinson, the Stenode genius, to send me a line to say how his apparatus was performing in the extraordinarily difficult conditions which prevail in the United States. If the European broadcast band is overcrowded, stations positively jostle one another on the far side of the Pond. The number has been reduced since the early days of broadcasting, when it exceeded seven hundred, but it still runs into the five hundreds. There has been, too, an all-round increase in power, and America now has a large number of stations rated at 50 kilowatts. I was particularly keen to know how the Stenode fared, since, much as I like our American cousins, I know that I can never help indulging in a little quiet rejoicing when we take them down a peg. I mentioned some time ago that they were not at all satisfied with the quality of the super-selective sets which their own makers had turned out to meet present-day conditions of super power stations.

A GOOD TEST

IT was a distinct feather in the British cap that American manufacturers should have cabled Dr. Robinson to come across and help them. I have just had a line from Dr. Robinson, in which he tells me that the crowded condition of the American broadcast band has given him a heavenly opportunity of showing what his Stenode can do. The U.S.A. Government asked for one demonstration and then insisted upon another, and yet another, in order that a big number of experts could see and hear the thing at work. At the Chicago Wireless Exhibition the Stenode was *the* feature, and since then the big noises amongst American manufacturing firms have been buzzing round the Stenode like wasps round a honey-pot.

——AND ONE TO "THERMION"

AS you know, I have taken the greatest interest in the Stenode from the days of its infancy, and I have been more than impressed by the demonstrations that I have had of its marvellous selectivity and of its wonderful quality. I have handled Stenode receivers on a good many occasions during these demonstrations, but what I have long wanted to do is to have one in my own house and to discover exactly what it will do under normal reception conditions. The new broadcast model is just getting into production, and your "Thermion" placed an order for the very first set that could be delivered. I am hoping to have it within the next few days, and when it comes I am going to put it through its paces. You can rely upon receiving from me a completely impartial and unbiased report of what it will do and what it won't. If it is a good thing I shall tell you so, but, at the same time, if it fails to come up to expectations you will hear that as well. Mine happens to be a house where it can receive a very thorough testing. I am only fifteen miles from Brookmans Park, and if you make an ordinary receiving set selective enough to bring in, say, Barcelona without a trace of interference when the London Regional is working, there are very distinct and very unpleasant effects upon the quality. Whether the Stenode will effect such a separation and at the same time provide first-rate quality is a thing that I want to find out, and shall be able to do within the next few days. Anyhow, I will let you know.

NEXT WEEK:

A UNIQUE ONE-VALVE LOUD-SPEAKER SET!

THE BETTER WAY

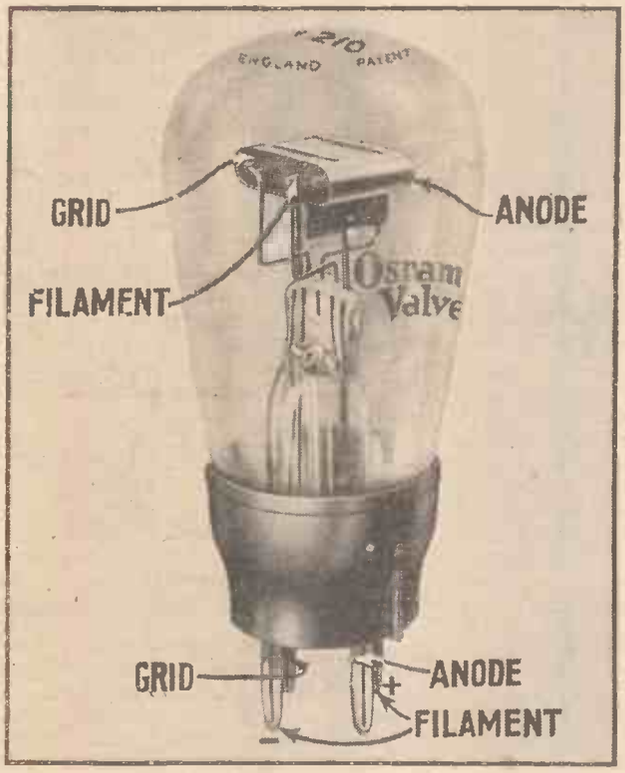
WHEN relays from theatres and music-halls were first suggested in this country there was a storm of opposition from theatrical circles. We were told that broadcasting would kill the theatre, since people could listen to performances in their own homes for about a farthing an hour instead of paying much more for seats in a theatre. Readers may remember that in those early days I took up quite a different standpoint, maintaining that, so far from killing the theatre, relays of plays and so on would help it enormously. My own experience was then, and still is, that if you hear a portion of a really good performance broadcast you thoroughly enjoy it at the moment and forthwith make a note to book a seat in order that you may go to see it. Business people know that there is nothing like the free sample for increasing the sales of a good article. Broadcasting provides the theatrical manager with the one and only means of giving the public free samples. The theatrical people over here have perhaps been a little slow to realise this, but they are coming round to the sane view of the position. Meantime, in Germany, broadcasting and the theatre are advancing hand in hand. A radio-theatre week is being arranged on every night of which extracts from popular theatrical performances are to be given. It is felt, and I am sure with good reason, that the effect will be two-fold. Inveterate wireless listeners will be attracted to the theatre, on the one hand, whilst, on the other, dyed-in-the-wool playgoers will make more use of their wireless sets. THERMION.

THE HOW AND WHY OF RADIO

IX—CHOOSING VALVES FOR BEST RESULTS

If you are a beginner in wireless, now is your chance to gain a clear conception of its theory and practice. In this series of articles, specially prepared for the beginner, no previous knowledge of wireless is assumed. Every aspect of the subject will be dealt with in ensuing issues, and the whole series will endow the beginner with sufficient knowledge to enable him to derive the greatest possible interest from the fascinating hobby of wireless

YOU will have to know just a little theory before choosing valves rightly. That little I will now tell, so that high-frequency, detector, low-frequency and power valves can be picked out with discrimination. Let us make a start with the characteristics common to all valves.



In this picture the elements of the ordinary valve are clearly depicted

The Filament

This specially coated length of wire between the anode and the grid of the valve has to be heated to a certain temperature before it will do its job, which is to emit electrons. The more electrons wanted, the greater the length or thickness of the filament. A long filament has a greater difference of potential across its ends than a short filament. And a thick filament passes more current than a thin filament.

In big valves the filament has to be heated at six volts, but most small valves need only two volts. To-day you can buy almost every type of valve with a 2-, 4-, or 6-volt filament. It has been found that, at 2 volts, the filament must pass not much less than .1 ampere, in order to emit enough electrons to work efficiently. For power valves, where current variations are so important, the filament has to be slightly thicker, the current passed is .15 ampere, .2 ampere, or .4 ampere for a 2-volt filament. For a 6-volt filament the current is usually .1 ampere or .25 ampere.

The substances of modern filaments are so well combined that you can get valves, for every set requirement, with 2-volt filaments. Only large power valves are precluded. The great convenience and low cost of a small filament battery of 2 volts should be remembered.

When the filament is heated with alternating current, usually at 4 volts, the actual current consumption of the filament is not important. The A.C. valves are much more efficient than those operated from batteries because of the greater filament electron emission.

The Anode

This has to be positively biased to attract the electrons from the filament. Usually the voltage required to do this is between 100 and 150 volts. In power valves of the larger type, a maximum anode voltage of 250 volts is common, and up to 400 volts can be applied to really big power valves.

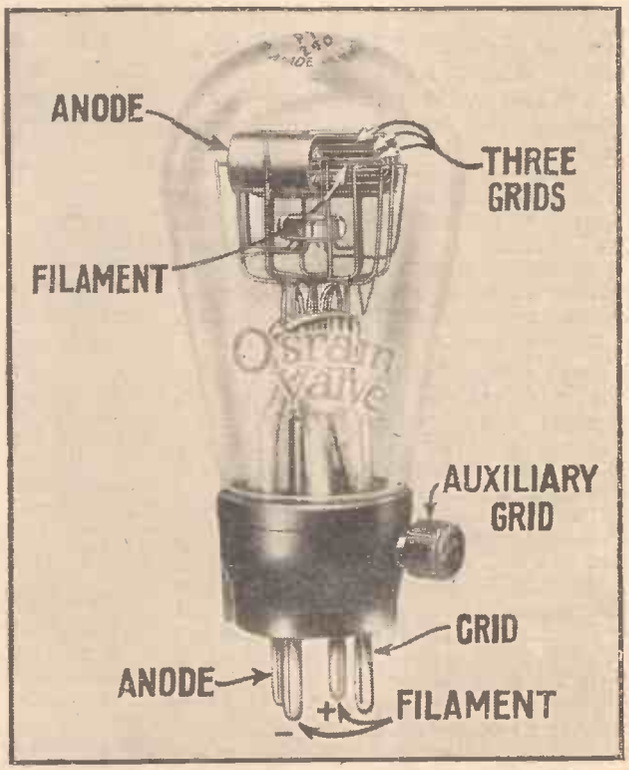
The Grid

This is a wire mesh between the filament and the anode. It controls the electron stream flowing from the filament to the anode. The grid is biased by so many volts negative for high-frequency amplification and low-frequency amplification, but in the usual detector arrangement the grid is biased positively. The grid of a low-frequency valve is quite critical in its bias. If under or over biased the grid will not be able to deal with the voltage applied to it and distortion will occur.

Filament, anode and grid determine the characteristic of the valve. They determine its impedance, which is the easiest index to a valve's function. We can divide all valves into high-, medium-, and low-impedance types. The average impedance values in each class are as follows: 35,000 ohms for high impedance, 15,000 ohms for medium impedance, and 5,000 ohms for low impedance.

Most high-frequency valves are in the high-impedance class, most detectors are in the medium-impedance class and all power valves, except pentodes, are in the low-impedance class. In the first two stages, high-frequency amplification and detection, the need is for voltage amplification, so the anode current does not have to be great, so the impedance need not be low But in the last stage the power output valve must cause current variations as

(*Continued at foot of next page*)



The pentode valve is of somewhat different construction, to the ordinary valve: note the extra terminal

NEXT WEEK: X—AMPLIFYING AT HIGH FREQUENCIES

SOME NOTES ON PRESENT-DAY SHORT-WAVE CONDITIONS

Around the Short-wave Dial

M. BARNETT

THERE is undoubtedly a great future for the short waves as far as the experimental side is concerned. New ideas, such as television, picture transmissions, etc., can all be tried out on the short waves, where at present they have plenty of room.

Whether or not television transmission will always be allowed on the ordinary broadcast band remains to be seen; it has already been banned in America, and I find that there are no fewer than thirty-four experimental short-wave television transmitters in the States. It still remains to be seen whether a number of television transmitters working close together on the broadcast band would produce mutual interference. Certainly, if the time ever comes when short-wave transmitters become so numerous that they have to be separated by only 10 kilocycles, we shall be in a sorry state. Some of the more powerful short-wavers, although they may tune very sharply on our present-day receivers, actually cover what would amount to a hundred or so kilocycles on the dial of the average short-wave receiver. Also, it does not look as though it is going to be altogether a nice job trying to produce a higher state of selectivity in the short-wave receiver.

High-frequency amplification does not appear to help much in this respect on the short waves, and it really seems as though some entirely new development with regard to H.F. amplification on the short waves will have to come along before we can make much more progress. Looking ahead, it certainly appears as though the short waves *will* become crowded, when we consider how the other wavebands have become filled and how the short wavebands themselves have filled so quickly during the last three or four years. The super-heterodyne method of reception seems as though it should be very useful on the short waves and some development in this direction may help to save the situation.

America seems to be making various efforts at developing a "plugless" short-wave receiver—so called because it does not utilise plug-in short-wave coils and will cover the whole of the short wavebands merely by the turn of a switch. Many different designs have been suggested, some rather humorous Heath Robinson affairs, whilst others appear quite practical.

One of the latter type takes the form of a combination of variable condensers and variometers and is claimed to have a range of 20 to 100 metres merely by turning two dials. One dial is used for ordinary tuning, whilst the other selects the wave range. Another method has a number of short-wave coils on a spindle which projects through the panel, with a control knob on the outside. As the spindle is turned, the coils engage with sets of sockets mounted on the baseboard. Thus, to change from one wave range to another it is only necessary to give the knob a short turn, which disconnects one set of coils and connects another. Yet another form of "plugless" tuner consists of a large solenoid short-wave coil with a number of turns capable of tuning up to the highest wavelength required. The turns are well separated and consist of bare wire. A circular metal ring controlled by a knob on the panel, makes contact with the bare wire and, as the knob is turned, travels farther down the coil, thus making contact with the desired amount of wire. One would imagine that this type of coil would have rather bad dead-end losses.

There do not appear to be any fresh activities to comment upon this week and conditions still remain very variable. It was at just about this time last year, if you remember, that the short waves started falling off somewhat. Perhaps they will oblige us now by coming back!

"CHOOSING VALVES FOR BEST RESULTS"

(*Continued from preceding page*)

large as possible, so the impedance must be kept down.

So far, we have not mentioned the amplification factor of the valve. This term is apt to be misleading if considered alone. The impedance of the valve should always be considered as well. In an amplifying valve it is most desirable to have as great an amplification factor as possible, but with as low an impedance as possible also.

Mutual Conductance

A much better index of a valve's capabilities in a set can be gained from a characteristic combining both amplification factor and impedance, namely, the mutual conductance. This is found by dividing the amplification factor by the impedance. A valve with an amplification factor of 20 and an impedance of 20,000 ohms would be twice as good as a valve with the same amplification factor but an impedance of 40,000 ohms. The first valve would have a mutual conductance of 1 and the second of only .5.

The mutual conductance of a valve is a measure of the control of the grid voltage over the anode current. The greater the mutual conductance the greater is the change in anode current for a given change in grid voltage. In fact, we can easily find the mutual conductance by dividing the change in anode current caused by a given change in grid volts.

The mutual conductance is often referred to as the "goodness factor" of the valve. It is certainly the best guide to the valve's performance. This applies to all valves, whether high-frequency, detector, low-frequency or power valves. The valve with the highest amplification factor for a given impedance should always be chosen.

Valve Selection and Couplings

The choice of any particular valve depends a great deal upon the coupling following it. Detectors vary a lot in impedance to suit the impedance of the following coupling. The theory is that to get the best results the impedance of the coupling after the valve must be at least twice as great as the impedance of the valve itself. In front of a resistance-capacity coupling the detector valve may have a high impedance, up to 50,000 ohms.

For very good transformers with high primary impedances, this impedance is quite safe, and is recommended where considerable amplification is wanted. For in a good valve a high impedance will mean a high amplification factor. For transformers with primaries limited to 1 or 2 milliamperes the use of a high-impedance valve is also preferable, since its impedance will limit the current to the required value. For most transformers a medium-impedance valve of 15,000 to 20,000 ohms is recommended.

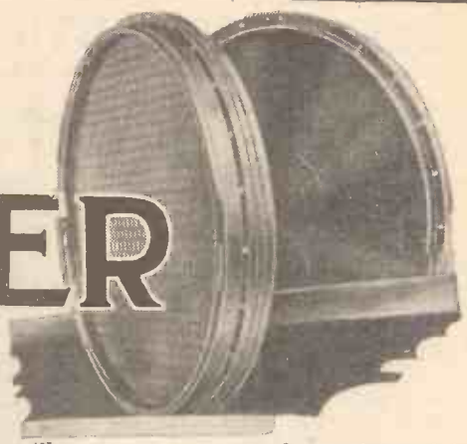
Power valves also vary greatly in impedance due to the different impedance requirements of the loud-speakers that follow. For moderate volume from a cone loud-speaker driven by a balanced-armature unit a power valve of between 3,000 and 5,000 ohms is suitable. The exact or even approximate matching of power valve to loud-speaker is not important if an output transformer is used. For then the primary of the transformer can be made to match the impedance of the valve and the secondary to match the loud-speaker. Pentode valves, which have three grids instead of one, have much higher impedances than loud-speakers, so a transformer output is desirable.

With high-frequency valves one usually designs the high-frequency transformer to match the impedance of the valve, which may be an ordinary three-electrode valve of moderate impedance or a screen-grid valve with an extremely high impedance. There is not so much scope for experiment in high-frequency valves as in the others, simply because there is usually one right one and no others.

Next Week:

A One-valve Loud-speaker Set

A SPEAKING CONDENSER



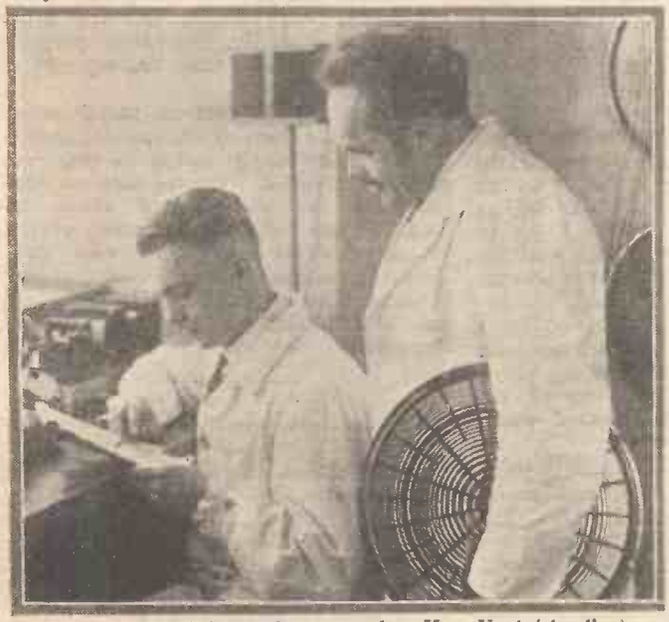
Hans Vogt's New Electrostatic Speaker

By DR. ALFRED GRADENWITZ

IT has long been known that there is more than one method of producing sound electrically. The usual way—the one so far almost exclusively used in connection with loud-speakers—is to produce variations of magnetism which, in turn, will set a membrane vibrating. However, there are many other ways, the "singing arc," for instance, which, about 20 years ago, was a favourite piece of apparatus in physical laboratories. Also, as far ago as in 1870-1880, it was suggested that variations of an electric field could be used for the production (or reproduction) of sound. Still, the first successful attempt to take up this suggestion was not made before 1922, when Hans Vogt, of Berlin, in connection with his first speaking films, demonstrated the achievements of his statophone, an electrostatic loud-speaker which, in spite of its undoubted advantages, ultimately failed to give actual satisfaction, the membrane being of insufficient strength and elasticity to produce a faithful reproduction of speech and music.

In an address delivered before the German Institute of Electrical Engineers, Mr. Vogt recently demonstrated a new type of electrostatic loud-speaker which seems to have overcome all former drawbacks. This "speaking condenser" mainly comprises an extremely thin membrane (0.015 millimetre in thickness and 400 millimetres in diameter) of a magnesium-aluminium alloy. This is stretched between two concave bakelite discs, the interior surface of which—*i.e.* the surface turned towards the membrane—is a conductor of electricity, which, however, is insulated from the membrane.

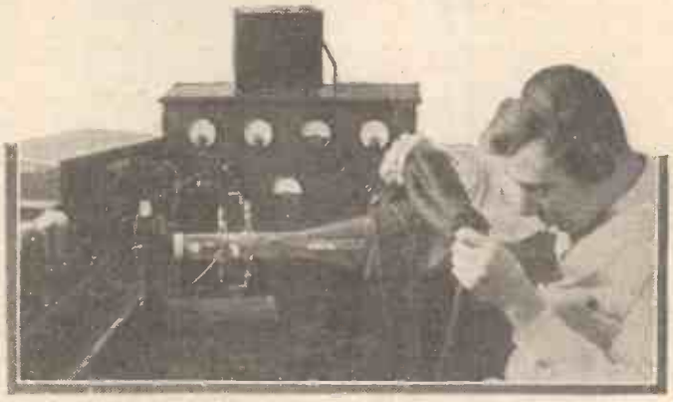
Each disc thus forms with the membrane a condenser, and as the membrane is alternately attracted and repelled by the metallised disc surfaces it is set vibrating in accordance with the original sound vibrations. In order to increase the efficiency of the speaker an electrostatic bias is applied. The fluctuating tensions corresponding to the transmitted speech or music are super-imposed upon the static-tensions by a step-up transformer, thus altering the electric field (field density about 20-50 KV per centimetre). The distances between the membrane and disc surfaces are variable in accordance with the output of the speaker, being in the case of a 3-watt apparatus about 0.4 millimetre at the edge and about 1.0 millimetre near the centre. A special varnish with a suitable dielectric constant is used for insulation purposes. Any resonance of the membrane is counteracted by a special shape of the static electrodes. Distortion is reduced to a minimum by simplicity of the arrangement, and the range of frequencies covered by the speaker is much larger than in the case of any magnetic or moving-coil loud-speaker.



The inventor of the condenser speaker, Hans Vogt (standing)

Good Quality Claimed

The inventor demonstrated the successive stages of development of his new speaker, showing the excellent acoustic qualities of the now perfected Oscilloplane, as it is termed. Simplicity of design, low weight and relative cheapness are features. The new speaker, it is expected, will open up a new and promising field in design.



Testing the performance of the Vogt electrostatic speaker

FOR AND AGAINST THE MAINS

VALVE for valve a mains-driven receiver gives longer reach and larger output than a similar circuit energised by batteries. This is due to the higher operating voltages and increased efficiency of the special valves used. On the other hand a battery-run set offers more scope for enterprise to the listener who likes to try out the effect of a new circuit. He can make changes from time to time without much difficulty. An all-mains set is practically a cast-iron affair in this respect. Once it has been assembled it must either "stay put" or be completely re-designed. B. A. R.

DIFFERENTIAL CONDENSERS

IN a differential condenser, a single bank of rotary vanes co-acts with two separate units or banks of fixed vanes. This type of condenser is particularly useful when used as a reaction control in the anode circuit of a detector valve, where it is desirable to maintain a permanent shunt capacity across the plate and filament. With the ordinary type of reaction condenser, this shunt capacity naturally disappears at zero setting. With a differential condenser the shunt capacity is at a maximum at zero reaction. As reaction is increased, the anode shunt capacity diminishes, but since this in itself increases the back-coupling effect, oscillation will set in long before the shunt capacity falls to zero. M. A. L.

SETS OF DISTINCTION

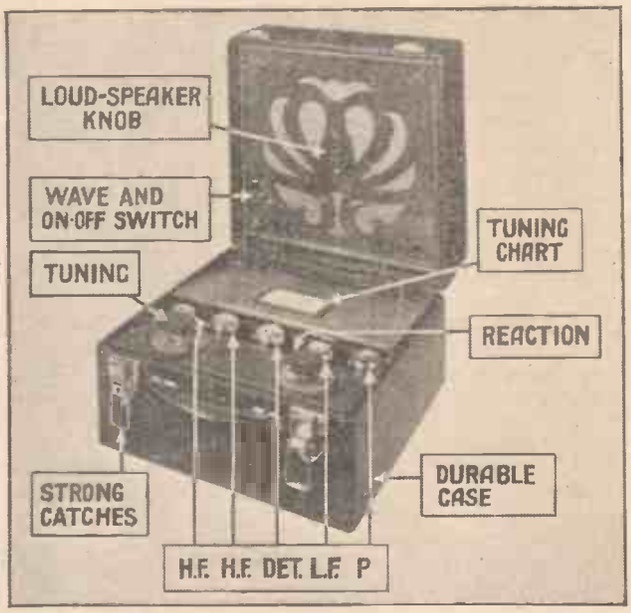
THE KONE-DOPE PORTABLE

Makers: Kone-Dope Company. **Price: 9 guineas.**

I HAVE just finished testing the smallest portable that has yet arrived in the laboratory. It is the Kone-Dope five valver, measuring 12 in. by 12 in. by 8 in. As I live five minutes' walk from the station, I was able to see whether the weight was too much for true portability. Without fatigue I arrived home, resolving that, whatever results might be obtained during tests, the real portability of the set should offset a great deal.

I frankly did not expect to get such good results as are here recorded. But, having got these results, I owe the makers my apologies for doubting that a 9-guinea, self-contained set could put up such a creditable show.

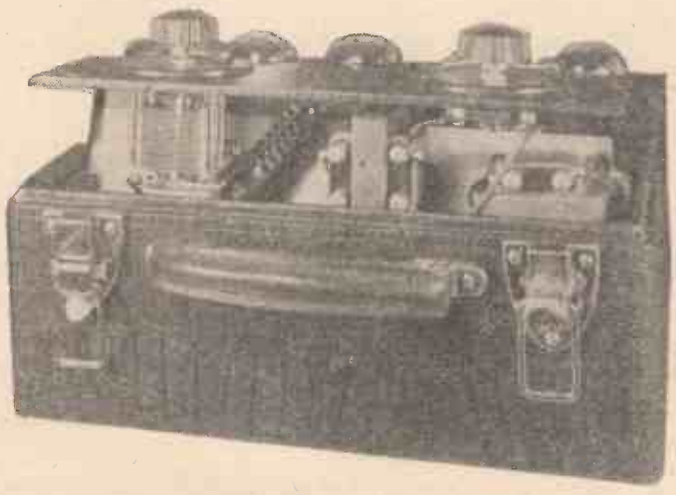
This five-valver takes a favourite portable form, an attaché-case with a blue fabric covering, most attractive and, I should think, very durable. The handle and catch fittings are robust, as they need to be in a portable, which is presumably carried about and often inadvertently knocked about.



The salient features of the Kone-Dope portable are shown in this picture

Inside the Case

Opening the lid, I found the usual disposition of components. The loud-speaker and frame-aerial for medium and long wavelengths are fitted in the lid behind a fret covered with silk gauze. A knob in the centre of the fret provides for the adjustment of the loud-speaker unit.



A picture of the body of the set with the chassis lifted

On the left is a three-position lever switch, pushed up for medium waves, set at the centre for the off position, and pulled down for long waves. Two sets of three leads come from the set to the loud-speaker and frame aerial connections in the lid. When opened, the lid rests firmly upon its hinges. I could see no weakness in these parts.

In the main part of the case is the five-valve set and the batteries. Over the section of the case nearest the handle is the cover of the five-valve set. Upon this are mounted slow-motion dials, of a particularly neat and attractive make, controlling tuning on the left and reaction on the right.

The five valves, two high-frequency amplifiers, detector and low-frequency amplifiers, are arranged in a line between the set and the battery compartment, which is protected with a lid carrying a tuning calibration scale.

Lifting this lid I found a 99-volt high tension battery, a 9-volt grid-bias battery and a small 2-volt accumulator. There are three high-tension-positive leads, H.T.+1 to 27 volts, H.T.+2 to 45 volts, and H.T.+3 to 99 volts. This splitting of the high-frequency, detector and low-frequency anode voltages is a perfectly legitimate way of saving anode current without too much loss of sensitivity.

I measured the total anode-current consumption by inserting a Ferranti meter in the high-tension negative lead. The needle of the meter flicked over to 8·5 milliamperes. So the high-tension battery, which I noted to be of British make, should last several months with ordinary use.

The accumulator is rather small, especially as the total filament-current consumption of the five Mullard valves is .6 ampere. Still, you cannot have a quart in a pint pot!

Now we come to actual results. When I say the results are very satisfactory, I am taking into full account two things about the set, its low price and its very small size. Here are some readings that will interest prospective buyers. Starting on the medium waves, London National was full strength at 44 and remained audible on either side of this tuning point up to the limits of 34 and 60. The London Regional station was full strength at 112 and remained audible down to 100 and up to 124. The Midland Regional was a full strength signal at 160.

These preliminary readings indicate the degree of sensitivity and selectivity. The strength of the Midland Regional proved the Kone-Dope portable to have a good service range from regional centres. The London station readings proved that, considering there are two untuned high-frequency stages in the set, it has an average degree of selectivity.

Wandering round the tuning dial, I had Lyons, 466 metres, at 156. This was quite strong and clear. Rome was the next at 148, exceptionally strong. Then Katowice was good at 132. Toulouse at 124 was very strong and just clear of the London Regional. I identified Madrid at 140, a fair loud-speaker signal. Paris PTT at 150 was strong enough to be pleasant. Milan at 166 was really good. Budapest at 177 was fair. From an evening's test I am inclined to think the Kone-Dope portable is most sensitive towards the top end of the tuning scale.

For most of the stations tuned in full use had to be made of the reaction, which operates very easily owing to the slow-motion dial fitted. On the long waves I identified five stations, of which the strongest was naturally Daventry, at 130. It caused slight interference with Eiffel Tower at 118 and Radio Paris at 144, both of which were very strong. Huizen at 157 and Kalundborg at 74 were medium strength.

The rebroadcasting of American programmes in South and Central America has created a demand for short-wave receiving sets.

Station KDKA, of Pittsburgh, has applied to the Federal Radio Commission for permission to invade foreign fields with American radio programmes via short-waves on a commercial basis.

PICK-UP POINTS

W. James Gives Some Good Hints That Will Enable You to Get Better Reproduction

THE output from different gramophone pick-ups may be from less than one-tenth of a volt to well over five volts. And there are, of course, the normal variations in the strength, whilst records are being played.

With such wide differences in the voltages generated by pick-ups, it is not surprising in the least that those not familiar with this point are not always able to account for the results. One has good results from a two-valve amplifier while another has too little output and is disappointed. Let us therefore look into the matter a little more closely.

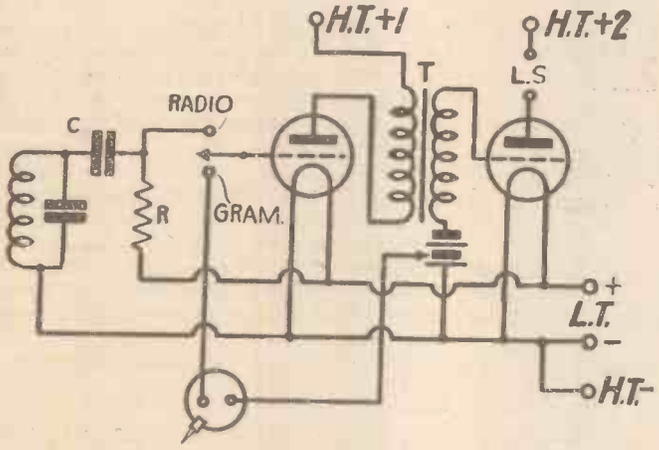


Fig. 1. Normal pick-up connections, with detector valve as amplifier

In the first place, most receivers have but a single low-frequency stage. The pick-up is normally connected to the grid of the valve which for radio is the detector. We change it from a detector into an ordinary amplifier, using a circuit which may be as Fig. 1.

Here the grid condenser C and leak R are joined to the grid of the first valve shown for radio. When the switch is operated, the grid condenser and leak are disconnected and the pick-up is joined between the grid of the valve and grid bias.

Note that the bias of the valve is changed when switching from the wireless to the pick-up. In one instance, the bias (positive) is that needed for good detection and in the other the bias is correct for normal amplification.

This first valve is probably of the medium impedance class, having, shall we say, an amplification factor of 15. In its anode circuit is a transformer T, having, as a rule, a ratio of 1 to 3, although it may be more, such as 6 or 7 to 1. It therefore follows that if we apply to the grid of the first valve a voltage of 1 from the pick-up, that the voltage set up across the secondary of the transformer approaches 45 for the 1 to 3 and 105 for the 1 to 7 transformer.

Now what value of grid bias is normally used on the grid of the second (power) valve? With battery valves used with a high tension of about 120, the bias may run to —15 volts. Often it is less, being —9 volts for many small power valves.

The voltage applied to the last valve ought not to exceed the value of the grid bias, or distortion through overloading will result. We therefore discover that, as the amplification when a 1 to 3 transformer is used amounts to 45 and the grid bias is, say, —15 volts, the value of the voltages applied to the grid of the first valve ought not to exceed ⅓ volt. This follows from simple arithmetic.

But our pick-ups may deliver anything from average values of .1 to 5 volts; too little in the first instance and far too much in the second. Obviously, then, with the pick-ups giving average voltages of less than one-third volt the output will be too little and the results will be unsatisfactory. Something must be done to raise the voltage applied to the power valve.

In the case of the more sensitive pick-ups, the output must be lowered. At the same time we have to bear in mind that some records are much louder than others and that the results are affected by the type of needle used. A good factor of safety is, therefore, needed.

We want always to be able to raise the strength a little if necessary, and, of course, to cut down the strength when too great.

With sensitive pick-ups, a volume control must be fitted as the output is normally too great. The output from a less sensitive pick-up, on the other hand, needs boosting up, but owing to the differences in records, needles and so on, it is still an essential that the volume be under control.

A volume control is thus needed in any case and it may take the form of a potentiometer. With a powerful pick-up all that is needed is a 100,000-ohm, approximately, potentiometer connected as in Fig. 2.

With the less sensitive pick-ups we must first strengthen the signals and when the amplifier of a set is being used, as is generally the case, we must arrange for the strengthening to be effected between the pick-up and the set itself.

There are two good ways, involving in one case, Fig. 3a, the use of a transformer, and in Fig. 3b, a tapped choke. The transformer may usually have a ratio of as high as 1 to 7 if of good make, or 1 to 3 for a cheap type. Tapped chokes are to be obtained and may be used, the best ratio being found by trial.

If a part has to be bought, then use a transformer, but the other method is shown as some may have parts by them, besides which, if the transformer is properly connected it functions as a tapped choke would.

A volume control may be added as

(*Continued at foot of next page*)

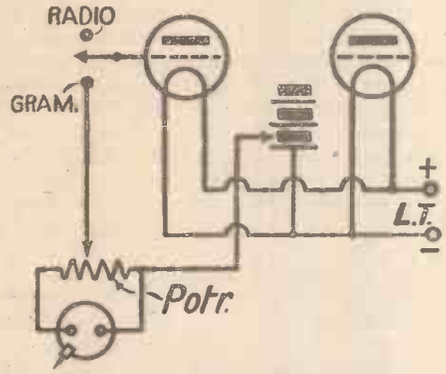


Fig. 2. A simple method of adding a volume control

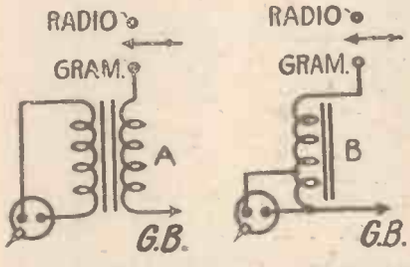


Fig. 3. (a) A transformer, and (b) a tapped choke circuit

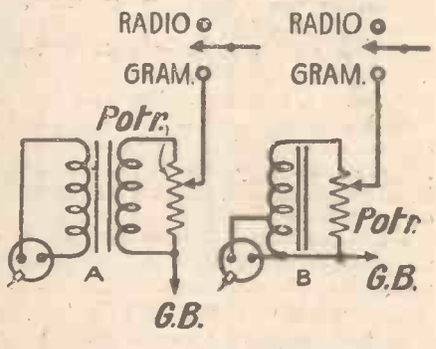


Fig. 4. Another system of connections for a volume control

THE B.B.C. and SHORT WAVES

This article by KENNETH ULLYETT is of particular interest in view of the proposed new Empire Station which will work on the short waves.

IN chatting with members of that fictitious personality, the "average" listener, I find that many have quite a muddled idea of what the B.B.C. does on the short waves. It is little to be wondered at, in view of this apathy and scant knowledge, that we get nowhere in short-wave Empire broadcasting, and that B.B.C. short-wave relays are no better or more reliable than they were in 1927.

On the one hand there is the below-100-metre reception which is done at the various B.B.C. listening posts in order to link up our transmissions for relays of American (and, occasionally, Continental) broadcasts. On the other hand there is the much discussed Empire broadcasting, which everyone seems agreed should be on the short waves.

World-wide Service

It does seem that so far as Empire broadcasts are concerned the goal is in sight, although there is a certain amount of over-enthusiasm about this which glosses over the fact that no one knows the extent of the listening public in the outposts of the Empire, nor the best way in which to arrange the transmissions.

It is no use setting up an ambitious "bigger brother" to 5SW (when sufficient money is forthcoming) only to find that there is not a sufficient number of listeners to justify the service. "Service" is the word which comes at once to one's lips in this connection, for the broadcasts to the Empire obviously must be on proper B.B.C. service lines, and not in the nature of an experiment.

I have discussed the matter with technical people who, unfortunately, are keener to see Empire broadcasting by the B.B.C. started because of the wonder of it from the technical point of view than from sheer utility.

Short-wave enthusiasts often point to the famous short-waver PCJ as an example of the way in which the B.B.C. should manage its short-wave transmissions. British listeners will need more proof than this.

I have been to PCJ, and while there is no doubt that (perhaps owing to a fortunate geographical situation) it covers the globe twice as efficiently as does 5SW, it does not give proper service to listeners in the Dutch East and West Indies. It works on only three days in the week, and although the announcer there vainly endeavours to make the broadcast worldwide, by announcing in English, French, German, Dutch and Spanish, I do not think even the heartiest supporters of PCJ will pretend that it gives a broadcast service in the sense that we know it.

It is not PCJ's job to do so, for the station is primarily the research transmitter of Philips; though, no doubt, Dutchmen in distant parts of the world get a certain amount of pleasure in listening to the transmissions at unearthly hours, and probably many Englishmen do so, too, and feel strongly that it should be 5SW doing the same job.

We hope that the B.B.C.'s new plans for Empire broadcasts come to a successful climax. Empire broadcasting is, in any case, a costly business and there is no room for experiment. If the B.B.C. is in doubt, it should not hesitate to get advice from PCJ, Huizen, and the dozens of American stations which have for three or four years been successfully carrying out the same sort of short-wave broadcasts that the B.B.C. needs for its Empire service.

It is a moot point whether the B.B.C. can afford to spend much in developing short-wave reception facilities at listening posts such as Tatsfield. It would be unwise for the B.B.C. not to have some reception facilities in this way in case of a National crisis, but not for ordinary broadcast work. During the winter, there will be a number of short-wave relays. It might be advisable for Mr. Noel Ashbridge to persuade those developing the inter-Continental telephones to link up with broadcasting.

Relays

Frankly, many of the B.B.C. American relays have not been a success during the past season, and listeners have made their own excuses for this sort of thing by saying: "Oh, well, you can't expect long distance short-wave rebroadcasts to be a success," despite the fact that these relays have often appeared as definite items in the programme.

Yet anyone can pick up the telephone and for the cost of a "fiver" or so be connected to a friend in America; and the G.P.O. never has to make apologies for "atmospheric conditions"—that stock excuse when the Tatsfield receivers are not working properly. The much maligned Rugby and Baldock do their work well. As with Empire broadcasting, the B.B.C. may find that it pays better to "follow my leader" and link up with those who have previously found success, rather than to set out on new ideas which may have a doubtful ending.

The short waves are *so* precarious.

"PICK-UP POINTS"

(*Continued from preceding page*)

indicated in Fig. 4, but the potentiometer should have a fairly high resistance, such as half a megohm or more or the output from the transformer or choke will be reduced.

The points I desire to bring out are, first, that, as pick-ups vary in sensitivity, it may be necessary to increase the voltages available, or to decrease them; and, second, that a volume control is essential for good results. These parts may be added externally to a set. When arranging a radio-gramophone set with a pick-up of a certain make the necessary parts can be included in the set.

A NEW SCOTTISH STUDIO

IT is hoped to make good use of the new Scottish studio. For some considerable time vaudeville has been conspicuous by its absence in the broadcast programmes originating in Scottish studios.

With the advent of the fine new studio in the new headquarters of broadcasting in Scotland, with its unique stage facilities and its generous accommodation for audiences, an attempt is to be made to revive this form of programme, using Scottish artistes.

Under the new conditions variety artistes who perform in this studio will be working under most stimulating conditions. Besides the familiar "stage" effect, with lighting and draping, they will have a visible audience. This revival will entail a renewed search for vaudeville talent in Scotland, and in a programme which is to be broadcast from Glasgow and Aberdeen at the end of the month, and prior to the actual opening of the B.B.C.'s new premises, several new artistes will be heard.

French radio fans report having picked up experimental tests by the new Trieste (Italy) broadcasting station on 248 metres.

A Weekly Programme Criticism—By SYDNEY A. MOSELEY.

Without Fear or Favour

EINSTEIN

THE QUEEN'S HALL CONCERTS

EINSTEIN'S broadcast was typically modest. He spoke not of his own work, but appealed in the cause of others. When praise was to be sung he sang of others—Shaw and Wells. A clear speaker, too.

◆ ◆ ◆

I saw and heard Einstein at the opening of the Berlin Radio Exhibition. He reads from manuscript, excellent from the listener's standpoint; but not so interesting, I fear, as he would be if he waved his arms about and spoke extempore!

◆ ◆ ◆

"Seats all sold" was the announcement at the second B.B.C. Symphony Concert at Queen's Hall. Yet there were vacant seats due to the thoughtlessness of those who were given invitation tickets and did not return them when they were unable to use them.

◆ ◆ ◆

I can understand the point of view of the correspondent who says he might with equal pleasure listen via wireless to a smaller orchestra. To him there is a good deal of "mush"; well, the orchestra, to those who can see as well as hear, has certainly justified itself, and now ranks as the best in the country. Good for you, Dr. Boult.

◆ ◆ ◆

Arthur Rubinstein banged at the piano as if he were striking a blacksmith's anvil. I thought the piano would not be able to stand it. But it appears that's how the piece should have been played!

◆ ◆ ◆

Oh, never let me forget to pay tribute to Bernard Shaw for one of his all too rare broadcast speeches. Please, G.B.S., read us another of your plays and we'll pay an extra licensing fee!

◆ ◆ ◆

Mrs. M. A. Hamilton was certainly not up to form in her talk, "The Month in the North Country." I don't know if she was talking merely from notes, but she sounded a wee bit ragged. On the other hand, Professor A. M. Carr-Saunders has a good broadcasting voice.

I don't know why Mr. A. Duff-Cooper spoke on "Modern Novels." What claims has he to the rôle of B.B.C literary critic?

◆ ◆ ◆

If the new policy of the B.B.C. is to vary its critics, well and good. But let us have experienced critics, please. And not only as regards literature, but plays, films, *and* gramophone records.

In this connection I would like to say that Mr. Christopher Stone has evoked considerable controversy of late. Some like him; some don't. No room to quote critics in detail; the main point is that he is said to *talk* too much.

◆ ◆ ◆

What is the true meaning of vaudeville? A correspondent, referring to the excellent programme which included Cicely Courtneidge and Norah Blaney, thinks that the violin solos of Alfred Rode, while meritorious, were out of place in such a programme.

◆ ◆ ◆

"Harold" writes: "Methinks that I have been missing something good. Until a few nights ago I had not had a proper opportunity of giving a very attentive ear to Henry R. Hall's Gleneagles Band. Now, having heard a full broadcast by it, I hasten to offer a meed of praise. It has a beautiful 'hot' style, without being blatant; its rhythm is a joy, and, moreover, it does not 'plug' the usual night-after-night tunes, but gives plenty of variety.

"The tone of the first saxophone is a revelation to those who sneer at this much-maligned instrument. But the best feature of this splendid band is that its members do not attempt to sing. The announcing, too, is done in English!"

◆ ◆ ◆

A baritone whom I have not heard before is Harold Deacon. He has a vigorous and easy style. I hope to hear him again.

◆ ◆ ◆

I sometimes doubt whether some of the announcers are quite happy as to their pronunciation. Were your ears particularly attuned one evening when a certain gentleman pronounced "golf" as "goff" and "goalf" almost in the same breath?

◆ ◆ ◆

There are, of course, the same differences of views with regard to television programmes as there are with regard to the B.B.C. programmes.

For instance, here is J.M.P., of Thornton Heath, writing that she so enjoyed a recent item that she felt she must write to tell me.

◆ ◆ ◆

Another—D.G.McC., of West Ealing—also writes praising the television programmes. She liked particularly the recent broadcast of Madame Weilart. "Her last song, Schumann's 'The Trout,' sounded exactly like Madame Gerhadt's singing of it," she writes.

Another reader, writing from the Hostel of St. Luke's, wanted to hear "My Heart Ever Faithful" again, as it was "perfectly delightful."

E.A.B., of Kingston-on-Thames, writes extolling a poem that was put over! "In conclusion I should like to add," writes this correspondent, "how we all enjoy your little concerts on Tuesday and Friday nights."

On the other hand, I still hear rumours from people who say that the programme is not toney enough. What do you think?

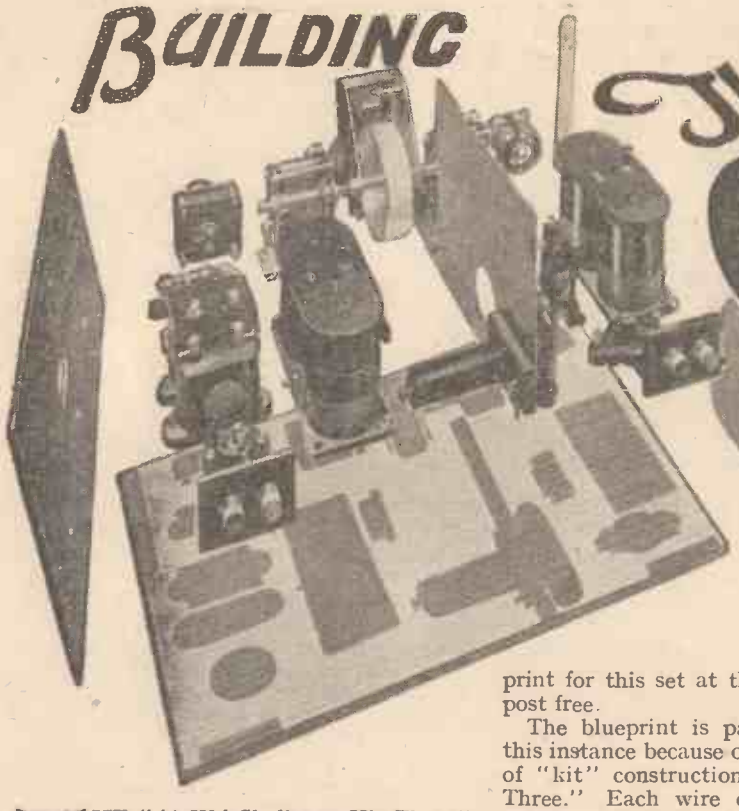
An Impression of Professor Granville Bantock

THE CRITICS

TELEVISION PROGRAMMES

P.T.T. Rennes (France) has suspended its transmissions pending a transfer of the new plant to Villeneuve.

BUILDING The CHALLE



A KIT SET

EASY TO BUILD : EFFICIEN

THE "'A.W.' Challenge Kit Three" is as easy to build as it is to operate, and those who read last week's preliminary details will know that the operation of this set, which on any evening should bring in twenty or thirty foreigners at loud-speaker strength, is thus as easy as that of a crystal set.

But first for the constructional work.

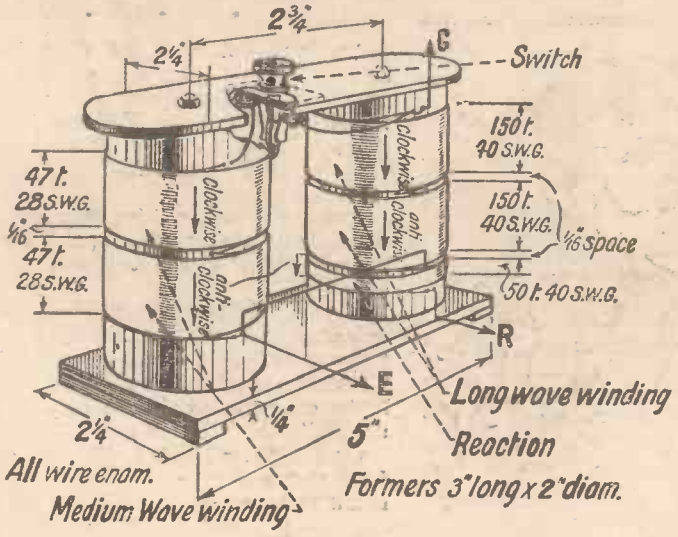
An accompanying panel shows the list of parts you will need, and a good general idea of the layout can be had from the photographs. If you prefer to work with a blueprint when building up a set, then you should get in touch with the "A.W." Blueprint Department, 58-61 Fetter Lane, London, E.C.4, who can supply a full-size print for this set at the small cost of 1s., post free.

The blueprint is particularly useful in this instance because of the special method of "kit" construction of the "Challenge Three." Each wire on the blueprint is numbered (this is normal "A.W." practice, for the numbers show the order of wiring), and these correspond with the numbers in the panel given last week, which shows the lengths of sleeving.

In this way you have only to cut the wire and insulated sleeving to the lengths shown and then put each one in place in the order given on the blueprint. This will obviate the possibility of leaving out any wire in the construction, or of making a wrong connection.

There are other jobs to be attended to before the wiring, however. First the panel must be drilled, unless it has been bought ready drilled. No difficulty attaches to the drilling and mounting of the volume control, filament switch, and reaction condenser, but a small aperture is needed for the window of the drum-control condenser.

This is best cut with a fretsaw, or by the rather more clumsy, but still quite effective, method of drilling a number of small holes along the side of the rectangle until the centre portion can be lightly tapped out.



The particulars given in this drawing are sufficient to enable constructors to build the coils

Assembly

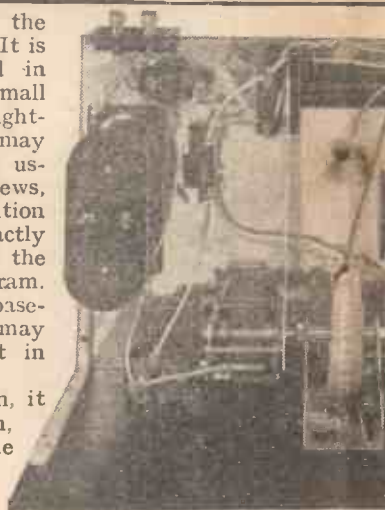
It is not advisable to mount any of the panel components until the panel has been attached to the baseboard, and, in any case, the drum-control condenser should not be mounted until a considerable part of the wiring has been done, as will be explained later.

When the panel is in position the screening (metal foil) may be fixed on the right-hand side of the baseboard. It is simply held in place with small nails. The right-angle screen may be mounted, using wood screws, and its position should be exactly as shown by the wiring diagram. The other baseboard parts may then be put in place.

The screen, it will be seen, acts as the support for the high-frequency choke, and

COMPONENTS REQUIRED FOR T

Cabinet (Clarion, Camco, Pickett).
Ebonite panel, 16 in. by 8 in. (Becol, Trelleborg).
Baseboard, 16 in. by 10 in. (Clarion, Camco, Pickett).
Two-gang .0005-mfd. condenser with drum dial (Lotus, Polar, Formo, J.B., Burton).
.0002-mfd. differential reaction condenser (J.B., Polar, Lotus).
120,000-ohm variable resistance (Regentstat, Igranic, Rotorohm, Lissen, Varley).
Piece of aluminium foil, 12½ in. by 10 in. (Parex, Readi-Rad, Wearite, Peto-Scott).
Screen, 7½ in. by 6 in. (Parex, Readi-Rad, Wearite, Peto-Scott).
Panel brackets (Bulgin, Readi-Rad, Camco, Keystone, Parex).
Pair of "Challenge" coils, aerial, anode with reaction (Tunewell, Atlas, Wearite, Readi-Rad, H. & B., Paroussi).
Universal valve holder (Parex).
Two valve holders (T W.B., Junit, Benjam Brownie, Wearite, Lisse
.0003-mfd. fixed conde T.C.C., Telsen, Dubili Farish, Watmel, Atlas).
.0002-mfd. fixed conde T.C.C., Telsen, Dubili Farish, Watmel, Atlas).
One megohm grid-leak (Lissen, Dubilier, G Bulgin).
15,000-ohm flexible (Bulgin).
2-mfd. fixed conden T.C.C., Dubilier, Igranic)
1-mfd. fixed conden T.C.C., Dubilier, Igranic)
Low-frequency transf "Hypermu," Lissen, Fer



The components in this plan view can layout diagram given

ENGE THREE

T IN USE

this screen has been purchased with a of parts for making this set, then it will ready drilled and, of course, the hole the screen-grid valve will also be cut.

HE "CHALLENGE THREE"

(Junit, W.B.,	Lewcos, Telsen, Igranic, Lotus, Burton, British General).
elsen, Lotus, in, Burton,).	High-frequency choke (Lewcos, Readi-Rad, Telsen, Lissen, Watmel Tunewell, Sovereign, Igranic).
nser (Lissen, r, Graham-	Filament switch (Readi-Rad, Bulgin Benjamin).
nser (Lissen, r, Graham-	Pre-set aerial condenser, .00015 mfd max. capacity (Igranic, Formo, Sovereign).
and holder raham-Farish	Two terminal blocks (Junit, Belling-Lee, Lissen).
resistance	Four terminals marked; Aerial, Earth, L.S.+, L.S.— (Belling-Lee Clix, Eelex, Igranic).
ser (Lissen,	Twelve feet of 20 s.w.g. tinned copper connecting wire (Lewcos).
ser (Lissen,	Five lengths of insulated sleeving.
ormer (R. I. ranti. Varley,	Five wander plugs, marked: H.T.—, H.T.+1, H.T.+2, G.B.+, G.B.— (Belling-Lee, Igranic, Clix).
	Two spade tags, marked: L.T.+, L.T.— (Belling-Lee, Clix, Eelex).

readily be identified in the last week

The correct position for the high-frequency valve holder should be found when a valve is in the socket, otherwise there is a possibility of the valve not clearing the hole in the screen properly.

The two coils can be screwed down to the baseboard, and the detector and low-frequency stage components can also be mounted. The correct positions for all these parts can be obtained from the blueprint.

If the full-size blueprint is being used, then it is an easy matter to use this as a mounting template. If the small-scale reproduction is used, then the mounting centres will have to be measured.

It will be seen that if the drum-control condenser is mounted at this stage it will be difficult to make connection to the filament switch, which is beneath the drum.

The Coils

The coils can be purchased ready wound or, if desired, you can wind them yourself. Full winding details are given in an accompanying diagram.

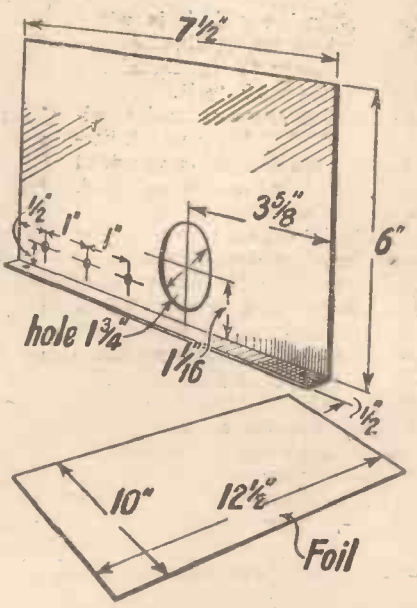
The formers consist of six tubes of bakelite or paxolin, 2 in. in diameter and 3 in. long. The tops and bottoms of the coils consist of pieces of ebonite, 5 in. long by 2¼ in. wide. The medium-wave windings are of No. 28 enamelled wire, and there are 47 turns in each half, with a ⅛-in. space between. Small holes should be made at the beginning and ending of each winding, and the wire can be threaded through these to make a neat finish.

Start winding the medium-wave coils ⅜ in. from the end of one tube, and when 47 turns have been wound on, finish the winding through two holes and leave a convenient length for connection. The second half of the coil can be made in the same way, and it should be noted that the two sections are wound in opposite directions.

The long-wave windings are of No. 40 enamelled wire, and it is rather important to wind each alike. Take particular notice of the reaction winding on one coil, of No. 40 enamelled wire. The position of the windings, spacing, and the arrangement of the formers can be seen quite clearly in the accompanying diagram. For neatness the coils should be finished with small feet below the lower 5-in. by 2¼-in strips, and these should be small strips of ebonite. The aerial coil is the same as the anode coil, except that no reaction winding is needed.

Wiring

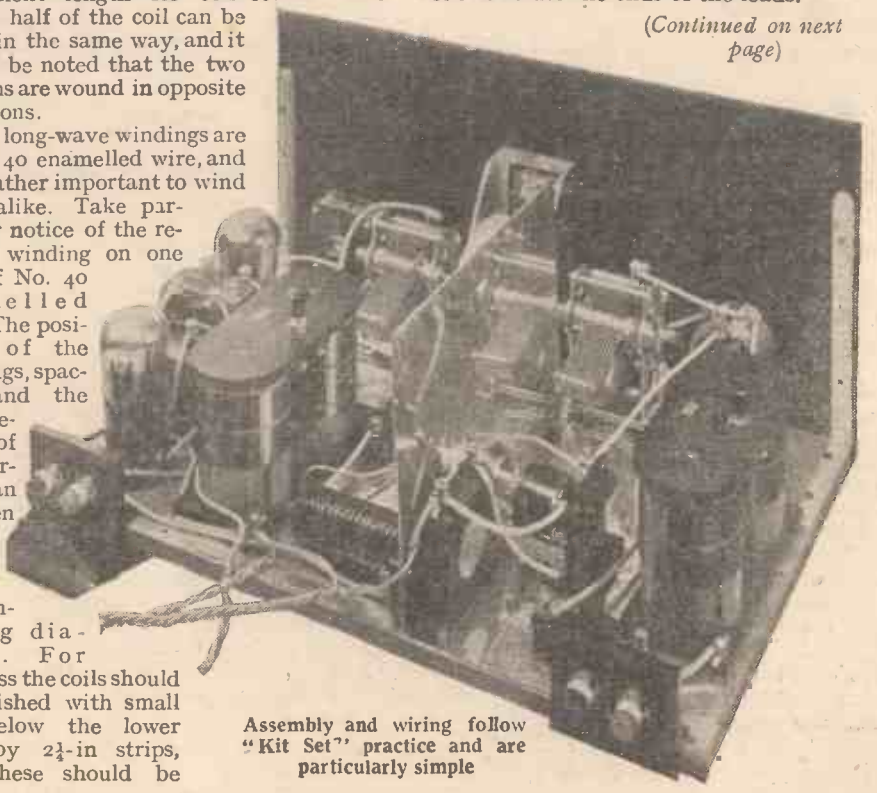
When completé, the coils should be mounted as shown, and the general wiring of the set may then be proceeded with.



Here are the details of the screening

It is recommended that the leads be covered with insulated sleeving, and that the point-to-point system of connection should be followed, for there is then no need to solder the ends of the leads.

(*Continued on next page*)



Assembly and wiring follow "Kit Set" practice and are particularly simple

BUILDING THE "'A.W.' CHALLENGE KIT THREE"

The lengths of wires given in the panel last week apply, of course, only to leads for the point-to-point system. If square-corner wiring is adopted, the lengths will naturally be considerably different. Flex is used for the battery connections for high-tension, low-tension, and grid bias, and these leads should be twisted in these three groups.

When the low-tension switch is wired up, then the drum-control condenser may be screwed down firmly to the metal foil base, and connections made to it.

With the standard drum control specified there is a small pilot lamp which illuminates the dial. No switch is provided for this, and its use is, of course, optional.

Make sure that no components which are not meant to be earthed accidentally make electrical contact to the screen or to the foil base, and, on the other hand, you should make certain that parts which are meant to be earthed (the feet of the drum-control condenser, for instance) make good contact with the metal screening.

It is advisable to check over the connections, using the blueprint as a guide, to make sure that no wires are accidentally omitted or any wrong connections made.

Naturally, the measure of satisfaction obtained from this new "Challenge" set depends largely on the valves, batteries, and aerial system selected to work with it.

Suitable Valves

So far as valves are concerned, the screen-grid valve should be of a type equivalent to the following two-volters, although it is, of course, not necessary to use two-volt valves. The four- or six-volt equivalents may be used: Cossor 220SG, Marconi S215, Osram S215, Six-Sixty 215SG, Mullard PM12, Mazda 215SG, Lissen SG215.

The detector valve should be chosen from the following: (Two-volts), Cossor 210HF, Dario Univ., Marconi HL210, Osram HL210, Six-Sixty 210HF, Mullard PM2DX, Mazda HL210, Lissen HL210 (four-volts), Mullard PM3, Six-Sixty 4075HF, Osram HL410, Marconi HL410, Dario Univ., Cossor 410HF (six-volts), Cossor 610HF, Marconi HL610, Osram HL610, Mullard PM5X, Mazda HL607.

The type of power valve to use depends partly on the amount of volume you need, and upon the high-tension current available. The following power valves do not consume an excessive high-tension current and will be suitable for most ordinary purposes: (Two volts), Cossor 220P, Dario SP, Marconi P2, Osram P2, Six-Sixty 220P, Mullard PM2, Mazda P220A, Lissen P220 (four volts), Cossor 410P, Dario SP, Marconi P410, Osram P410, Six-Sixty 410P, Mullard PM4 (six volts), Cossor 610P, Marconi P610, Osram P610, Six-Sixty 610P, Mullard PM6.

Current Supply

There is no objection to raising the high-tension and grid-bias voltages, and using a power valve of an even larger type if necessary. It all depends on the amount of high-tension available.

If dry batteries have to be used, then the medium- or super-capacity types should be chosen, as it will be practically impossible to get good results even for a short while with small-capacity batteries. A mains unit, if used, should be capable of delivering about 20 milliamperes.

A good earth is advisable because it "anchors" the set and makes it stable to work. An efficient aerial is also an advantage, although there is no need to have a very long wire, for long aerials are naturally unselective.

The pulling power of the screen-grid valve in this new "Challenge" is amazing, and will come as a surprise to those who have for a long time put up with the performance of inferior sets.

Let us know what results you get. Other readers will be interested to read your reception logs.

FINE RESULTS WITH THE "CHALLENGE THREE"

ONE-KNOB control makes this set so easy to adjust that within the first half-hour of working no difficulty should be experienced in getting a good "bag" of foreigners.

In order to make quite sure of efficient tuning, the high-frequency and aerial circuits must be properly ganged. With the "Challenge Three" this is a very simple job.

Ganging the Circuits

First, the two sections of the ganged condenser should be freed and the drum control turned to zero. The sections of the condenser should then be adjusted by hand so that both the sets of vanes are fully apart. The grub screw may then be tightened, linking the halves. This results in the sections working exactly step by step, and if the coils are carefully wound (or have been bought ready made, when they will have been balanced on test), then the tuning will be approximately ganged.

Account must be made, however, for the additional capacity and inductance caused by the aerial. When the aerial is disconnected both the high-frequency and aerial circuits should be properly matched, but with the connection of the aerial extra "weight" is added to the aerial circuit and this may put the ganging out of step.

Adjustment to counteract this is made by means of the .00015 maximum pre-set condenser. This will be made clear by means of a concrete example.

At the AMATEUR WIRELESS laboratory in Fetter Lane the London National was received at 45 degrees on the dial, the Regional at 115 degrees, and the Midland Regional at 164 degrees.

When the condensers had been set to work in step, the Midland Regional was tuned in and it was found that over a certain part of its range, slacking off the pre-set condenser did not decrease signal strength, as is usually the case. On the other hand a certain adjustment of this increased the volume because it brought the aerial and high-frequency circuits into step.

It was then found that the London National and Regional stations were received at full volume and that foreigners could be brought in merely with a twist of the tuning control and without careful adjustment of reaction.

Among the chief foreign stations which were received within the first ten minutes of working, were Langenberg on 473 metres, Rome, 441 metres; Kattowice, 408 metres; Toulouse, 385 metres; Goteborg, 322 metres; Bordeaux, 304 metres; Horby, 257 metres; and Barcelona, 268 metres.

As a guide to reception on the long waves, Daventry 5XX came in at 160 degrees on the dial and Radio Paris at 172 degrees. Huizen was received on 176 degrees, and Eiffel Tower on 145 degrees. There was no mutual interference.

The differential reaction control incorporated gives a very smooth control of oscillation.

Certainly nothing could be easier to control than this latest edition to the "Challenge" series, and when you become accustomed to the working of the one-knob control you should have no difficulty, given a tolerably efficient aerial, and using the valves and batteries specified, in getting a good reception log of well over 20 stations at proper speaker strength.

AERIALS AND THE LAW

A NOTTINGHAM listener was fined recently for operating a wireless set without a licence. Only one aerial was used to supply two sets belonging to different tenants in the same house. In these circumstances the defendant pleaded that the licence held by the other tenant ought to be sufficient. However, the magistrate thought differently, and imposed a fine of five shillings. This appears to be settled law, but on the other hand there seems to be no objection to the sole owner or tenant of a house erecting two separate aerials, one in the back and the other in the front garden, if he so wishes, on the basis of a single receiving licence. M. B.

WE TEST FOR YOU

A weekly review of new components and tests of apparatus.

Conducted by our Technical Editor, J. H. REYNER, B.Sc., A.M.I.E.E.

The Insulated Insulator

UNDER good conditions an aerial insulator of the simplest and most inexpensive type is quite suitable for preventing leakage from the aerial. Unfortunately moisture and soot deposited on the surface of an insulator decreases its resistance, unless special precautions are taken.

In the Insulated Insulator, made by T. R. P. Williams, of Netherend, Cradley, Birmingham, an attempt is made to overcome leakage by providing an insulator of exceptional length. The space between the reels is protected by a cylindrical glass cover with rubber fitting porcelain end pieces to prevent the ingress of moisture. For leakage to occur it would be necessary for the moisture or soot to extend from the centre of one reel, along the glass cylinder to the centre of the other reel, which is unlikely to happen under normal conditions.

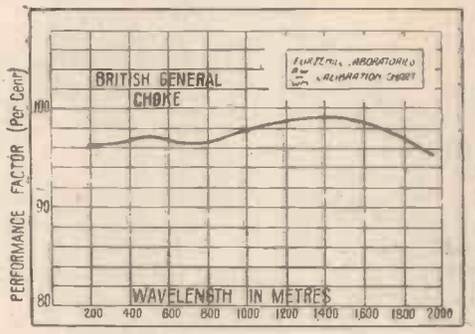
A novel insulator made by T. R. P. Williams

British General Choke

THE performance of H.F. chokes is now understood considerably more than a year or two ago. At the lower wavelengths a choke acts to all intents and purposes as a capacity. The lower this capacity, the more efficient is the high-frequency impedence of these wavelengths. At the higher wavelengths the combination of inductance and capacity is of importance, until one comes to the natural resonance of the choke, above which the efficiency falls off.

In the British General choke, which has been tested this week in our laboratories, particular care has been taken to balance the constants of the winding, so that a uniform characteristic is obtained over frequencies varying from below 100 metres up to 2,000 metres. The winding is placed in twelve air-spaced slots, cut in an exceptionally low-loss fibre former. This is finally housed in a neat brown moulded case, the end of the windings being taken to two terminals on the base.

The characteristics reproduced on this page, and taken with special apparatus in our laboratories, show that a high standard of efficiency is maintained throughout the broadcasting range of wavelength. The



The performance curve of the British General choke

performance factor is the proportion of current shunted by a .0001 bypass condenser in preference to passing through the choke. With a perfect choke this figure would be 100 per cent. whereas a practical choke gives a figure varying between 80 and 100 per cent.

It is our experience that a choke maintaining a figure above 95 per cent. throughout the range is exceptionally efficient and it will be seen that the British General choke complies with this condition. This component costs 5s. 6d. and may be recommended for general use.

The British General high-frequency choke

Pifco Test Meter

A UNIVERSAL test meter is one of those instruments which no serious electrical engineer can afford to be without, for it reduces the location of faults to a science rather than a tedious groping in the dark. Although accuracy in calibration may be of importance to the engineer, it is not so necessary to the amateur who merely wishes to check the voltages and currents of his set.

A meter known as the Pifco "All-in-one" Radiometer, has been submitted to us for test. Selling at a price of only 12s. 6d. this instrument reads high tension up to 160 volts, low tension up to 8 volts, and current consumption up to 40 milliamps. A small cell is included inside the meter, enabling it to be used without any auxiliary apparatus for testing circuits.

One has merely to connect up the two flexible leads to the meter and the other ends to the portion of the circuit to be tested. A reading will indicate that the circuit is complete, even if it happens to be the primary of a low-frequency transformer having a resistance up to 2,000 ohms. For

A useful test meter—the Pifco

testing the filament of a valve, provision has been made for plugging the valve directly into the back of the meter.

As regards technical details, the meter is of the moving iron variety, and has a resistance of 25 ohms per volt. When testing the voltage of a 100-volt battery, the consumption will be 40 milliamps, and the meter should, therefore, not be left in circuit. This precaution does not apply when measuring anode current.

Tests carried out in our laboratories showed the accuracy of the high-tension range to be within 2 per cent.; the low-tension range 7 per cent. and the milliameter range 4 per cent. As an inexpensive and practical instrument, it may be recommended to readers.

The Radio Corporation of America recently transferred its licences to operate visual broadcasting to the National Broadcasting Company.

USE READY RADIO APPROVED KITS FOR EVERY CIRCUIT

TROUBLE-FREE SET BUILDING

USE READY RADIO APPROVED NON-SOLDERING KITS ONLY

USE JIFFILINKS FOR WIRING UP

IMMEDIATE DISPATCH

CASH OR EASY PAYMENTS

"CHALLENGE THREE"

	£ s. d.
1 Permcol ebonite panel 16"x8"x3/16"	6 0
1 Hand polished cabinet with baseboard	1 5 0
1 J.B. two gang condenser, ·0005 mfd. condenser with drum-dial	1 6 6
1 J.B. ·0002 differential reaction condenser	4 0
1 Regentstat 120,000 ohm type "A"	9 6
3 Valves as specified by Mullard or Cossor	1 19 0
1 Screen 7½"x6" and aluminium foil 12½"x10"	4 0
1 Pr. Readi-Rad panel brackets	10
1 Set Challenge coils (aerial and anode with reaction)	1 1 0
1 W.B. Universal valve holder	1 3
2 W.B. sprung type valve holders	2 6
1 Readi-Rad ·0003 fixed condenser	10
1 Readi-Rad ·0002 fixed condenser	10
1 Readi-Rad 1 meg. grid leak and holder	1 4
1 T.C.C. 2 mfd. condenser	3 10
1 T.C.C. 1 mfd.	2 10
1 R.I. Hypermu L.F. transformer	1 1 0
1 Readi-Rad H.F. choke	4 6
1 Readi-Rad filament switch	10
1 Formodenser, type F	1 6
2 Junit terminal blocks	1 8
4 Belling-Lee terminals "B"	2 0
1 Set Readi-Rad Jiffilinx	2 6
1 15,000 ohm Spaghetti resistance. 5 Wander plugs H.T.–, H.T.+1, H.T.+2, G.B.+, G.B.–. 2 Spade tags, wire, flex, screws, etc.	2 6

TOTAL (including Valves and Cabinet) £9 : 5 : 9

ANY OF THE ABOVE COMPONENTS CAN BE SUPPLIED SEPARATELY, IF DESIRED

KIT A less valves and cabinet **£6 : 1 : 9**
or 12 equal monthly payments of 11/3

KIT B with valves less cabinet **£8 : 0 : 9**
or 12 equal monthly payments of 14/9

KIT C with valves and cabinet **£9 : 5 : 9**
or 12 equal monthly payments of 17/-

RECOMMENDED ACCESSORIES

	£ s. d.
2 Fuller 60-v. H.T. batteries, super capacity	1 7 0
1 Fuller 2-v. 30-amp. L.T. accumulator	11 0
1 Fuller 9-v. grid bias battery	1 6
1 Amplion cone loudspeaker	1 19 6

"CHALLENGE FOUR"

KIT A less valves and cabinet **£8 : 6 : 9**
or 12 equal monthly payments of 15/3

KIT B with valves less cabinet **£11 : 5 : 9**
or 12 equal monthly payments of 20/9

KIT C with valves and cabinet **£12 : 18 : 3**
or 12 equal monthly payments of 23/9

TO OVERSEAS CUSTOMERS. Your goods are very carefully packed for export and insured, all charges forward.

TO INLAND CUSTOMERS. Your goods are dispatched post free or carriage paid.

Ready Radio

159, BOROUGH HIGH STREET, LONDON BRIDGE, S.E.1.

Telephone: Hop 5555 (Private Exchange). Telegrams: READIRAD, SEDIST.

Advt. of READY RADIO (R.R. LTD.), 159, Borough High Street, London, S.E.1.

THIS DOUBLE-HUMP BUSINESS

By J. H. REYNER, B.Sc., A.M.I.E.E.

I HAVE received quite a number of letters from correspondents on the subject of Ohmic-coupling, and its relative advantages or disadvantages compared with the more usual form of coupled circuit. A little confusion appears to have been caused by the statement made in previous articles that no double hump was obtained with the Ohmic-coupled system, and the question which has arisen is whether the system is a band-pass filter or not.

This depends upon the definition of the word band-pass filter. In recent months the term has come to be applied more particularly to those forms of coupled

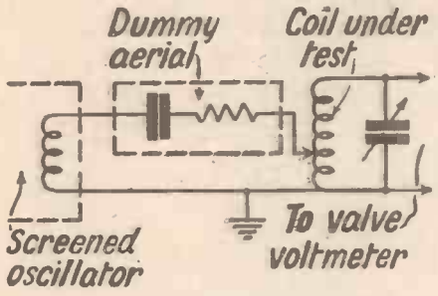


Fig. 1. The circuit used for test

circuit in which a doubled-humped tuning curve is obtained. There is no reason why this should be so, however, and in point of fact, any coupled circuit will tend to give a band-pass action. To avoid any confusion, however, I propose to refer to the Ohmic-coupled system as a coupled circuit, and my contention is that this arrangement gives more nearly what is required under practical conditions.

I shall not have space in the present article to discuss the difference between the two arrangements on theoretical grounds. The fact remains that if the common impedance used to couple the two circuits together is either an inductance or a capacity, the system has two tuning points and by arranging these to occur quite close together, one can obtain a resonance curve with a somewhat flattened top, obtaining at the same time an increased selectivity. If the coupling impedance is a resistance, a double hump is not obtained, but there is still a flattening of the top of the resonance curve and the selectivity is also increased to a marked extent. In order to demonstrate the exact effect a series of curves has been taken which is reproduced herewith.

The first set of curves was obtained with a simple tuning coil. The circuit employed in taking these curves was of an essentially practical form (Fig. 1). The voltage was induced from a high-frequency oscillator into an artificial aerial system, and this was coupled to the coil under test. The voltage across the coil was measured with a valve voltmeter, and the resonance curves obtained at three wavelengths are plotted in Fig. 2. The curves are somewhat broadly tuned, the sensitivity falling off as the wavelength is increased.

The next stage in the proceedings was the building of a band-pass filter, using another coil identical with the first coil, and connecting it with the circuit shown in Fig. 3, to form the usual capacity-coupled filter. The capacity of the coupling condenser was chosen as .015 microfarad, this being the value which calculation shows to be the most suitable for the broadcast band. The same test was then applied to this arrangement, the artificial aerial being connected to the first circuit, using exactly the same tapping as before. The voltage developed across the second circuit was then measured and is plotted in Fig. 4.

Increase in Selectivity

The first point that strikes one about these curves is the increase in selectivity, the cut-off being much sharper away from the resonant point. The next point is that the middle curve of the three is a very pleasant tuning curve. It contains a more or less flat top and steep sides, which is the ideal for tuning purposes. Indeed, if one could obtain a curve like this over the whole range, this band-pass filter would be excellent. When one examines the behaviour at the two ends of the scale, however, it will be seen that there is a departure from this ideal condition. At 300 metres there is little sign of the flat-top effect. We have a simple resonance curve, distinctly sharper than that for the single coil alone, but that is all.

At 600 metres on the other hand, we have a very pronounced double hump, and these two humps are something like 12 kilocycles apart. Now this means several degrees on the condenser scale, and the effect is thus that the station tunes in two places. It is not easy—indeed, it is often not possible—to tune to the middle point of the dip, and there is a distinct danger of tuning to one or other of the two humps.

This is especially the case if one uses reaction, for there is a tendency to tune to one of the humps and to accentuate this hump by reaction, so that we lose the flat-topped resonant curve altogether, and in its place we have a circuit which tunes in a peculiar and often bewildering manner. This, to my mind, is the principal objection to the band-pass filter in its present form, and it was this effect which lead me to experiment with the Ohmic-coupled system.

One may remark in passing that the sensitivity is more nearly constant with the band-pass arrangement, tending to increase somewhat at the top of the scale. This is a peculiar property of the capacity-coupled filter, and is undoubtedly of value. As will be seen, however, this same constancy is retained with the Ohmic-coupled system.

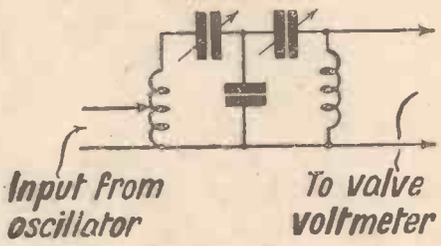


Fig. 3. Capacity-coupled filter circuit

The final test was to insert a resistance of 15 ohms in place of the coupling condenser in Fig. 3. This value of 15 ohms was chosen to give an impedance equivalent in value, at 450 metres, to the .015 condenser. A high-frequency resistance was used for the purpose so that its H.F value was the same as the D.C. resistance. The curves obtained for this circuit are shown in Fig. 5, and the advantages of the system can be appraised from this figure. It will be seen that in every case the resonant curve is distinctly sharper than that of a single coil. Indeed, it is sharper, taken throughout, than the corresponding capacity-coupled filter. At the same time there is a very distinct flat-topped character to the curves, and the sensitivity is more or less the same over the whole wavelength range.

The sensitivity of both the capacity-coupled and the Ohmic-coupled arrangements is distinctly less than that of a single

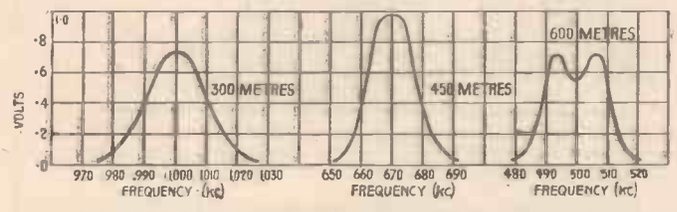


Fig. 2. Resonance curves obtained with a single coil

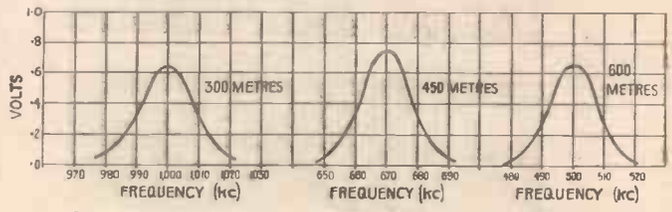


Fig. 4. Curves obtained with capacity-coupled filter

coil, if one uses the same aerial coupling throughout. In practice, it is desirable to increase the aerial coupling slightly when using a band-pass filter or coupled circuit. This reduces the selectivity by a small amount, but brings the strength up to a value more commensurate with that obtaining with a single circuit.

These figures will serve to illustrate why I

(*Continued at foot of page 760*)

The Science Museum Receiver

SIR,—Apropos the recent article in "A.W." *re* the Science Museum receiver it may interest your readers to know what results are actually obtained on same.

At present there is some trifling technical hitch which prevents satisfactory reception of the National programme on 261.3 metres without interference and the demonstrations are being given on the Regional programme. The attendants show a marked reluctance to utilise more than a fraction of the available output of the receiver, and with the volume cut down the upper register would appear to predominate. With increased volume the result is more realistic, but the general opinion is that the volume is too great for the room in which the set is installed.

I beg leave to suggest that this room could be better served with two or three moving-coil speakers of the cone type which, although not giving such a good response curve as the 27-ft. exponential horn type, could be run at a normal volume and give a better general effect. The impression one gets with the reduced volume on the horn type is distinctly unsatisfying.

The present demonstration set is a very meritorious achievement, but until it is housed in a hall large enough to permit working the speaker up to its capacity, it is rather wasted.

G. B. S. (London, W.).

"Do Readers Agree?"

SIR,—Referring to the above paragraph in October 25 issue, here is one reader who surely does not accept the latter part at least. in where you claim the 250-ft. trailer which was used as the aerial saved the flight at one period!

Obviously the trailer would not remain suspended below the 'plane whilst in flight, but even allowing that phenomenon to take place can you enlighten me as to why signals ceased when the aerial touched the water?

Three weeks ago I crossed the Atlantic in a steamer from Boston to Liverpool and received loud-speaker results each night on my five-valve "Radiola" set. The aerial I employed was a 200-ft. length of insulated cable leading through a port-hole and trailing *in the sea* astern of the ship.

G. H. (Bootle).

Coils for the "Challenge" Sets

SIR,—Here is a time-saving suggestion for those who make their own astatically wound coils for the "Challenge" sets.

When a sufficient number of turns has been wound in one direction and it is necessary to wind the remainder in the other direction, instead of making two holes in the former as you suggest, cutting the wire and anchoring it with a short end left out to attach to the second half of coil and then making two more holes to start this second half, a continuous and unbroken winding can be made by making three holes in triangular formation with slots cut between the first and second and first and third holes, to enable the wire to be looped over the tongue which results. This saves the double anchorage and also does away with the necessity of soldering the two windings together, thereby I think adding to the efficiency of the coil.

R. W. H. (Paris).

The "Roosters'" Route March

SIR,—Since "Savoy Hiller" has given away nearly all the secrets of the Roosters' prison-house in his interesting inside article "When the Red Light is On," we may as well go a step further and shatter the remaining fragments of illusion.

It is, indeed, true that the small and best audiences in the studio are vastly amused in watching the "Roosters'" antics when they broadcast their famous route march—in the manner of the small boy who loves to see the wheels go round. Two other "effects" we use, however, have been omitted by "Savoy Hiller," one being of great importance. This is the precious case containing stones, which gives the impression of the dull thud of a thousand packs falling upon a thousand backs, without which the whole effect of a march would be poor, indeed. In addition, another Rooster has a smaller case containing a mess tin, enamel mug, knife, fork and spoon, to give an added suggestion of the rattle of equipment.

We also make use occasionally of a board covered with sandpaper, on which we march. These, with the contraptions referred to by "Savoy Hiller," added to the splendid help of a military band and all the male chorus voices available in the studio give, as we are so often told, the glorious illusion of a battalion of men on the march.

Incidentally our small company is *six*!

PERCY MERRIMAN (London, N.W.).

Programme Comparisons

SIR,—Having just come back from Canada and the States, I think our programmes are flat. Three reasons: Firstly, why do we want the same thing broadcast twice and three times a week? Secondly, when the Regional System is completed, five stations will broadcast the same programme every day; for I am sure people in the North can get the National station direct now that the power is increased. Thirdly, why can't we broadcast advertisements and avoid sending money abroad? L. W. (Canvey Island).

Blue Spot Units

SIR,—You recently printed a letter of appreciation of Messrs. Hughes, Ltd., by L.W. (Honiton).

As a reader of AMATEUR WIRELESS since its inception, I would like to associate myself with L.W.'s remarks, as I have experienced the same very kind assistance from Messrs. Hughes, Ltd., and in my case it was not a unit fault, but a strain, owing to tension on the reed, caused by myself. Without any charge, however, Messrs. Hughes sent me an entirely new unit (Blue Spot). A. J. D. (Doncaster).

"THIS DOUBLE-HUMP BUSINESS"

(*Continued from page* 758)

suggested that the Ohmic-coupled circuit is a good one for average use. I feel that the difference between the curves of Fig. 5 with their partial flat top, and the middle curve of Fig. 4 with its somewhat more pronounced band-pass action, can only be detected by a very critical ear unless one is using a number of such band-pass circuits. My object was the development of a circuit suitable for simple receivers employing a detector only, or perhaps one stage of screened-grid amplification, and these results to my mind show conclusively that the Ohmic-coupled circuit is the more suitable.

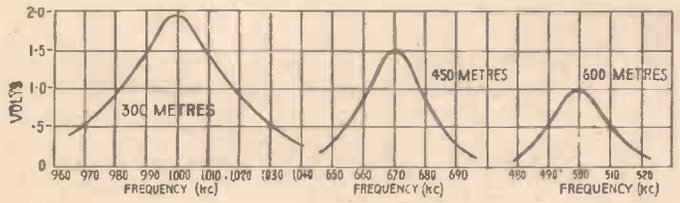


Fig. 5. Curves obtained with Ohmic-coupled circuit

If any reader wishes to try the two effects for himself, he can easily do so by replacing the resistance in his Ohmic-coupled circuit with a fixed condenser of value approximately .015 microfarad. Indeed, it is quite an easy matter to connect up a band-pass circuit for oneself, and to carry out experiments. The only essential is, that the two coils must be screened one from the other by means of a simple electrostatic shield, while magnetic coupling should be avoided by making one or both of the coils astatic.

BUILD THIS MODERN SCREENED 3

and be independent of your local station.
The complete kit of parts costs only **£3.12.9**
It will bring you programmes from all European countries with wonderful purity and marvellous volume.
Cabinet to contain Dynaplus Screened 3 (as illustrated) finished polished walnut, complete with Voltron Cone Loud-speaker. Ample room provided at back for batteries or eliminator, **50/-**
This set is being enthusiastically received and praised by press and public alike as the most thrilling long-distance station-getter yet produced.

You can get full particulars of Voltron authorised agents throughout the British Isles. In case of difficulty, write to us for the free blueprint and name of our nearest agent.

VOLTRON ELECTRIC, LTD.,
Queensway, Ponders End, Middlesex

DYNAPLUS SCREENED THREE

RELIABILITY

Illustration shows Sovereign Wire Wound Resistance with Bakelite holder and metal supports and terminals.

The SOVEREIGN VARIABLE RESISTANCE (100,000 ohms price 4/6) specified in THE SIMPLE GRAMOPHONE AMPLIFIER is a further commendation to the quality and standard of Sovereign Products.

for CONSTRUCTORS

IT is not difficult to construct mains eliminators if the right components are used. SOVEREIGN WIRE WOUND RESISTANCES are built to endure at a constant standard of efficiency. Every one is guaranteed within 5% of its stated value and is astatically wound.

Sovereign also make:—
Volume controls; Potentiometers; Rheostats; Wave Traps; Dual-range and Screen-grid Coils; H.F. Chokes; Compression-type Condensers, etc. Components upon which experts rely.

SOVEREIGN PRODUCTS LTD.
52-54 Rosebery Avenue, London, E.C.1.

SOVEREIGN — OF BRITISH MANUFACTURE

POPULARISING WATES GRAMOPHONE PICK-UP

GIVEN FREE!!

TO EVERY PURCHASER OF A

WATES

STAR PICK-UP DURING THE MONTH OF NOVEMBER, WILL BE GIVEN FREE, A WATES PICK-UP ARM, AS ILLUSTRATED.

Pick-Up Arm is finished to match the Pick-Up.

The value of a gramophone can be greatly increased when a pick-up is used. The Wates Star Pick-Up immediately gives ordinary gramophone music a life-like reality that brings out all the more subtle sounds with a purity and accuracy of tonal value that is amazing.

This unique free offer enables you to fix a pick-up to your gramophone without interfering with the ordinary sound box. You can, therefore, not entirely dispense with the old method of reproduction until experience has proved to you the infinite superiority of the Wates Pick-Up.

THIS OFFER WILL DEFINITELY TERMINATE ON NOVEMBER 30th, 1930.

Buy your Wates Pick-Up now and take advantage of this offer. If any difficulty regarding supply, write direct giving name and address of your usual radio supplier to:

THE STANDARD BATTERY CO.,
(Dept. A.W.),
184/188, Shaftesbury Avenue, London, W.C.2.

M.B.

NEW RECORDS FOR THE RADIO-GRAMOPHONE

THE recent Exhibition was a remarkable demonstration of the popularity and present commercial importance of the radio-gramophone. It was very encouraging to those who have visualised right from the start the wonderful possibilities of this method of reproduction to note the amount of space allotted to gramo-radio equipment. I was pleased to hear a demonstration during one of my visits of Grieg's "Concerto in A minor" for piano and orchestra, played by Friedman and an orchestra under Philippe Gaubert, a Columbia recording (L9446-9). When this record was first issued it was severely criticised by one or two eminent critics, although its amazing vitality and good piano reproduction caused it to be widely appreciated. I was interested to note that the B.B.C. announcer in his preliminary description said that : "it showed how good a piano record could be."

Film Records

Talking pictures continue to colour the lighter side of the programmes of records issued to-day. "The King of Jazz Selection" by the Broadcast Talkie Boys has some neat saxophone playing and is marked also by the guitar accompaniment to the vocal refrains (Broadcast 598). Guitar accompaniments are also featured in the "Paramount on Parade Selection" played by Bidgood's Symphonic Dance Orchestra (Broadcast 5181). Both records are tuneful with a pleasing rhythm and the recording of the vocal portions of the selection is well up to modern standards.

Another successful dance record from the last mentioned film is "Any Time's the Time to Fall In Love," by the Rhythm Maniacs (Decca F1898). Clear, bright and rhythmic playing characterises this issue. Spike Hughes and his Dance Orchestra contribute a "hot" number in "That's where the South Begins" (Decca F1906). Hot playing is not so popular as it was, and records now made all have to be tuneful as well as being a vehicle for displaying the pyrotechnic methods of some of our saxophone players.

Tom Jones and his Orchestra from the Grand Hotel play "Poupee Valsante," by Poldini, on Broadcast 5185, with clear dainty phrasing. The celeste opening is nicely recorded. The Decca Company has issued two further numbers in their "Glimpses of the Great Operas" series—the Finale of Act 3 of *Aida* (K533) and the "Garden Scene from *Faust*" (K535). The soloists are May Blyth (soprano), Henry Wendon (tenor), and Richard Watson (bass). The *Aida* extract is the better record, but in each the orchestra is effectively recorded. The best operatic record of the month is a duet: "See Ev'chen! Where methought can she be?" from Wagner's *Meistersingers*, in which Elisabeth Rithberg and Friedrick Schorr sing with delightful ease. The exceptionally good recording of the orchestra and clear enunciation by the singers label this as a really outstanding record (H.M.V. DB1421). Song medleys are again prominent. "War Marching Songs," sung by Dan Donovan and a male quartet to an accompaniment by Debroy Somers' Band (Col. DA112) and Parts III. and IV. of "Cheery Song Memories" (Broadcast 603), are exactly what they are announced to be, cheerful singing to a dance-band accompaniment without any trace of false sentiment produce a record suitable for winter evenings.

A. G. McDONALD.

BUILD THIS ELIMINATOR FOR £3:0:0

CARRIAGE PAID

No more H.T. Troubles

40 m/a Output

★ *Specially Suitable for*

OSRAM MUSIC MAGNET 3 & 4
MULLARD 1931 ORGOLA 3 & 4

etc.

YOU don't need to put up with inefficient and expensive H.T. dry batteries for a day longer. You can now have a complete and efficient H.T. eliminator of guaranteed quality for at least 40 per cent. less than you pay for ready-made eliminators giving smaller outputs.

TWO HOURS EASY WORK

The Stal Kit enables anybody to build this complete and most efficient H.T. eliminator in less than two hours with only a screwdriver and a pair of pliers. Every nut, every bolt you need is included in the kit. There are no holes to drill, no soldering, no mess, no trouble. You can do the job in the drawing room or anywhere else in the house.

CAN'T GO WRONG

Full instructions for building are given with every kit together with easily followed diagrams, and photographic reproductions. It is practically impossible to make a mistake.

GREATER ECONOMY AND EFFICIENCY

When you have built the Stal Eliminator and put it into service in your set you will be astounded and delighted at the wonderful improvement in reception, tone, and volume of your receiver. Instead of losing power and lowering performance as always happens when dry batteries are used, the Stal Eliminator gives your set the constant and unfluctuating voltage which is essential to first-class loud-speaker performance. The cost for current is so small as to be negligible and cannot be compared with the ever-recurring expenditure on old type H.T. dry batteries.

SATISFACTION OR MONEY BACK

Don't be satisfied with old-fashioned methods. Send your money order to-day and we will post you a Stal Kit by return. We guarantee to return your money at once if you are not satisfied with the Stal Kit and return it to us within seven days.

PRICES:

A.C.	D.C.
Stal Senior Kit.—Output 40 m/a. 175 v. 3 Variable Tappings (including Triotron Rectifying Valve, 9/6), £3 0 0	Stal Senior Kit.—Output 30 m/a 150 v. 2 Variable Tappings, £2 5 0
Or built ready for immediate use, £3 19 6	Or built ready for immediate use, £2 10 0
Stal Junior Kit.—Output 20 m/a. 140 v. 1 Variable Tapping (including Triotron Rectifying Valve, 9/6) £2 2 0	Stal Junior Kit.—Output 20 m.a. 120 v. 1 Variable Tapping £1 10 0
Or built ready for immediate use, £2 19 6	Or built ready for immediate use, £1 15 0

All Kits are sent Carriage Paid.

STAL

COUPON

To PEARL & PEARL,
190 Bishopsgate, London, E.C.2.

I enclose £ Send me Stal (*state name of Kit and whether A.C. or D.C.*)..... Kit as advertised, carriage paid.

Name .....

Address .....

A.W.15/11/30.

The WATES 3 in 1 TEST METER Price 8/6

WATES

ORIGINAL AND GENUINE

3 in 1 TEST METER

used in conjunction with a

POLYSCOPE

PAT. APP. FOR

DETECTS
MEASURES &
CHECKS

THE WATES POLYSCOPE Price 3/-

EVERY KIND OF RADIO TEST!

Great Success of Recent Competition

The Wates Meter Competition proved to be of absorbing interest to thousands of wireless users. The amazing variations of tests and experiments that these two instruments provide, enable you to keep your set in first-class condition and to improve results to the maximum capacity of your set.

Buy your Wates Meter and Polyscope to-day and ask for the leaflet of instructions explaining how simple it is to detect distortion, check consumption, anticipate battery troubles and in every way to keep an expert's eye upon the performance of your set.

Obtainable from all Radio Dealers, or if any difficulty direct from:

The STANDARD BATTERY Co.

(Dept. A.W.), 184/188, SHAFTESBURY AVENUE, LONDON, W.C.2

For the Newcomer to Wireless: ACCUMULATOR MATTERS

I WANT to take good care of my new accumulator and I wish you would tell me what I ought to do.

First of all I would strongly advise you to invest a shilling or two in a simple hydrometer.

Half a minute, please. What is a hydrometer?

It is a simple device which enables you to discover the specific gravity of the solution in the cells. When you mix sulphuric acid and water the resulting solution is heavier than water itself. The only way of discovering that the proportions are just what they should be is to measure by means of a hydrometer.

What is the correct gravity of the solution?

It varies a little with different types of cell but you'll find it stated on the label.

Now what else?

See what charging rate the makers recommend—you'll find that on the label, too—and obtain an assurance from the charging station that this won't be exceeded. Next, you ought to make sure that your battery is properly charged when it comes home.

How can I do that?

This is where the hydrometer comes in again. The ever-useful label will show you what the gravity of the solution should be when the battery is fully charged. Test it out and see that it is as it should be.

And next?

You are not likely with dull-emitter valves to discharge the battery at too high a rate so you needn't worry about that. Keep a bottle of distilled water in the house and make a point of looking at your accumulator about once a week. If the solution is dropping below the tops of the cells take a syringe or fountain pen filler and top them up.

How do I know that the battery is nearly run down? Can I use a voltmeter?

In such cases the voltmeter is almost useless for the E.M.F. of an accumulator doesn't begin to drop seriously until it badly wants charging. Make use of the hydrometer and if the gravity drops down to about 1180 have it recharged at once. Most accumulators have a gravity of about 1200 when fully charged and 1170 when discharged as far as they should go.

How long should the battery work my set at one charge?

That depends upon the current taken by your valves. You can very easily find out by adding up the maker's filament current figures for the valves and dividing these into the actual ampere-hour capacity of the battery.

My set's a three-valver and the valves use .1, .1, and .25 ampere. Let me see, that makes .45 in all, and the accumulator is 40 actual ampere hours.

Dividing .45 into 40 you find that you can expect about 88 working hours, say 75 to be on the safe side. This means about three weeks' working in the ordinary way. Remember one thing, though.

What's that, please?

Whether you are using the battery, or whether you are not, small current leakages must always be taking place. In other words, the battery will slowly run down even if it is switched off. Don't ever let an accumulator stand idle without a recharge for more than three months. And there is just one last thing I would like to mention. If the hydrometer shows that your battery is run down the quicker you get it to the charging station the better, for nothing damages a battery so much as remaining in a nearly run down state.

NEXT WEEK: FULL DETAILS OF A ONE-VALVE LOUD-SPEAKER SET

Postcard Radio Literature

Good Fixed Condensers

IT is essential to use good fixed condensers in a set, but there is no need for them to be expensive. I like the new Filta Bank condensers made by the Mains Power Radio Co. Before you buy, write for a free folder describing the wide range of "microfarads" to be had. **93**

A Cat-a-Log

Curry's, Ltd., the well-known retailers, have a large radio branch, and the new "Cat-a-Log" (that is how they term it) gives some idea of the parts available. I advise you to get this. **94**

New Differentials

A new idea is the air-dielectric differential condenser made by Sydney S. Bird and Sons. Differential condensers are all the rage now for reaction control, and set-builders would be well advised to get the Cyldon literature describing these condensers. **95**

Portables on the Mains

Many portable-set users are working their sets from the mains these days, but quite a new notion is the Enemains convertible five-valve mains portable set, which can easily be adapted to work on A.C. or D.C. supplies. **96**

A Good Set

The Columbia portable, which, of course, is a battery-operated set, made a fine reputation for Columbia, and this has been backed up by the even higher performance of the 304 table model, which works from the mains. If you are on the lookout for a good set, I recommend you to get the new Columbia folder giving full details of these. **97**

New Moving Coils

Bakers have been making moving-coil speakers since the very early days. If you want to see what great progress has been made for 1931, get the new book giving full technical information of the new models, including the latest permanent-magnet types. OBSERVER. **98**

GET THESE CATALOGUES FREE

Here "Observer" reviews the latest booklets and folders issued by well-known manufacturers. If you want copies of any or all of them FREE OF CHARGE, just send a postcard giving the index numbers of the catalogues required (shown at the end of each paragraph) to "Postcard Radio Literature," "AMATEUR WIRELESS," 58/61, Fetter Lane, E.C.4. "Observer" will see that you get all the literature you desire.

"A.W." Solves your Wireless Problems

RADIOGRAMS

THE B.B.C. has decided to start a new experiment in vaudeville on November 24 (National). A band of regular artistes in these programmes will perform under the name of "The Foursome" and it will be their job to link up the performances, announce the "stars," sing choruses and generally keep things moving "Star" artistes appearing in the first of the new-style vaudeville will include Clapham and Dwyer, Ross and Sargent, Teddy Brown, and Ronald Frankau.

Palladium relays, one of the most popular features of broadcast vaudeville, will be heard by National listeners on November 20.

A "really Parisian" cabaret will be produced by John Watt on National on November 18 and Regional on November 19. Its title is *Au Lapin Qui Saute*, and Leonard Henry heads the list of artistes.

On November 18 and 19 the last of the present series of studio operas, Debussy's *Pelléas and Mélisande*, will be broadcast from the Regional and National transmitters.

A series of "cartoons" of well-known actors and actresses will be introduced by Elizabeth Pollock in a vaudeville broadcast on November 17 (National), the second in the series being dated for November 22 (Regional).

The winning band of the Boy Scouts' Musical Festival will broadcast nationally on November 15.

The National programme on November 22 will include a popular Saturday night concert from the Kingsway Hall, with the Royal Air Force Band and Leonard Henry.

The Ripley United Silver Band, which recently won the Junior Championship of the British Empire at the Crystal Palace, will be heard from Midland Regional on November 24.

The National Orchestra of Wales is to play on November 26 in the Coal and Shipping Exchange, Cardiff, instead of in the National Museum of Wales. It is hoped for the future to make this lunch-time performance a regular fortnightly feature in the Exchange. The concerts take place at 1.15 p.m.

An Old Favourites programme which will be broadcast from Cardiff on November 27 will consist of selections made by personalities well-known in the West Country.

At the request of listeners, the "Summer Mummers" will give a repeat performance of one of their shows of last summer. This has been fixed for broadcast from the Northern Regional on November 22.

The first of a series of talks on organs will be broadcast by Mr. K. W Anderson from Midland Regional on November 28.

The next interview in the Cardiff series of Intimate Interviews will be given on November 29, when a tugboat skipper will come to the microphone.

The studio service on November 16, for Manchester and Leeds, will bring to the microphone Dr. A. J. Grieve, the Principal of the Lancashire Independent College, Manchester.

The orchestral concert on November 16 which Manchester and Leeds listeners will hear, will include Tchaikovsky's ever popular *Casse Noisette*.

L. du Garde Peach has written a revue specially for the North, and this is to be broadcast on November 18. It consists of a series of imaginary incidents in the life of the North.

Another short-waver to be logged by DX enthusiasts is Rio de Janeiro (Brazil), on 31.75 metres. Transmissions are made daily between 10 p.m. and midnight G.M.T. The station is operated by the Radio Club of Brazil.

On November 25 the Band of the 16th/5th Lancers (the Cavalry Battalion), at present in garrison, is to give a concert in the Edinburgh studio for broadcast from all Scottish stations.

For the eighth year in succession KDKA (East Pittsburgh, U.S.A.) has resumed its special broadcasts of private messages, news bulletins, and entertainments for reception in Arctic regions. They take place every Saturday, at 4 p.m. G.M.T., throughout the winter until and including February 14. The transmissions are mainly destined to members of the Canadian Royal Mounted Police, traders, and trappers. Whilst the new KDKA plant is capable of radiating 1,500 kilowatts, it is possible that the authorities may restrict the energy to 40 kilowatts, except for experimental purposes. The plant is now 3,000 times more powerful than the original transmitter used ten years ago.

Owing to Turin's recent change in wavelength, the Hilversum station has obtained from the Dutch Posts and Telegraphs administration a temporary authority to carry out tests in the later evening hours on 1,110 metres, with a view to finding a suitable position between Oslo and Kalundborg. During the day broadcasts will continue to be made on 299 metres.

An interchange of broadcast programmes is shortly to take place between Vienna and Milan and, later, between Vienna and Munich. Experiments recently carried out between these cities proved a great success.

Since the Broadcasting Corporation of Japan has taken over the control of the radio system in that country, its development has greatly progressed. By March last over 700,000 registered licences had been issued over a period of twelve months, thus ensuring an income of 8,500,000 yens or, roughly, £850,000. Ten-kilowatt stations have been erected at Tokio, Osaka, Nagoya, Hiroshima, Kumamoto, Sendai, and Sapporo, and a further six smaller relays will be in operation by the end of the present year.

What are foreign studio announcers paid? In Paris they do not receive a fixed salary, but are paid according to their hours of duty when their presence is required at the station. In the United States these officials only receive a nominal remuneration from the broadcasting companies, but are paid high fees by the advertisers who sponsor the programmes. Thus, Graham McNamee, perhaps one of the most popular of American announcers, gets 250 dollars when introducing a commercial programme, and during the winter months, it is stated, he may act for four such broadcasts in one week.

A Sunday evening of familiar old songs will be given on November 16, when the Wireless Chorus, conducted by Stanford Robinson, will broadcast a number of songs of the four nations. The English songs will include "On the Banks of Allan Water," and "The Lass of Richmond Hill."

Lille (France) will soon be in possession of its 15-kilowatt transmitter; listen for its signals, as tests are to be made within the next few days. They are likely to prove more powerful than those of PTT Strasbourg.

8-METRE TRANSMISSION FROM TANKS!

Have you seen the new Army tanks fitted with 8-metre ultra-short-wave wireless sets? Here is a description of the radio gear

IN a news film now circulating in provincial theatres some interesting views are given of the latest thirty-mile-an-hour Army tanks in operation with wireless sets on board.

Radio enthusiasts have expressed a certain amount of surprise with regard to this because as tanks have an all-metal construction, and as it is not possible to erect a high aerial in case of emergencies, it is not easy to see how efficient transmission can be carried out.

Anyone who has seen these tanks in operation will realise what a danger these, in conjunction with an efficient radio outfit, would constitute in the event of another war. Already the Army authorities seem to have the radio end well in hand and fleets of these new tanks can be given orders from one H.Q. and the operators in the tanks can keep touch with the back of the lines and report the damage done!

Recently I had the opportunity of inspecting the latest Marconi apparatus which has been designed for this tank work, and although, naturally, in view of Army restrictions, the sets are "hush-hush," I can give an outline of the arrangements used. Communication is carried out on the ultra-short waves, the actual wavelength being about 8 metres. Either speech or morse code can be transmitted, and it has been found that in conjunction with the special aerial used, the 8-metre wavelength gives an efficient range of communication.

The aerial is almost invisible, and consists of a copper-plated steel rod, 12 ft. in height, and made in four sections. In use it is liable to be subjected to severe swaying and bending, but it is designed to be very flexible and will not buckle.

A feeder cable connects the transmitter to the aerial, which is connected to the body of the tank or to "earth" through a balancing coil, so as to permit the maximum amount of energy to be transferred to the aerial for the wavelength in use.

The transmitter and receiver are compactly fitted in a teak case, and are very simple and easy to operate. When the set is fitted in a moving vehicle, where jars and shocks would cause damage, these vibrations are eliminated by shock-absorbing slabs of sponge rubber.

Power for the transmitting valves is supplied by a rotary transformer, driven by a 12-volt accumulator, and delivering 600 volts to the anodes.

For speech the choke-control system of modulation is used, and, for telegraphy, an interrupter disc mounted on the shaft of the rotary transformer enables the tonic-train system of transmission to be employed. Four valves are used in the transmitter, two oscillators and two modulators, and four valves are used in the receiver, the last two stages being low-frequency amplifiers.

An interesting innovation for land vehicles is the system of intercommunication and dual control which was previously confined to aircraft apparatus. This allows the wireless set to be switched off and two people in the vehicle to communicate with each other by means of the phones, or, alternatively, either of them can operate the wireless equipment. When communicating with each other, the last two stages of the receiver are brought into use as speech amplifiers.

It is very convincing to see these ultra-short-wave portable sets in use in all-metal tanks. On the radio side it is interesting to realise that, whereas many motorists cannot work ordinary portable sets in their cars because of the damping of all-metal body construction, on the tanks long-range communication is possible on the low wave of 8 metres. On the side of utility the efficiency of these mechanical monsters in constant radio communication with H.Q. is striking.

U.

THE B.B.C. CONCERTS

AT the third Queen's Hall Concert the orchestra had much improved. It was well together for the prelude to Act 1 of *Lohengrin*, and the individual performances were as good as ever. Vaughan Williams' "Sea Symphony" was done with the help of the Philharmonic Choir. This work has probably small claim to immortality, but no one could complain of the performance, and Dorothy Silk and Roy Henderson sang with exactly the right feeling. Adolf Busch played Beethoven's Violin Concerto with fine tone and understanding; he put his whole personality into the performance.

L. R. J.

The new short-wave telephony station at Rabat (Morocco) continues to test daily on 23 metres between 10 a.m. and 1 p.m., G.M.T. Two-way conversations may be picked up with Ste. Assise (France).

The Milan-Turin-Genoa group of broadcasting stations proposes to transmit a series of well-known operas during the coming winter season. For this purpose an augmented orchestra of seventy instrumentalists has been engaged, as well as a mixed chorus of fifty voices and a number of male and female operatic singers.

P.T.T. Rennes (France) has undergone a thorough overhaul and the new plant has now been brought into operation. From this station listeners on the south and south-east coasts of England should receive strong signals. A special land line connects the studio to Brest, with a view to the relay of concerts by French Naval bands.

On October 1 the number of licensed listeners in Germany reached a grand total of 3,241,725, or an increase of 16,781 over the figures officially published on July 1 last. Statistics based on the last census (1929) show that of the general population, namely, 64,104,000, but roughly 5 per cent. are owners of wireless receivers.

BROADCAST TELEPHONY

Broadcasting stations classified by country and in order of wavelengths. For the purpose of better comparison, the power indicated is *aerial energy*.

Metres	Kilocycles	Station and Call Sign	Power (Kw.)
GREAT BRITAIN			
25.53	11,751	Chelmsford (GSW)	15.0
200	1,500	Leeds	0.16
242	1,238	Belfast	1.2
261	1,148	London Nat.	68.0
288.5	1,040	Newcastle	1.2
288.5	1,040	Swansea	0.16
288.5	1,040	Stoke-on-Trent	0.16
288.5	1,040	Sheffield	0.16
288.5	1,040	Plymouth	0.16
288.5	1,040	Liverpool	0.16
288.5	1,040	Hull	0.16
288.5	1,040	Edinburgh	0.4
288.5	1,040	Dundee	0.16
288.5	1,040	Bournemouth	1.2
288.5	1,040	Bradford	0.16
301	995	Aberdeen	1.2
309.9	968	Cardiff	1.2
356	842	London Reg.	45.0
376.4	797	Manchester	1.2
398.9	752	Glasgow	1.2
479	626	Midland Reg.	38.0
1,554	193	Daventry (Nat.)	35.0
AUSTRIA			
246	1,220	Linz	0.6
246	1,220	Salzburg	0.6
283.6	1,058	Innsbruck	0.6
352	851	Graz	9.5
453	666	Klagenfurt	0.6
517	578.5	Vienna	20.0
BELGIUM			
206	1,460	Antwerp	0.4
212	1,415	Binche	0.2
216	1,391	Chatelineau	0.25
243	1,235	Courtrai	0.1
244.7	1,226	Ghent	0.25
251.4	1,194	Schaerbeek	0.5
338.2	887	Brussels (No. 2)	15.0
509	590	Brussels (No. 1)	1.2
CZECHO-SLOVAKIA			
263	1,139	Moravska-Ostrava	11.0
279	1,076	Bratislava	14.0
293	1,022	Kosice	2.5
342	878	Brunn (Brno)	3.0
487	617	Prague (Praha)	5.5
DENMARK			
281	1,067	Copenhagen	1.0
1,153	260	Kalundborg	10.0
ESTONIA			
401	748	Reval (Tallinn)	0.7
FINLAND			
221	1,355	Helsinki	15.0
291	1,031	Viipuri	15.0
1,796	167	Lahti	54.0
FRANCE			
172.5	1,739	St. Quentin	0.3
200	1,500	Radio Roubaix	0.2
210	1,430	Radio Touraine	0.2
222.9	1,346	Fécamp	0.7
235.1	1,275	Nimes	1.0
244.9	1,224	Béziers	0.6
249.5	1,202	Juan-les-Pins	0.5
256	1,171	Toulouse (PTT)	1.0
265	1,130	Lille (PTT)	15.0
272	1,103	Rennes	1.7
286	1,049	Montpellier	2.0
287.2	1,044.6	Radio Lyons	0.5
296.4	1,012.1	Limoges (PTT)	0.08
300	1,000	Strasbourg	0.35
304	988	Bordeaux (PTT)	35.0
308	973	Neuilly (Paris)	0.3
309	970	Natan-Vitus	1.0
316	950	Marseilles (PTT)	1.5
328.2	914	Grenoble (PTT)	1.2
329	911	Caen (Normandy)	0.6
329.5	910.3	Poste Parisien	1.2
345.2	869	Strasbourg	15.0
369.3	812.2	Radio LL (Paris)	0.5
385	779	Radio Toulouse	15.0
447	671	Paris (PTT)	1.0
466	644	Lyons (PTT)	2.3
1,446	207	Eiffel Tower	15.0
1,725	174	Radio Paris	17.0
GERMANY			
31.38	9,560	Zeesen	15.0
218	1,373	Flensburg	0.6
227	1,319	Cologne	1.7
227	1,319	Münster	0.6
227	1,319	Aachen	0.31
232.2	1,293	Kiel	0.3
239	1,256	Nürnberg	2.3
246.4	1,217.2	Cassel	0.3
253.4	1,184	Leipzig	2.3
259.3	1,157	Gleiwitz	5.6
270	1,112	Kaiserslautern	0.25
276	1,085	Königsberg	1.7
283.6	1,058	Magdeburg	0.6
283.6	1,058	Berlin (E)	0.6
283.6	1,058	Stettin	0.6
316.6	947.6	Bremen	0.3
318.8	941	Dresden	0.3
325	923	Breslau	1.7
360	833	Stuttgart	60.0
372	806	Hamburg	1.7
390	770	Frankfurt	1.7
419	716	Berlin	1.7
452.1	662	Danzig	0.25
473	635	Langenberg	17.0
533	563	Munich	1.7
560	536	Augsburg	0.3
566	530	Hanover	0.35
570	527	Freiburg	0.3
1,635	183.5	Zeesen	35.0
1,635	183.5	Norddeich	10.0
HOLLAND			
31.28	9,599	Eindhoven (PCJ)	30.0
299	1,004	Hilversum (also testing on 1,110m.)	8.5
299	1,004	Radio Idzerda (The Hague)	0.6
1,071	280	Scheveningen-Haven	5.0
1,875	160	Huizen	8.5
HUNGARY			
210	1,430	Budapest (Csepel)	1.0
550	545	Budapest	23.0
ICELAND			
1,200	250	Reykjavik (shortly testing)	16.0
IRISH FREE STATE			
224.4	1,337	Cork (1FS)	1.5
413	725	Dublin (2RN)	1.5
ITALY			
80		Rome (3RO)	9.0
247.7	1,211	Trieste	3.0
296.2	1,012.8	Turin (Torino)	8.5
312.8	959	Genoa (Genova)	1.5
332	905	Naples (Napoli)	1.7
441	680	Rome (Roma)	75.0
453	662	Bolzano (IBZ)	0.2
501	599	Milan (Milano)	8.5
LATVIA			
525	572	Riga	12.0
LITHUANIA			
1,935	155	Kaunas	7.0
NORTH AFRICA			
363.4	825.3	Algiers (PTT)	13.0
416	721	Radio Maroc (Rabat)	10.0
1,350	222.2	Tunis Kasbah	0.6
NORWAY			
364	824	Bergen	1.0
306	819.5	Frederiksstad	0.7
453.2	662	Porsgrund	1.5
453.2	662	Nidaros	1.2
1,071	280	Oslo	60.0
POLAND			
214.2	1,400	Warsaw (2)	1.9
234	1,283	Lodz	2.2
244	1,229	Cracow	1.5
313	959	Wilno	0.5
338.1	887.1	Poznan	1.9
381	788	Lvov	2.2
409.8	732	Katowice	16.0
1,411	212.5	Warsaw	14.0
PORTUGAL			
240	1,247	Oporto (Teatro Apollo)	0.25
320	937.6	Lisbon (CT1AA)	0.25
ROMANIA			
394	761	Bucharest	16.0
RUSSIA			
720	416.6	Moscow (PTT)	20.0
800	375	Kiev	20.0
824	364	Sverdlovsk	25.0
937.5	320	Kharkov	25.0
1,000	300	Leningrad	20.0
1,060	283	Tiflis	10.0
1,103	272	Moscow Popoff	40.0
1,200	250	Kharkov (RV4)	25.0
1,304	230	Moscow (Trades' Unions)	100.0
1,380	217.5	Bakou	10.0
1,481	202.5	Moscow (Kom)	20.0
SPAIN			
251	1,193	Barcelona (EAJ15)	1.0
266.7	1,125	Barcelona (EAJ13)	10.0
349	860	Barcelona (EAJ1)	8.0
368	815	Seville (EAJ5)	1.5
424	707	Madrid (EAJ7)	2.0
460	652	San Sebastian (EAJ8)	0.5
SWEDEN			
230.6	1,301	Malmo	0.75
257	1,166	Hörby	15.0
300.2	999.3	Falun	0.65
322	932	Göteborg	15.0
436	689	Stockholm	75.0
542	554	Sundsvall	15.0
770	389	Ostersund	0.75
1,229.5	244	Boden	0.75
1,348	222.5	Motala	40.0
SWITZERLAND			
318.8	943	Basle	0.65
403	743	Berne	1.1
459	653	Zurich	0.75
678.7	454.6	Lausanne	0.6
760	395	Geneva	1.5
TURKEY			
1,200	250	Istanbul	5.0
1,958	153	Ankara	7.0
YUGOSLAVIA			
306.8	978	Zagreb (Agram)	0.7
430.7	696.5	Belgrade	3.0
577.1	519.9	Ljubljana	2.8

A USEFUL SPEAKER CABINET

USERS of efficient speakers capable of giving plenty of bass, such as the new "A.W." Linen Diaphragm speaker, know that it is essential to use either a baffle or cabinet in order to prevent loss of the lower frequencies.

A cabinet is generally more convenient in use than a baffle, and the H. & B. Radio Co., of 34-38 Beak Street, Regent Street, London, W.1, have produced a fine

One of the new H. & B. speaker cabinets housing the "A.W." Linen Diaphragm speaker

cabinet for housing the "A.W." Linen Diaphragm speaker. One of the range is illustrated here, and it should be noted that cabinets are available in four sizes, from 14 in. by 14 in. to 24 in. by 24 in. The prices are very low and range from 17s. 6d. to £1 15s.

The finish of the woodwork is of a very high order, and apart from improving performance owing to the baffle effect, one of these cabinets makes a handsome addition to the furniture of a room.

FULL-SIZE BLUEPRINTS

EACH BLUEPRINT SHOWS THE POSITION OF EVERY COMPONENT AND EVERY WIRE, AND MAKES CONSTRUCTION A SIMPLE MATTER.

WHEN ORDERING, PLEASE SEND A POSTAL ORDER, NOT STAMPS, TO BLUEPRINT DEPT., "AMATEUR WIRELESS," 58/61 FETTER LANE, LONDON, E.C.4

CRYSTAL SETS

All these 6d. each, post free.

B.B.C. Brookman's Park Set	AW206
Regional Crystal Set	WM176

ONE-VALVE SETS

All these 1s. each, post free.

B.B.C. Official One	AW208
A.1	WM153
Hartley Single-valver	WM198

TWO-VALVE SETS

All these 1s. each, post free.

Ace of Twos (D, Pentode)	AW143
All Mains Two (D, Trans)	AW180
Loud-speaker America Two (D, Pentode)	AW190
Talisman Two (D, Trans)	AW194
Hyper-selective Two (D, Pentode)	AW198
Pentector Two (P. det., RC)	AW213
British Broadcast Two (D, Trans)	AW215
Easy-tune Two (D, Trans)	AW226
Wavelets Two (D, Trans)	AW229
No-battery A.C. Mains Two (D, Trans)	AW230
No-battery Gramo-radio 2 (D, Trans)	AW238
1930 Talisman 2 (D, Trans)	AW239
Easy Tune Short-wave 2 (D, Trans)	AW242
Searcher Two (D, Trans)	AW245
Arrow Two (D, Trans)	AW249
Forty-five Shilling Two (D, Trans)	AW250
Q-coil 2 (D, Trans)	WM62
Crusader (D, Trans)	WM69
Flat-dweller's 2 (HF, D)	WM76
Tetrode Short-wave Two (SG, D)	WM99
Key-to-the-Ether Two (D, Pentode)	WM107
Clipper Two (D, Trans)	WM135
Twinflex (Reflex)	WM138
Continental Two (D, Trans)	WM143
Stay-put Two (All AC, D, Trans)	WM155
Ether Ranger (D, Trans)	WM156
A.B.C. 2 (D, Trans) with copy "W.M." 1s. 3d.	WM160
Brookman's Two (D, Trans)	WM168
A.C. Two (D, Trans)	WM175
Programme Two (D, Trans)	WM177
New Crusader (D, Trans)	WM182
Radio-Record Two (SG, D)	WM187
Gleaner Two (D, Trans)	WM201
Music Monitor (D, Trans)	WM208
Merlin Two (A.C. Set)	WM213

THREE-VALVE SETS

All these 1s. each, post free.

Three-valve Mains Receiver (HF, D, Trans)	AW109
British Station Three (HF, D, Trans)	AW122
Simplicity Screen-grid Three (HF, D, Trans)	AW132
All-purpose Short-wave Three (D, RC, Trans)	AW147
All-Round Three (D, RC, Trans)	AW155
All Britain Three (HF, D, Trans)	AW158
Bantam Three (D, RC, Trans)	AW160
Binowave Three (D, RC, Trans)	AW172
Clarion Three (SG, D, Trans)	AW175
Broadcast Three (SG, D, Trans)	AW192
James dual-range Three (HF, D, Trans)	AW196
Knife-edge Three (D, RC, Trans)	AW201
Talisman Two-three (D, RC, Trans)	AW203a
Wide World Short-wave Three (HF, D, Trans)	AW207
Everybody's Three (SG, D, Trans)	AW209
1930 Ether Searcher (SG, D, Trans)	AW211
New All-Britain Three (HF, D, Trans)	AW214
Best-by-Ballot Three (SG, D, Trans) Price 4d. free with copy of "A.W."	AW217
Brookman's By-pass Three (D, 2 Trans)	AW220
Everybody's All-electric Three (SG, D, Trans-A.C.)	AW221
1930 Clarion Three (SG, D, Trans)	AW223
Auto-Coupler Three (D, 2LF)	AW225
Beginner's Regional Three (D, 2LF)	AW233
Britain's Favourite Three 1930 (D, 2 Trans)	AW243
Car Three (D, RC, Trans)	AW244
The "A.W." Exhibition 3	AW247
"A.W." Challenge Kit Three (SG, D, Trans)	AW253
Britannia (D, RC, Trans)	WM67
All-wave Screened-grid Three (HF, D, Pentode)	WM110
Standard Coil Three (HF, D, Trans)	WM117
Festival Three (D, 2 LF-Dual Imp)	WM118
The Q3 (D, RC, Trans)	WM124
Lodestone Three (HF, D, Trans)	WM129
Simple Screen Three (HF, D, Trans)	WM131
Dynamic Three (A.C.—SG, D, Trans)	WM136
Short Wave Link (D, RC, Trans)	WM142
Binowave S.G. Three (SG, D, Trans)	WM152
Fanfare (D, 2 Trans)	WM157
Brookman's Three (SG, D, Trans)	WM161
Community Three (D, RC, Trans)	WM164
New Q 3 (SG, D, Pentode)	WM167
Brookman's Push-Pull Three (SG, D, Trans) 1/6	WM170
Celerity Three (SG, D, Trans)	WM173
All-nations Three (D, 2 Trans)	WM178
Inceptordyne (SG, D, Pentode)	WM179
Brookman's A.C. Three (SG, D, Trans) 1/6	WM184
Music Marshal (D, 2Trans)	WM190
Gramo-Radio D.C. Three (SG, D, Trans)	WM196
Concert Three (D, 2 Trans)	WM199
New Lodestone Three (HF, D, Trans)	WM205
De-luxe Three (D, RC, Trans)	WM209
Five-point Three (SG, D, Trans)	WM212
Falcon Three (A.C. Set)	WM217
New Brookman's Three (SG, D, Trans)	WM218

FOUR-VALVE SETS

All these 1s. 6d. each, post free.

Explorer Four (HF, D, RC, Trans)	AW120
Facility Four (HF, D, 2 RC—Q-coil)	AW154
Broadcast Picture Four (HF, D, 2RC)	AW163
The Orchestra Four (D, RC, Push-pull)	AW167
All Europe Four (2HF, D, Trans)	AW173
Stability Four (HF, D, RC, Trans)	AW182
Clarion All-electric Three (SG, D, Trans A.C, Rectifier)	AW200
Music-lover's Gramo-radio (SG, D, RC, Trans.)	AW202a
Horizon Four (SG, D, 2 Trans)	AW237
Challenge Four (2SG, D, Trans) with copy of A.W. 4d. post free	AW251
Challenge Four (2SG, D, Trans) Mains operated with copy of A.W. 4d. post free	AW252
Touchstone (HF, D, RC, Trans)	WM109
Standard-coil Four (HF, D, 2RC)	WM122
Dominions Four (2SG, D, Trans)	WM134
Drum Major (HF, D, RC, Trans)	WM137
Music Player (HF, D, RC, Trans)	WM144
Arrow (SG, HF, D, Trans)	WM154
1930 Monodial (2SG, D, Trans)	WM158
Electric Four (All A.C.—SG, D, RC, Trans)	WM162
Outpost Four (SG, D, 2 Trans)	WM165
Brookman's Four (2 SG, D, Trans)	WM174
Transportable Four (SG, D, 2 RC)	WM180
Super Q (SG, D, 2 Trans)	WM189
Lodestone Four (HF, D, RC, Trans)	WM193
Searcher's Four (SG, D, RC, Trans)	WM194
Invitation Four (SG, D, RC, Trans)	WM200
Regional Band-pass Four (SG, D, RC, Trans)	WM211
Five-Point Four (SG, D, RC, Trans)	WM216

FIVE-VALVE SETS

All these 1s. 6d. each, post free.

James Quality Five (2 SG, D, RC, Trans)	AW227
All-wave Lodestone Five (HF, D, RC, Push-pull)	WM146
1930 Five (2 HF, D, RC, Trans)	WM171
Dual-screen Five (2SG, D, RC, Trans)	WM185
Radio-Record Five (SG, D, Trans-parallel)	WM188
Overseas Five (3SG, D, Trans)	WM191

PORTABLE SETS

House Portable (SG, D, RC, Trans)	AW163	1/6
£5.5.0 Portable (D, Trans)	AW181	1/-
Holiday Portable Three (D, RC, Trans)	AW188	1/-
Music Leader (SG, D, RC, Trans) with copy "A.W."	AW203	-/4
Merry-maker Portable (D, 2Trans)	AW228	1/-
Sunshine Three (SG, HF, SG, D, Trans)	AW235	1/-
Continental Portable (SG, D, Trans)	AW241	1/-
Wayfarer Portable (Super-het)	WM139	1/6
1929 Chummy (SG, D, Trans, RC)	WM145	1/6
Picnic Portable (D, RC, Trans)	WM148	1/-
Pedlar Portable Two (D, Trans)	WM195	1/-
Pedlar Portable Three (D, 2 Trans)	WM197	1/-
James Portable SG3 (SG, D, Trans)	WM203	1/-
Foursome Portable (SG, D, 2 Trans)	WM206	1/6

AMPLIFIERS

All these 1s. each, post free.

Utility (RC, Trans)	AW68
Hook on Short-waver	AW104
Purity Amplifier	AW108
Add-on Distance-getter	AW117
Screened-grid HF Amplifier	AW138
Searcher Unit (HF)	AW176
"A.W." Gramophone Amplifier	AW205
Beginner's Amplifier (D, 2 v.) 9d.	AW210
Brookman's Separator (HF Unit)	AW212
Two-valve Amplifier	AW216
"Mag." Gramo Unit	AW224
Auditrol Amplifier	WM132
Concentrator (HF, Unit)	WM169
Radio-Record Amplifier (D.C. Mains)	WM183
Selecto Amplifier (H.F. Unit)	WM210

MISCELLANEOUS

Arcadian Linen-diaphragm Loud-speaker (full-size)	AW177a	1/-
Short-wave Adaptor (1 v.)	AW183	1/-
Gramophone Amplifier (3-v.)	AW187	1/-
High-tension Battery Charger	AW191	1/-
Mains Unit for S 8 Valves	AW193	1/-
Simplest H.T. Unit	AW197	1/-
B.P. Wavetrap	AW204	-/6
By-pass Unit (Wave Trap) with copy "A.W."	AW218	-/4
Home-constructor's pleated paper Loud-speaker	AW219	1/-
"Twin" Brookman's By-pass	AW222	-/6
"A.W." Paper Loud-speaker	AW231	1/-
James H.T. and L.T. Charging Unit	AW232	1/-
Simplest H.T. Eliminator for D.C. Mains	AW234	1/-
Simplest H.T. Eliminator for A.C. Mains	AW236	1/-
Choke Output Unit	AW240	1/-
Simple Tester Unit	AW246	-/6
"A.W." Improved Linen-diaphragm Speaker	AW248	1/-
James H.T. Unit for D.C. Mains	WM133	1/-
Short-wave Adaptor for Dominions Four	WM140	1/-
Two Ampere Low-tension Unit	WM147	1/-
A.C. Mains Amplifier	WM149	1/-
A.C. Mains Unit for All-wave Lodestone Five	WM151	1/-
H.T. Unit for A.C. Mains	WM159	1/-
"W.M." Linen-diaphragm	WM172	1/-
Trimmer (Selectivity Unity)	WM181	-/6
Brookman's "Wipe-outs"	WM186	1/-
Short-wave adaptor for Overseas Five	WM192	1/-
Staminator Unit for A.C. Mains	WM202	1/-
Universal Push-pull Amplifier	WM204	1/-
Outspan Short-wave Adaptor	WM207	1/-
"W.M." Standard A.C. Unit	WM214	1/-
"W.M." Standard D.C. Unit	WM215	1/-
Falcon A.C. Unit	WM219	1/-

Copies of "Amateur Wireless" and of "Wireless Magazine" containing descriptions of any of these sets can be obtained at 4d. and 1s. 3d. respectively, post free. Index letters "A.W." refer to "Amateur Wireless" sets and "W.M." to "Wireless Magazine" sets.

MORE RADIOGRAMS

The "military" band which is to broadcast from Glasgow and Aberdeen on November 15 is really a "civil" band. The apparent contradiction in its title is explained by its history. It was founded in 1856 by workers of the Kinneil Colliery Co. Three years later it became the regimental band of the local Volunteers, and hence the Kinneil Military Band, a title which it retained after severing its military connection some considerable time afterwards. This will be its first broadcast.

During the month of November, PCJ (Eindhoven) will relay a special concert from Paris for broadcast to South American listeners.

Two new playlets will be broadcast to Cardiff listeners on November 15: *At Monk's Close*, an episode of the Commonwealth, by Miriam Pritchett, and *Wait For It*, by Donald Davies.

Dr. Adrian Boult, who recently relinquished the position of conductor of the City of Birmingham Orchestra to become music director of the B.B.C., has received recognition for the work which he did in the Midland city, the degree of Doctor of Civil Law having been conferred upon him by the University of Birmingham.

In St. Paul, U.S.A., the use of automobile receiving sets has been prohibited.

When Asking Technical Queries

PLEASE write briefly

A Fee of One Shilling (postal order or postage stamps) must accompany each question and also a stamped addressed envelope and the coupon which will be found on the last page. Rough sketches and circuit diagrams can be provided for the usual query fee. Any drawings submitted should be sent on a separate sheet of paper. Wiring plans and layouts cannot be supplied.

Queries cannot be answered personally or by telephone.

"CHALLENGE THREE" KIT PRICES

OWING to an unfortunate omission, detailed prices were not given in the Ready Radio advertisement on page 709 of last week's issue for the new "Challenge Three" Kit Set. It should be noted that three kits of parts are available. Kit A (less valves and cabinet) costs £6 1s. 9d., or twelve equal payments of 11s. 3d. Kit B (with valves and without cabinet) costs £8 0s. 9d., or twelve payments of 14s. 9d. Kit C (with valves and cabinet) costs £9 5s 9d., or twelve payments of 17s. Recommended accessories are available, and readers who are building this latest three-valver should turn to page 757 of this issue, where full details of the components and kits will be found in an interesting Ready Radio announcement.

A Rapid Valve Guide

All valve users should have the new book just issued by Mullard and which can be obtained free, giving particulars of the whole range in a very convenient rapid-guide indexing system.

A Good "Two"

The Burton Empire "Two," which was reviewed recently by "Set Tester" is certainly a marvel at the price, namely 57s. 6d. If you are interested in a set of this type then write for a free copy of Burton's new catalogue. Some fine components for home constructors are also described in this.

A Ferranti Constructional Chart

Ferranti, Ltd., have just produced a constructional chart for a screen-grid three-valver, and you can obtain copies of this free through our Catalogue Service. A chart for a battery-operated two-valver is also available.

"Amateur Wireless and Radiovision." Price Threepence. Published on Thursdays 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.

PREPAID ADVERTISEMENTS

Advertisements under this head are charged THREEPENCE PER WORD, minimum charge THREE SHILLINGS. DEPOSIT SYSTEM

As the Publishers cannot accept responsibility for the bona fides of advertisers in this publication, they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom double fees are charged.

The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to

"AMATEUR WIRELESS" ADVERTISEMENT DEPARTMENT
58/61 FETTER LANE, LONDON, E.C.4

PATENTS.—Trade Marks, Advice Handbook free.—B. T. King, Regd. Patent Agent, 149a Queen Victoria Street, London.

DECORATE YOUR LOUD-SPEAKER YOURSELF. Transfers giving painted effects on Fabric, Wood, Metal, etc. Sample and catalogue 1/-. A.W., Axon Ltd., Jersey, England.

ALEXANDER BLACK, Wireless Consultant, will call and cure your set. (London and Home Counties). Radio Association appointed representative. Components and McMichael Portables on hire.—55 Ebury Street, S.W.1. Sloane 1655.

WIRELESS NOTES.—For all those who want the best in Radio, Gramophone, or Television.—Post card for particulars to Capt. Robinson, Langmead, Pirbright, Surrey.

ELIMINATOR TRANSFORMERS for Westinghouse H.T. 5, 6, and 7 rectifiers. 15/6. "Challenge Four" Coils, 10/6. Approval. Lists Free.—Edwards, 5 Bradford Street, Chelmsford.

ENGINEERS.—IMPORTANT NOTICE.—Results now to hand show that 93 per cent. of our candidates pass their Exams. at the first attempt, a remarkable record, unapproached by any other organisation and showing why we alone guarantee "NO PASS—NO FEE." If 93 out of every 100 ordinary men can succeed, why should you remain in the ranks? Now is the time to "get busy" and investigate. Our handbook, "ENGINEERING OPPORTUNITIES," explains the most simple and successful home-study methods of passing B.Sc., A.M.I.Mech.E., A.M.I.C.E., A.M.I.E.E., A.M.I.A.E., G.P.O., C. & G., Matric., etc., Exams. This book outlines Courses in all branches of Civil, Mech., Elec., Motor and Wireless Engineering, shows the unique advantages of our Appointments Dept. and includes a brilliant foreword by Prof. A. M. LOW, in which he shows clearly the chances you are missing. Send for FREE HANDBOOK now (state branch, post, or Exam.). — BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY, 109 Shakespeare House, 29-31 Oxford Street, London.

FERRANTI TRANSFORMERS.—AF3, 10/-; AF4, 8/-; AF5, 17/6; OP1, 12/6. Mullard Permacore, 10/-. Vee Unit and Cone, 20/-. Wates' Double Chassis, with Hegra Unit, 15/-. All as new.—Smeeton, 9 Sansom Street, London, S.E.5.

PAY AS YOU LISTEN.—Receivers, Kits, everything you want, cash on delivery or credit. My terms *are* lowest.—R. Hillier, 10 Brymer Road, S.E.5.

"VERT" WIRING CLIP.—No soldering. No bending wires round terminals. Takes any number of wires to a terminal, any gauge. Tested and approved "Amateur Wireless." Gross (sufficient for 3 Valve set) 2/-. Trade inquiries invited.—W. Green & Son (A) Redclyffe, Horley, Surrey.

TRICKLE CHARGERS, A.C. mains, for 2- and 4-volt accumulators, no upkeep; 18/6, carriage paid.—A. Benoit, 4 Manor Gardens, Gunnersbury Avenue, London, W.3.

WET BATTERY REPLACEMENTS.—New Process Sacs, approximately 20,000 m.a., 2/6 per dozen. Particulars free.—Scottish Batteries (A.W.), Braeside, Uphall Station.

WE WILL ACCEPT YOUR SURPLUS APPARATUS (making you a high allowance) in part payment for any new apparatus, your inquiry will be dealt with promptly.—Bostock & Stonnill, 1 Westbourne Terrace, S.E.23.

BANKRUPT BARGAINS.—Lists free. Easily cheapest. Telsen Radiogrand, 9/6. Ace, 6/6. Dual coils, 5/-. Bullphone, 8/6. Polar .0001, 2/-. .0003, 2/9. Regal .0005, 2/6. Differential, 2/9. Midget .0005, 2/-. S.M. dials, 1/6. Ormond, 2/-. Cone units: Bullphone, 6/6 and 9/6; also Blue Spot. Motor, etc. Eliminators, valves, panels, cabinets, coils, switches. Three-valve kits, 35/-. Two, 24/-. Let me quote for any kit or set.—Butlin, 143b Preston Road, Brighton.

OUR BLUEPRINT SERVICE

Constructors of receivers described in this Journal should make full use of our Blueprint Service and avoid all risk of failure.

Printed in England. Published by Bernard Jones Publications, Ltd., 58/61 Fetter Lane, London, E.C.4
Sole Agents for South Africa: CENTRAL NEWS AGENCY, LIMITED. Sole Agents for Australasia: GORDON & GOTCH, LIMITED. Saturday, November 15, 1930.

OUR ONE-VALVER—A REAL LOUD-SPEAKER SET

COMMON FAULTS AND THEIR REMEDIES

Amateur Wireless

and Radiovision

Every Thursday 3d

Vol. XVII. No. 441 Saturday, November 22, 1930

Registered at the G.P.O. as a Newspaper

Here's your chance to Test NIKALLOY!

The Metallurgical Marvel of the Nickel Age in Radio.

HYPERMITE

L.F. INTERVALVE TRANSFORMER

The NIKALLOY core of the "Hypermite" gives 50 henries inductance and ensures perfect high and low note response.

NIKALLOY renders "Hypermite" the smallest efficient transformer for modern compact set assembly and use with modern valves.

NIKALLOY makes "Hypermite" the most reliable low-priced transformer obtainable.

NIKALLOY is the latest phase in the triumphant progress of R.I. Transformer manufacture; specialised experience must count.

The leading set makers have chosen "Hypermite" for inclusion in modern receivers—it is specified in most popular circuits—it is indisputably the best at its price.

Resistance primary D.C. 1,000 ohms.
Resistance secondary D.C. 6,000 ohms.
Inductance primary 50 henries.
Ratio 3½ to 1.
Dimensions overall 2⅝" × 1⅜" × 2¼" high.
Weight 7 oz.
Mounted in a neat bakelite case.

12/6

Ask your dealer or us for leaflets giving full description and technical details of the R.I. Big Nikalloy Three—the "Hypermu," "Hypermite," and "Hypercore."

STOCKED BY ALL GOOD DEALERS

MADRIGAL WORKS, PURLEY WAY, CROYDON

POPULARISING WATES GRAMOPHONE PICK-UP

GIVEN FREE!!

TO EVERY PURCHASER OF A

WATES

STAR PICK-UP DURING THE MONTH OF NOVEMBER, WILL BE GIVEN FREE, A WATES PICK-UP ARM, AS ILLUSTRATED.

Pick-Up Arm is finished to match the Pick-Up.

The value of a gramophone can be greatly increased when a pick-up is used. The Wates Star Pick-Up immediately gives ordinary gramophone music a life-like reality that brings out all the more subtle sounds with a purity and accuracy of tonal value that is amazing.

This unique free offer enables you to fix a pick-up to your gramophone without interfering with the ordinary sound box. You can, therefore, not entirely dispense with the old method of reproduction until experience has proved to you the infinite superiority of the Wates Pick-Up.

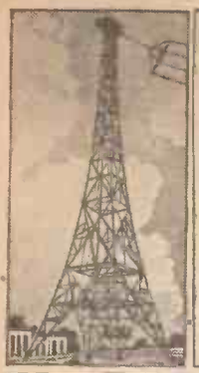
THIS OFFER WILL DEFINITELY TERMINATE ON NOVEMBER 30th, 1930.

Buy your Wates Pick-Up now and take advantage of this offer. If any difficulty regarding supply, write direct giving name and address of your usual radio supplier to :

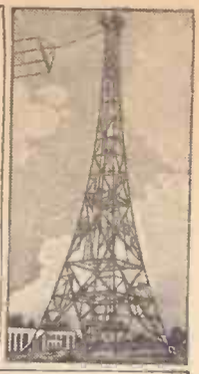
THE STANDARD BATTERY CO.,
(Dept. A.W.),
184/188, Shaftesbury Avenue, London, W.C.2.

M.B.

No. 441. Vol. XVII. NOVEMBER 22, 1930



Amateur Wireless and Radiovision



EDITOR: BERNARD E. JONES.
TECHNICAL EDITOR: J.H. REYNER, B.Sc., A.M.I.E.E.
THE LEADING RADIO WEEKLY FOR THE CONSTRUCTOR, LISTENER & EXPERIMENTER.
RESEARCH CONSULTANT: W. JAMES.
ASSISTANT EDITOR: H. CORBISHLEY.

NEWS · & · GOSSIP · OF THE · WEEK

A GERMAN REGIONAL SCHEME

BY the time this appears in print the first of the new German Regional stations will be making initial tests on 360 metres. This station is situated just outside Stuttgart and, having a power of 70 kilowatts in the aerial, should be heard very well in England. If this new Stuttgart station proves successful then existing German stations will be dismantled in turn and two other regional transmitters will be built to cover the northern and middle areas of Germany. The new Stuttgart station serves the south.

An aerial view of Broadcasting House, which is fast nearing completion. The building, in plan view, bears a striking resemblance to a ship. The main entrance and offices occupy the whole of this corner of the building

FOOTBALL BROADCASTS

IT is high time the whole question of football broadcasts was ventilated because it certainly does appear that the B.B.C. and listeners are on the losing side in the war between the First Division clubs and those anxious to give broadcasting facilities. A Savoy Hill official says that all the leading First Division clubs were approached, at the beginning of the season, with the suggestion that running commentaries should be broadcast from their grounds—a fine idea, in view of the millions of football fans. Every club, except the Arsenal, refused, without giving any explanation.

BEHIND THE SCENES

THE League Management Committee, it is suggested, has put pressure to bear on the clubs and presented the argument that broadcasting facilities will bring down the "gate" attendance. It looks as though we shall have to be content with the broadcasts from the Arsenal ground. This Saturday, November 22, the second half of the Arsenal *v.* Middlesbrough match will be relayed; on December 20 the Arsenal *v.* Newcastle United match, and on December 26, the Arsenal *v.* Manchester City match.

THE CASH QUESTION

SOMEONE is making a big mistake if it is supposed that running commentaries cause a decrease in the "gate." On the last occasion when a broadcast was made from the Arsenal ground there was an attendance of 65,000. Soccer officials seem to take a peculiar view of this side of broadcasting. All the important Rugger matches are being relayed, including the Oxford *v.* Cambridge match.

PRINCIPAL CONTENTS

THE KING'S MICROPHONE

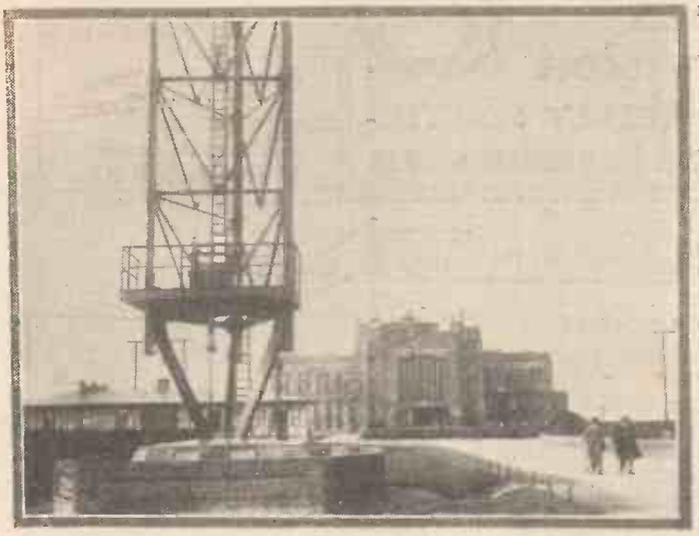
WHEN H.M. the King opened the Indian Round-Table Conference in the Royal Gallery of the House of Lords, he again used the special gold and silver microphone which is known as the "King's microphone." This instrument, which has a solid silver body, embellished with the Royal Coat of Arms and Cipher in gold, is reserved for the exclusive use of His Majesty. A silver plate on the case bears the record of the nine previous dates on which it has been used, the last being the opening by His Majesty of the Five Power Naval Conference, also in the Royal Gallery of the House of Lords, in January.

A "BOTTLED" BROADCAST

DID you hear the broadcast gramophone record of the King's speech? The quality was amazing and there was not a flaw in the recording to suggest that it was not an original broadcast. There should be greater use made of this method of "bottling" events for re-transmission in the evening when all listeners can hear: midday broadcasts never have a large audience. It is very interesting to recall that about

NEWS & GOSSIP OF THE WEEK —*Continued*

four years ago when the Editor of "A.W." was visiting Savoy Hill, he suggested that a speech by the Prince of Wales which was then being given should be recorded for re-transmission later in the day. Various difficulties arose to prevent this, but the King's speech record last week shows that it can be done.



An unconventional view of Nauen, the big German station housing seven short-wave transmitters! New plant has just been installed, and new aerials erected, the base of one being shown to the left

THE BROADCASTING HOUSE RACE

AS you probably know, Berlin now boasts of a new Broadcasting House, containing studios, offices and a radio museum. It looks as though it will be in full working order before our B.B.C. Broadcasting House, in Portland Place, is ready, but it may not be so vastly superior, as some B.B.C. critics think. "They are making wonderful progress with Broadcasting House," says an "A.W." correspondent who was in Regent Street yesterday. "The concrete floors are complete right up to the seventh, and the outside cement work has already grown up to the fourth storey. From the front entrance end the building appears to be not far short of complete."

ARTHUR BURROWS AGAIN

ARTHUR BURROWS, "Uncle Arthur" of the old 2LO days, who is now the secretary of the Union Internationale de Radiodiffusion, is having a busy time. The U.I. de R. has just finished a Conference at Budapest. The Union helps listeners to get interference-free reception, for one of its duties is to act as an ether policeman. The Union is also developing its "Internationale" side and is making arrangements for Continental travellers who want to take their portable sets with them. Previously duties, customs bothers and local taxes have made travelling with a portable set a difficult business.

AN AMERICAN RELAY

MAKE a point of listening this Saturday, between 8.45 and 9 p.m., to a novel American relay, atmospherics permitting! This will be a running commentary of an American Rugger match between Yale and Harvard, and should be a "hot" commentary full of Americanisms. It will be during the last quarter-of-an-hour of play, and it is hoped to convey something of the intense keenness of American sporting crowds as the climax of the game is reached.

A RADIO-THEATRE WEEK

AS "Thermion" announced last week, the theatre and wireless interests in Germany have arranged a "week" for their mutual benefit. Every night extracts from popular shows will be broadcast and it is hoped that this will encourage playgoers to listen-in and, conversely, attract listeners to the theatre.

A NARROW ESCAPE

AN artiste who came within an ace of having his career ended by bootleggers is George Parr, who broadcasts on November 27. On his arrival in a "moonshine" district of Kentucky he was suspected of being a revenue officer on the prowl and was obliged to stay in his hotel until the local inhabitants had been reassured!

FOR CONSTRUCTORS

THERE is a novel idea described in this issue for set home-constructors—a one-valver capable of working a speaker at really full volume. A pentode is used in a novel circuit, and in this way you save the cost and running expense of a power-amplifier stage. No "hefty" high-tension batteries are required: the high-tension consumption is only 10 milliamps. Turn to the centre pages for full details.

OPTIMISM IN CZECHOSLOVAKIA!

THE Czechoslovak radio authorities seem determined to please listeners, and they have copied the idea first tried out in Denmark. They have just issued a form which is to be filled up by radio listeners. Questions are to be answered regarding the popularity of each type of broadcast. It is not compulsory, as in Denmark.

ARMCHAIR ACTORS

RADIO actors appear to be in for a very easy time if the B.B.C. copies a new Continental idea. In a play recently transmitted from Lille, two of the principal parts were broadcast by the actors from their own sitting-rooms. By following the play with phones every member of the cast was able to take his "cues" just as promptly as if all the actors had been together in the studio.

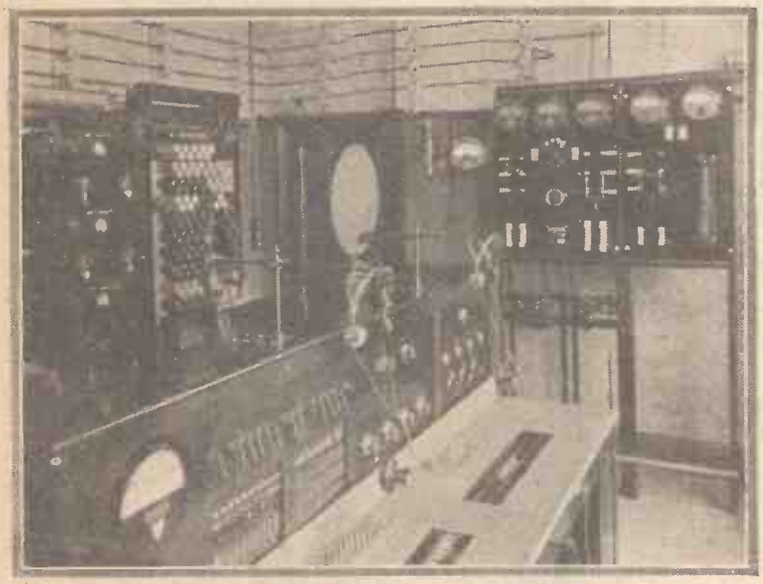
The "ghosts" who participate in a Cardiff programme entitled "Phantomime," on December 2, will be entirely friendly.

Short waves and Army tanks. Here is the radio gear, described in last week's issue, which is being tried by the Army officials on the new Vickers-Armstrong tanks. A wavelength of only 8 metres is used. Note the copper-tube vertical aerial on top of the tank

The TRUTH ABOUT THE B.B.C. LANDLINES

Many complaints have been made of the quality of land-line transmissions. This article by Alan Hunter explains the difficulties that exist and indicates that the near future will see a considerable improvement

WITH four thousand miles of G.P.O. telephone lines in the B.B.C.'s simultaneous-broadcasting network, it is natural to ask questions about the present efficiency and the possibility of ultimate improvement in land-line technicalities. Some listeners go much further than tentative inquiry and condemn the B.B.C. for the poor quality of all land-line transmissions. From Scotland and the North come not infrequent complaints about the inferior quality of a land-line relay as compared with the actual broadcast.



The combined S.B. and corrector disk ; on the right is the power-board and automatic alarm lamps

With the object of clarifying the present land-line situation for AMATEUR WIRELESS readers, I recently had a long discussion with a B.B.C. official. Although the B.B.C. is, first and last, a broadcasting organisation, a special "lines" section has been found essential. And with the growth of the Regional Scheme this department will have still more responsibility in the maintenance of the high standard of quality for which the B.B.C. always strives.

The S.B. Network

At the present time the "S.B." network radiates, from London, to Bournemouth in the south; Plymouth in the south-west; Cardiff and Swansea, via the Gloucester repeater, in the west; Brookmans Park, Daventry, and Birmingham in the midlands; and so through Stoke to Manchester in the north; up through Leeds and Newcastle to Glasgow in Scotland; and, finally, to Edinburgh, Dundee, and Aberdeen in the north of Scotland. Most of these connections are made through overhead wires. Only ten per cent. are underground cables. The distinction between overhead and cable wires was made clear by the B.B.C. With overhead wires there is no great difficulty in balancing up for a good frequency response, as required for the *faithful* transmission of speech and music, and as distinct from the less stringent G.P.O. requirement of *intelligibility*.

The drawback of the overhead system is its unreliability in bad weather. Trees fall across the wires; insulation breaks down; shorts develop, poles collapse, and various other calamities occur that spell interruption of the broadcast service. Buried cable would, therefore, seem to be the sensible alternative method of linking up the various points in the B.B.C.'s system. Unfortunately, there are not yet enough cables available. And the characteristics of those already down cannot easily be modified to suit the broadcasting need of a wide frequency response. The London to Brighton cable, for example, cuts off at 2,200 cycles.

That there is no insuperable difficulty in obtaining a wide frequency response from cables is illustrated by the new lightly-loaded cables in Belgium and Germany, where frequencies up to 7,000 cycles are handled, compared with the 3,000 cycles adequate for commercial speech.

The B.B.C., wholly in the hands of the G.P.O. for land-line improvements, must therefore, make the best of existing facilities. Whatever justification for complaint there may be at the present time, the extensive co-operation between the B.B.C. and the G.P.O. may be taken as a good sign. The engineers of the B.B.C. stress the fact that they derive the utmost support and help from the Post Office.

New Cables

The installation of a new type of cable by the G.P.O. bears out this contention. In the near future this new cable will be available to the B.B.C., between London and Manchester, via Leeds. As the frequency response will be between 50 and 7,000 cycles, the new connection will give good quality with the utmost reliability.

Scottish and West of England listeners can also take heart from the fact that this new type of cable will subsequently be extended to Scotland and the west.

To those who question the G.P.O.'s delay in extending high-quality cables, the answer is given that the capital cost of cables is extremely high. Once installed, though, the maintenance cost is low and the reliability of a high order.

It was interesting to learn that the present overhead wire land-lines, with the B.B.C.'s balancing, give a frequency response from 100 cycles to 7,000 cycles. This balancing is not affected by weather conditions, which produce background

(*Continued at foot of next page*)

For the Newcomer to Wireless: SCREENING

WHAT exactly is the purpose of screening the high-frequency valves in a receiving set?

To put it in a nutshell we may say that it serves to confine each valve and each circuit strictly to its own particular job.

I don't quite follow.

You know that if you wind a piece of insulated wire into a coil and pass a current through it it becomes an electro-magnet, the strength of whose field depends upon the number of turns and the current passing?

Yes, I know that.

In other words, every coil has a magnetic field. Couple two coils tightly or loosely and the one will induce a current in the other.

As in transformers, reaction couplings and so on?

Yes. You have mentioned what we may call wanted couplings; don't forget that there may be also unwanted couplings.

I begin to see.

When there are two high-frequency stages, or one high-frequency stage and detector undesirable couplings will exist between their circuits if we don't take steps to prevent them. And don't forget that high-frequency currents can be conveyed from one circuit to another in another way besides induction.

By capacity I suppose you mean?

That's it; capacity couplings are responsible for a great deal of instability in unscreened sets.

Then what is the effect of screening?

In the first place the screen prevents inductive couplings since it obviates interaction between the fields of the two coils between which it stands. Secondly, it cuts down capacity couplings owing to the way in which it is arranged.

How is that?

The screen is earthed. When it is placed between two conductors of different potentials each has a capacity to earth *via* the screen and their capacity to one another is thus minimised.

I follow that all right; but here's a point that I don't quite see. Supposing that I am building a three-valve set consisting of one high-frequency stage, detector and a note-magnifier; wouldn't it be sufficient just to screen the rectifying stage? In that case there would be no interaction between it and the high-frequency stage, which is all that one seems to want.

To make a receiving set selective enough to cut out a local station at short range, or a high-power station at medium range, all high-frequency circuits as well as those of the rectifier should certainly be screened, or what is known as direct pick-up is liable to occur.

What is that?

You know that you can receive stations on a frame aerial?

Of course!

Well, a frame aerial is simply a large coil. Any coil is liable to act to some extent as a miniature frame aerial and to respond to a very powerful nearby transmission. By screening the coil we can prevent this transmission from setting up currents in its windings.

"THE TRUTH ABOUT THE B.B.C. LANDLINES"

(*Continued from preceding page*)

noises or complete breakdowns.

Half an hour before a broadcast involving a landline, B.B.C. tests are made to ensure a good frequency response and freedom from background noises. Occasionally, a fault develops between the time of the test and the actual broadcast. Then a hasty changeover has to be made and re-balancing done. Sometimes, the B.B.C. admits, quality is below par, due to the fact that it is definitely impossible to appropriate a good connection. The entertainment value of the broadcast is sometimes considered so great that the B.B.C. allows a loss of quality rather than omit the item altogether. This state of affairs is uncommon, occurring only when something very important is being played or said in some out-of-the-way location.

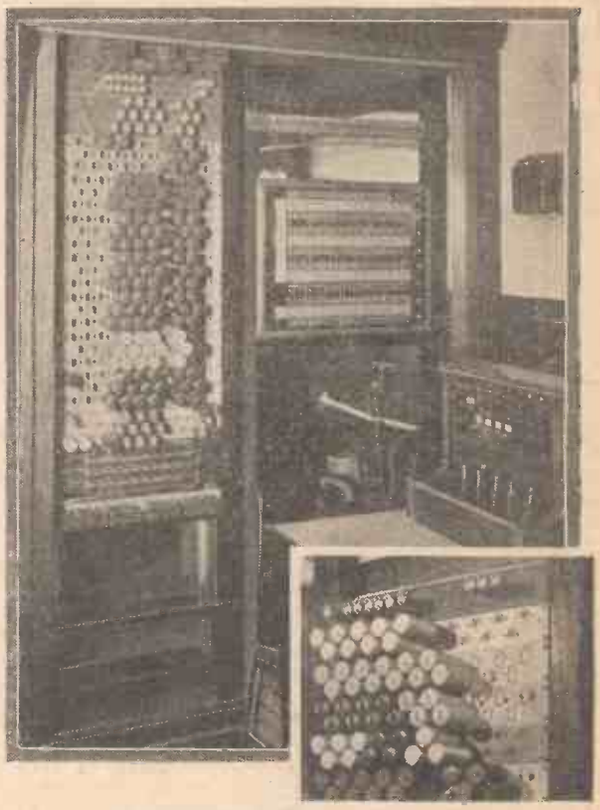
What Balancing Can Do

Asked why some landline transmissions sounded as though the music was being played through a pipe, as noted by several AMATEUR WIRELESS readers, a B.B.C. official said that the normal balancing process only counteracts attenuation or the falling characteristic in a line; it cannot counteract odd "peaks" in the response curve. These peaks can be produced when an overhead wire has been poorly balanced with an intervening section of cable, usually at the point where the line runs through an intervening town. Such peaks would introduce high-note resonances, giving the "pipe" effect. Generally speaking, the aim is to correct the lines so that the output at one end has the same frequency characteristic as the input at the other. And this is, normally, quite practicable.

The complaints from Scotland about landlines usually relate to background noises and not to poor quality. All the normal B.B.C. lines in the S.B. network are corrected for frequency response. This B.B.C. claim may surprise some grumblers.

The suggestion has been made, in more than one quarter, that to eliminate all landline difficulties, the B.B.C. should link together its broadcasting centre with its own special cables. But, quite apart from the fact that the G.P.O. has the monopoly on all British landlines, the cost of such a scheme would involve millions of pounds, for the laying rights of installation and for the staff for maintenance.

B.B.C. listeners must, therefore, resign themselves to the new G.P.O. cable scheme, whereby the B.B.C. is confident that good quality will be successfully achieved.



The S.B. Loard relays and fuse panel. Inset is an enlarged view of the relays.

NEXT WEEK:

Two Special Features—A Unique Linen-diaphragm Loud-speaker and a Short-wave Distance-getter

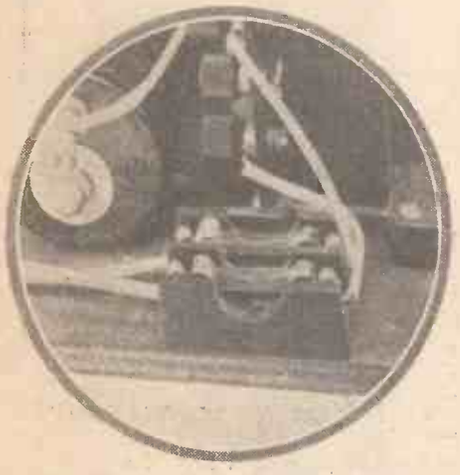
Here KENNETH ULLYETT dispels the idea that a mains-worked set is dangerous to handle—

—and it is explained how to avoid all possibilities of shocks and short circuits, using simple "gadgets"

MAINS WORKING IS SAFE!

RECENTLY a neighbour of mine decided to install a mains eliminator to work his set, but he was rather discouraged on mentioning this to a few friends, for they hinted at all manner of dangers that attended mains working.

So he came round to see my set, which works from the mains, and to find out whether or not there is any danger. To



"For safety's sake you should have a fuse in each mains lead. . . ."

cut a long story short, I convinced him that the supposed "dangers" arise chiefly from the incorrect use of sometimes poorly chosen mains units, and I promised to show in the installation of his eliminator how these difficulties sometimes crop up.

Mains Prejudice

It would seem that many people are still of the opinion that there is a constant danger of shocks and perhaps even greater harm with high- or low-tension eliminators, and although much of this prejudice exists from the early days of eliminators when manufacturers did not turn out apparatus complying with the I.E.E. regulations, there is no doubt that many good units to-day give trouble and subsequently "blow up" or fuse because they are poorly fitted.

Mains eliminators are generally supplied complete with a length of flex for the mains input, and although I know this has been pointed out time and time again, it must not be overlooked that in the cheaper eliminators, generally of Continental manufacture, some of the flex is really dangerous after about a year's use, for the rubber perishes and short circuits are likely to happen; and if they do happen the house fuse blows —not in itself a serious thing but sufficient to make the average non-technical radio man believe that the mains unit is dangerous.

This can be cured at its source by fitting stouter flex if it appears necessary. Ordinary twisted lighting flex is obtainable in three or four thicknesses, and as only a couple of yards or so, at the most, will be needed, there is no point in saving a few pence here.

Safety with Plugs

On no account make twisted connections to the mains point, but employ a proper recessed-contact plug and socket. It is not safe to assume that the switch usually fitted to domestic wall-plugs entirely insulates the eliminator when it is switched off. Generally it "breaks" only one of the wires, and with most mains circuits this means that you can still get a shock, if only a small one, by touching the other wire.

For a small sum you can purchase insulated switches which are connected in the flex line itself, and these completely insulate the eliminator.

Many set-users have a wrong idea about fuse-blowing. If a fuse blows through a fault in an eliminator or in its connections, do not blame the fuse! A fuse is the safety valve of an electrical circuit.

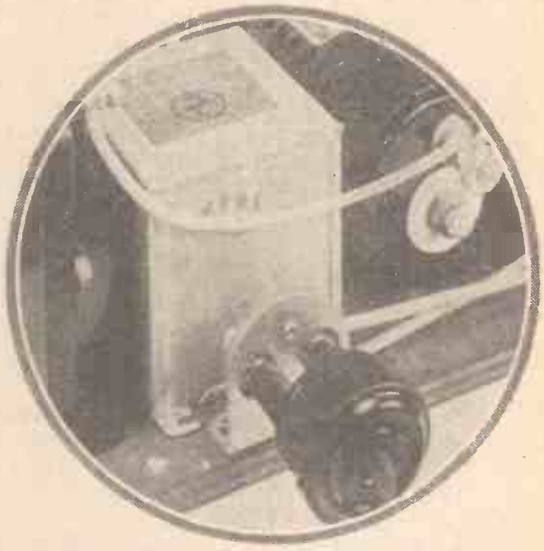
For safety's sake you should have a fuse in each mains lead, in the eliminator itself, at the input terminals to it, or down by the mains plug. Small insulated fuses can be purchased for this job.

It is no use fitting a fuse unless a ready supply of fuse wire is at hand in case of a blow-out. A small spool of (usually) 5-ampere fuse wire should be hung near the mains fuse box of the house, while thinner wire should be at hand near the mains eliminator.

If you buy an eliminator of a good make you need have no fear that it will give trouble through internal short circuits. The general practice nowadays is to paint over the components with a heavy insulating compound when all the wiring is done, and this obviates the possibility of short-circuits. If you make up your own eliminator you should take equal care to see that all the parts are firmly screwed to the base-board so that they cannot rattle loose and touch one another. In most alternating current eliminators there is often a certain amount of vibration of the power transformer and choke, and this must be watched.

Some eliminators are provided with metal rectifiers, either of the Westinghouse or Igranic-Elkon type, but there are certain eliminators employing an electrolytic action, and when topping up the rectifier cells the makers' instructions should be carefully followed.

A certain amount of trouble arises in some eliminators because their users forget that the voltage given is greater than that of the dry batteries generally used. Even an extra 50 volts high tension in a set may



"On no account make twisted loose connections to the mains point, but employ a proper recessed-contact plug and socket"

cause trouble unless provision is made for this greater voltage.

Cheap paper-dielectric condensers of doubtful manufacture may stand up to a steady 80 to 100 volts from a dry battery, but the insulation may break down under the strain of the 120 or 150 volts given by a

(*Continued in third column of page* 808)

COMMON FAULTS—and Their Remedies

Common faults are not always due to the most obvious reasons. Below, W. James gives some practical hints on locating the probable causes

WHEN a fault crops up, what do you do—test systematically or try various things in an endeavour to find the fault?

Most of us are able to spot the numerous small things which seem always to be cropping up when numbers of sets are tried and experimented with. But to some readers the finding of faults is a difficult matter, and I therefore propose to note a few of the common ones.

What is likely to be the matter when the set is noisy? First take off the aerial and earth. If the noises go it is clear that they are produced in the aerial or earth circuit. The aerial may be touching the roof, the lead-in insulator may be broken, or the aerial insulators.

Eliminating Noises

It is possible that the aerial or earth wires may be fractured or making a poor contact somewhere. Should the noises persist with the aerial and earth removed, pull out the first valve in the set, then the second, and so on, so as to discover, if possible, which part of the circuit is noisy.

If you find that with one of the valves out the noises cease, then examine that circuit. Look for a loose connection, a faulty coil or transformer, or a poor condenser.

Perhaps the set is dusty. Dust may have collected on the vanes of the tuning condenser or a valve holder may be faulty.

An old dry battery, whether used for high tension or grid bias, will usually produce noise, and, of course, a poor connection anywhere. Do not overlook the external connecting wires, plugs, and loud-speaker wires.

When the tuning appears to have become sharper than usual, we may look for a fault in the aerial circuit. Perhaps the aerial has become disconnected, or the earth. When there is a screen-grid valve, look at the supply to the screen. If this supply is missing, or if the voltage is too low, the tuning will appear sharper than usual and the volume will be down.

Very often the reaction effect becomes less after a time. This is usually a sign that the batteries are running down. The detector valve may, of course, have been injured, but, as a rule, the trouble is due to batteries only.

Poor selectivity may be a sign that a leakage is occurring across a tuned circuit, but, as a rule, when the selectivity becomes noticeably poor the fault is to be found in the aerial circuit.

Lack of volume may be due to many things. A run-down battery is perhaps the most likely fault. Valves gradually lose their effectiveness, and so do loud-speakers. When there is a sudden fall in the volume the fault is probably a more serious one, such as a breakdown of one of the parts.

You should start with the aerial circuit, however, looking over the aerial, earth, switch, and connecting wires. Then go over the set, looking for a broken wire, such as a dry joint or a poorly fitting contact at a terminal.

Tuning coils sometimes break down and switch contacts fail. Usually, however, a faulty part or a poor contact will also produce noise. I know of one case where poor volume was found to be the result of joining the filament accumulator the wrong way round.

When anode batteries appear to discharge rather more quickly than expected, look first at the grid bias to the power valve. Make certain the bias is sufficient. Then, if you have a milliammeter, connect it in the high-tension negative wire to the set and note the current taken by the different valves, testing them one by one. Some screen-grid valves are very greedy, taking 7 or 8 milliamperes. You will probably find that this current can be reduced considerably by lowering the screen voltage.

Mains Working

If you have a high-tension mains unit and a hum is heard, try first placing the unit well away from the set, and place the mains wires away from it, too. Then note whether the hum can be cut out by altering the adjustment of the resistances usually provided.

If so, then the filtering may not be good enough and a 2-microfarad condenser might be tried across the different taps.

An overloaded mains unit will hum, as a rule. Therefore, try reducing the hum by increasing the bias on the power valve. This lowers the current, and may also cut down the hum.

If you get a noise when the variable resistances of the mains unit are tapped, the supply is unstable and poor results may well be expected. Some units have a number of fixed tappings. You may hear a noise when one of the circuits is joined to a particular tap, showing that tapping to be faulty.

Intermittent reception is usually the result of a poor contact somewhere. Look for a bad grid-leak connection, a poor switch contact, or faulty condenser.

Generally, noise is heard, and by banging the set a poor contact hardly to be seen may be turned into a complete disconnection. A bad screen-grid valve, if it has a grid condenser and leak joined to it, may cause this trouble.

Motor-boating

Motor-boating indicates a faulty high-tension supply, as a rule, or a discharged grid battery. A high resistance in the grid-battery circuit may produce motor-boating, or in a push-pull stage the failure of one of the valves.

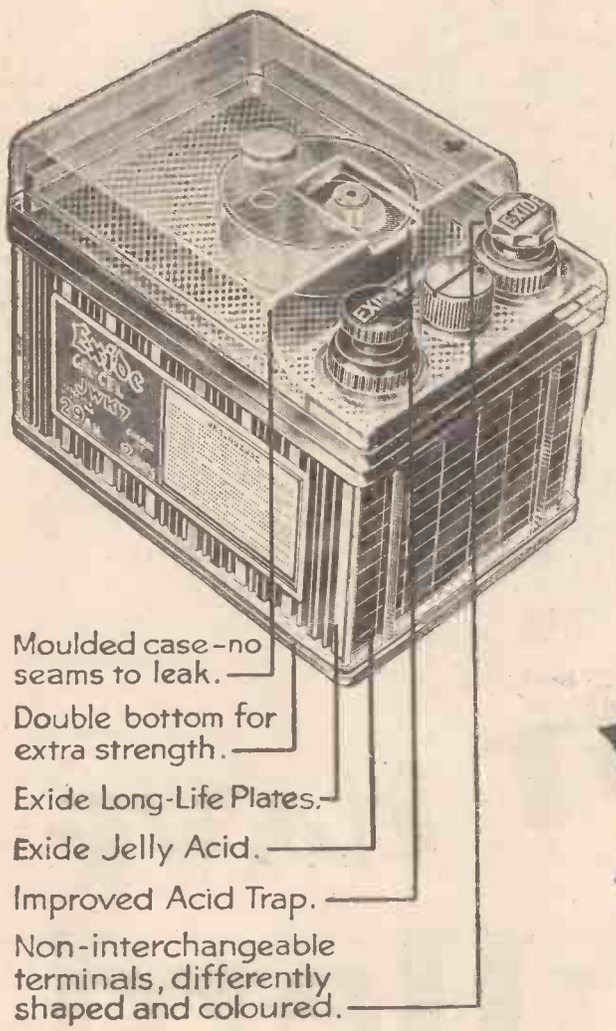
Valves do not often go soft in these days, but if one does while in use in a set you will notice at once a loss of volume and a change in the quality of the reproduction.

VOLUME CONTROL

ONE form of volume control is to use a variable aerial coupling, preferably regulated by a differential condenser so as to avoid de-tuning. Another very simple method of control is by means of a filament rheostat. With mains-driven sets, however, the best plan is to adjust the grid-bias so as to regulate the "sensitivity" of one of the H.F. stages. If the latter is normally biased near the bottom bend of the curve, an increase in negative grid-bias diminishes the effective grid "swing," *i.e.*, lessens the volume, whilst a decrease of negative grid-bias produces the opposite effect. The fact of working "over the bend" of the curve does not introduce distortion in the H.F. stages. M. B.

The Postmaster-General informed Lieut.-Commander Kenworthy recently that no scheme had been submitted to his Department for subsidising a national theatre from wireless licence revenue.

Voted—
the best battery
in Wireless World public Ballot



AGAIN an Exide Battery has won first place in the "Wireless World" Olympia Ballot. Every year an Exide Battery wins this distinction. This now-famous Ballot is voted in by the more advanced wireless experimenters—men who know what to look for in a battery. In the Exide Gel-cel—the new jelly acid battery—they have seen advantages never before available in a low tension battery for portables. Examine them yourself and when next you need a battery for a portable set you will insist on an Exide Gel-cel.

Exide
GEL-CEL

There is a size to suit every set. Prices range from 13/-

From Exide Service Stations or any reputable dealer. Exide Service Stations give service on *every* make of battery

Exide Batteries, Clifton Junction, near Manchester. Branches at London, Manchester, Birmingham, Bristol and Glasgow

On Your Wavelength!

AN AMAZING WEEK

I AM writing during a period of wonderful wireless events. To begin with, there was the Heinz simultaneous banquet at which all the guests sat down at the same moment, though the time was actually half-past six in the evening in the U.S.A., half-past eleven at night in this country, and breakfast time in Australia. The wireless part of the business practically monopolised the world's long-distance radio telephone links. It included speeches from the President of the United States and other big people, all of which were heard to perfection by the guests in each country. Then there was the wonderful demonstrations given to the Empire delegates, during which telephone conversations were carried on in places in many parts of the world. Another big event is still to come as I write, though it will be a matter of history by the time that this note appears in print. We are to hear the King once more when he opens the Indian Conference. Lastly, there was the wonderful relay of the Armistice Day service at the Whitehall Cenotaph, which seems to be better and better done every year. Indeed a thrilling time in wireless history.

WATCHING FADING

I AM perfectly serious. I really mean what the heading of this paragraph says. I have actually been *watching* fading—or perhaps I should say watching its immediate effects. You can do so quite easily yourself if you have a set with a couple of good high-frequency stages and an anode-bend detector. All that you have to do is to rig up a sensitive milliammeter reading from about 0 to 1.5 or 0 to 2 in the plate circuit and tune in a station, such as Nürnberg or Cologne. The stronger the carrier wave, the higher is the reading shown by the milliammeter, and vice versa. But by watching the milliammeter you can detect fading when the ear hardly notices it. The other night, for instance, when Turin was heard as a perfectly steady signal, he was showing a very distinct though slight fading to the eye. The process was absolutely regular, the same number of seconds always elapsing between one point of greatest strength and the next. What is amusing is to tune in station after station towards the lower end of the band and to count the duration of the fade. You may also get some surprises in the strength of carrier waves. You will find that Turin, Toulouse, Rome, Kalundborg, and Radio-Paris all show terrific carriers. They are not quite equal in strength actually, and this is probably because their modulation differs. I think I am right in saying that Toulouse modulates on the frequency system, though I don't know any other European station that does so.

ASTONISHING FIGURES

WHEN you come to work out the overall magnification that you get from a really big set, it does really run to something rather astonishing. For a day or two last week I was using a really large fellow borrowed from a friend. It contained three screen-grid H.F. amplifiers, a detector valve, and one note-magnifying stage. Since the circuits are pretty efficient, we can take it that we are getting something like a magnification of 40 per stage out of the S.G.'s. This comes to 40 x 40 x 40, or 64,000 on the H.F. side alone. The L.F. transformer used as a step-up ratio of 3½ to 1 and the magnification of the output valve is probably of the order of 3. Leaving out the detector, therefore, the total becomes 672,000. Of course, with a set like that you can receive even stations like the tiny Swedish relays at full loud-speaker strength, but the amount of amplification that has to be done in order that the loud-speaker may raise the roof serves to show how almost infinitesimal is the power that reaches one's aerial from a distant station.

STILL BIGGER!

I EXPECT that you will think that I have got a swelled head or a swelled set, or something of the kind, when I tell you that to-day I have been using something still bigger even than the set described in the last paragraph. I really have. And, what's more, I hope to have a bigger fellow still in operation next week! These fat sets certainly are a joy to use, provided that they are well designed, for they do bring things in with a punch. On the overcrowded broadcast band, though, it is not all jam—or, rather, I should say it *is* inclined to be all jam, owing to the unsuspected heterodynes which the extra amplifying power brings up. To be able to run round Europe with comfort you want big magnification and a very high degree of selectivity. Whether the Stenode will do this I hope to discover before so very long, for I have been bothering everybody, all most night and day, in order to obtain delivery. To receive stations like Gleiwitz and Moravska-Ostrava, which are but one channel apart from the Brookmans Park National, and Graz and Stuttgart separated by the same extent from the Brookmans Park Regional, seems almost too good to be true. Anyhow, I will let you know whether it does or does not do so either in next week's notes or in those of the week after. I may add that my house is a very good place for a test of this kind, since I am only fifteen miles from Brookmans Park and mine happens to be a locality in which both stations come in with a particularly vicious punch. If it lets me hear all or any of these four stations with "Noisy Nat" and "Raucous Reg" at work, I will certainly take off my hat to it.

A SUPER-HET. BOTHER

IT is a long time now since I prophesied that the super-het. might return to popularity, provided that an up-to-date form was produced which could do away both with the unpleasant hissing of older types and with the distortion that was always present when they were in use. My experiences with a big super-het. recently confirm this belief, for there is no doubt that by careful design this kind of set can be made to give almost if not quite the same quality as a "straight"—and that, too, without any unpleasant background.

There is still, though, one big problem about the super-het. which no one seems yet to have been able to solve. This is what is known as second-channel interference. As you know, impulses brought in by the aerial are beaten up by means of a local oscillator to a much longer wavelength, which means, of course, a lower frequency. This is done by tuning the oscillator so that its frequency differs from that of the aerial by exactly the natural frequency of the I.F. circuits. A moment's thought will show that you can thus tune in a station at two different settings of the oscillator, one giving a frequency above that of the received signal and the other a frequency below. In the case of very strong stations at short range there may be two main channels and two subsidiaries, which means that you can hear the station at four different settings.

A TROUBLE

THE bother about this second-channel business is that it cancels out to a large extent the natural powers of the set. It ought in theory to be able to receive, say, fifty or sixty stations on the medium-wave band, but if each occupies two separate and distinct channels the number is very much cut down, since some second channels blot out other stations. In the most modern super-hets. a great deal has been done to get rid of second-channel interference, and so long as you keep the oscillator and the frame in step it isn't much of a nuisance, except when you pick up a very powerful station which may force its way through on a second channel.

THE S.G.'S OPPORTUNITY

TO my mind, the time is ripe for the super-het. to-day as it never was before. In the days when receivers of this type achieved a certain amount of popularity we had nothing but the triode valve to act as intermediate amplifier, and this introduced a variety of complications. The intermediate-frequency circuits, for example, had to be neutralised, or to be held down to earth by damping introduced *via* a grid potentiometer. The screen-grid valve has made straight the path for the super-het. designer, for in its most up-to-date form plate-grid capacity is small enough to be practically negligible, which means that highly efficient circuits can be used without there being any instability. Further, the screen-grid valve's amplification increases as the wavelength of the circuit goes up. Hence in an intermediate-frequency amplifier whose circuits have

On Your Wavelength! (continued)

usually a wavelength of 500 metres, or a bit more, a very high degree of overall magnification can be obtained.

ANOTHER POINT

MODERN valve design, too, has removed another objection to the superheterodyne. In the old triode days you needed about nine valves to obtain really big magnification and the filament current consumption was appalling. With bright emitters it ran to between 6 and 7 amperes at 6 volts, and when the first dull-emitters came in there was no enormous reduction, since the super-power valve needed in the last holder wanted about a couple of amperes to itself. Nowadays the S.G. has reduced the total number of valves needed to five or six and the filament current has come down to amazingly small figures. Suppose, for example, that you are using six-volt valves and that the set contains an oscillator, first detector, two S.G. intermediate frequency stages, second detector, and one note-mag., the total current works out at about .6 ampere—or a good deal less than a single-valve set needed in the funny old days of early bright emitters. The plate current for such a set is, of course, rather big, running as it does to 30 milliamperes or a little more. This, however, need not worry those who have the mains at their command, and the battery man can easily manage it from H.T. accumulators.

A RADIO ELECTION

WIRELESS, I hear, played a very big part in the recent elections in the United States. Apart from broadcast addresses by candidates, great use was made of it by the Secretary of State for Ohio, Mr. Clarence Brown, for the conducting of the actual polling and counting. In the State of Ohio, for instance, there are eighty-eight counties, each of which has its vote-counting headquarters. Officials at all of these were ordered to have wireless receivers installed so that Mr. Brown might keep in touch with them and explain step by step the proper process of vote counting. Mr. Brown spoke from his office in the State House at Columbus, Ohio, and by means of the wireless link was able to keep in touch with the whole of the officials over a wide area. It was a pretty late night for the broadcasting station people, for the results did not begin to come through until one-thirty in the morning.

WAVES AND WAVES

SIR JAMES JEANS has been delving into the mystery of the universe and finds it to be a mere wilderness of waves. There are waves of radiation, including light, heat, and those that come from Brookmans Park and Daventry, and further afield (if one has the right kind of receiver), and then there are the waves of matter. The last kind belong to the new science of wave mechanics. This is a bit beyond me; but if Sir James says it is so, who can contradict him? In my early days I was taught that the atom was the ultimate unit of matter, inconceivably small, and indivisible; but definitely solid, like a tiny cannon ball, in fact. Later, Bohr's theories converted us all to the idea of a proton nucleus surrounded by a regular solar system of whirling electrons. And now, it seems, that each atom is really a complicated system of "standing waves" localised in space. It's all tremendously fascinating, though I must say I feel more at home with the good old broadcast type of wave, in spite of the fact that they, too, can be very elusive at times.

THE PIEZO-ELECTRIC BOOM

THE piezo-electric crystal owes a lot to radio science. A few years ago it was just a laboratory curiosity. Then Cady found it would oscillate at frequencies up to and over a million a second, and so brought it into fashion for stabilizing frequency in transmission. As a means for anchoring a station down to its allotted wavelength it proved a great success. Now it has invaded the receiving side, where it is apparently setting up an entirely new standard of selectivity. The history of the piezo-electric crystal is, in fact, a striking example of how the apparently "small" discoveries of science have a knack of making their value felt in due season.

DO YOU KNOW—

that low-loss construction is still advisable in condensers? When choosing a condenser for your new set, you should see that there is not too much insulating material in the construction and that what insulating material there is, is good. High condenser losses are often the cause of poor selectivity.

that Nurnberg on 239 metres is fairly well heard now, although its power is only 2.3 k.w.? The call sign is "Hier deutsche stunde in Bayern, Munchen, Nurnberg, Augsberg und Kaiserslautern.

THE CHEERFUL IDIOT

MOST readers probably are blessed (?) with friends who simply will not do any thinking for themselves if they can get somebody else to do it for them. You know the sort of fool I mean. If he is making up a new circuit he won't bother to do for himself the small amount of puzzling out that may be required, but comes round to you and asks all kinds of silly questions. He cannot take the trouble to read the figures of voltages that the makers print clearly on their valve boxes, but needs must take up your time by asking for information on the subject. I am only too happy, as most of us are, to do anything that I can to help people who genuinely are puzzled, but this sort of fellow really does get on my nerves. I had to put my foot down on one the other day. He sent me a little note asking if I would be kind enough to explain how the screen-grid valve worked. I sent him round a bound volume of AMATEUR WIRELESS, with markers between the appropriate pages, and told him that it was really about time that he read something for himself. I commend to readers the same method of dealing with importunate seekers of information which they are too slack to dig out for themselves. Make them read AMATEUR WIRELESS, and both you and they will benefit accordingly.

OUT OF DATE

THE other day I was rather surprised to find how difficult it was to find a component which used to form a large part of the stock-in-trade of every wireless shop. I had made up a simple set intended for good-quality reception of the local station only. The tuning, though good enough to separate easily the two Brookmans Park stations at short range, was anything but knife-sharp, and it didn't seem worth while fitting a slow-motion dial to the grid tuning condenser—still less to that controlling reaction. Clearly, plain dials were indicated. I would just step out and buy a couple. In my little town we have two quite good wireless shops, both carrying fairly big stocks. But neither of them could produce the old-fashioned plain dial!

I WONDER WHY!

I WAS wondering the other day why the jack has gone out of fashion in wireless sets. Personally, I have always used it in mine, and I expect that I always shall. There is no more convenient fitting than a single-filament jack at the output end of the set. You fix the leads of your telephones and your loud-speaker to standard plugs, and all that you have to do to bring the set into action is to push in whichever one you want to use.

A QUEER STANDPOINT

AMONGST the many friends of mine who are wireless enthusiasts there are, I regret to say, one or two who, for some queer reason, cuss everything in the way of valves and components made in this country and are loud in declaiming the superiority of what comes from America. I am not denying that American components, particularly the more expensive ones, are extraordinarily good, but I am sure that they are not better than our best. As regards valves you have only to conduct a few practical tests, to assure yourself that the British-made article is in most cases very much superior to the American. Test out a batch of half a dozen American valves of the same type and make, and you will quite likely find big differences between the actual and the published characteristics. There may be differences if you conduct the same test with British valves, but they will be much smaller. But the most convincing test of all is this. Pick out good valves from each country and use them full time for a month. At the end of this period test them again and see how the curves that you get compare with those obtained when they were brand new. I am open to wager that in the majority of cases the American "toob" will show a much greater departure from its original characteristics than will the British.

THERMION.

THE HOW AND WHY OF RADIO

X—HIGH-FREQUENCY AMPLIFICATION SIMPLY EXPLAINED

If you are a beginner in wireless, now is your chance to gain a clear conception of its theory and practice. In this series of articles, specially prepared for the beginner, no previous knowledge of wireless is assumed. Every aspect of the subject will be dealt with in ensuing issues, and the whole series will endow the beginner with sufficient knowledge to enable him to derive the greatest possible interest from the fascinating hobby of wireless

WHEN the incoming signal is boosted up before detection, the process is called high-frequency amplification. Actually, the low frequencies of speech and music, super-imposed by modulation upon the high-frequency of transmission, are also amplified but the term high-frequency amplification adequately distinguishes pre-detector amplification from post-detector amplification, where only the low frequencies are amplified, since the high frequencies have been by-passed at the anode of the detector.

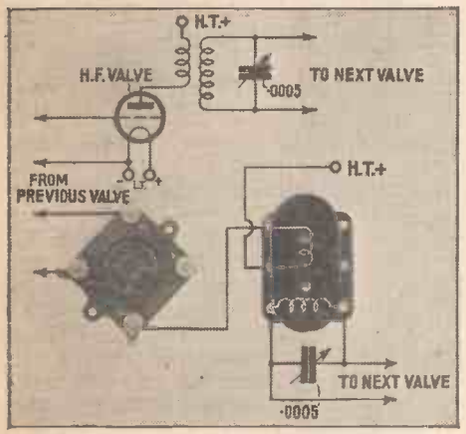


Fig. 1. A popular form of high-frequency-coupling—the transformer

Now whereas detection, namely that process whereby the high frequencies are separated from the low frequencies, can be effected with crystals and other devices apart from valves, and whereas low-frequency amplification has on occasion been carried out with suitable microphone circuits, the process of high-frequency amplification can be done only with valves. As a rule the screen-grid type is employed, although three-electrode high-frequency valves still have an application.

The valve is often quoted as the Aladdin's Lamp of radio; in no part of the receiver is such a title more justified than in the high-frequency stages. Without the valve for high-frequency amplification, distant reception would indeed be mediocre.

The need for high-frequency amplification was referred to in No. 5 of this series (see AMATEUR WIRELESS dated October 18). Unless signals are up to a certain strength the detector cannot do its job efficiently. Two things can cause the signal to be weak: the transmitting station may be hundreds of miles away, resulting in a big attenuation or falling-off in the initial signal before it reaches the receiver, and much the same condition is created by a very poor aerial, such as a small indoor wire or a frame, picking up a relatively near-at-hand station. If either or both of these factors exists, the need for high-frequency amplification is imperative.

H.F. Amplification and Selectivity

Selectivity also demands high-frequency amplification. Stations cannot be separated one from another unless several successive stages of tuning are provided. In transferring the signal from one tune to the next, some of the initial energy is lost. It is quite possible for an initially strong signal to arrive at the grid of the detector in just as poor a condition as if the station were very distant or the aerial poor. In practice a valve amplifier is inserted between successive stages of tuning, so that any energy lost in transfer is compensated.

Present-day designers of high-frequency amplifiers have always to strike a suitable balance between stage gain and selectivity.

NEXT WEEK: XI—
The A.B.C. of Low-frequency Amplification

On consideration, the beginner will appreciate that the inter-stage boosting effect might well be overdone, to such an extent that the original idea of employing successive tuning circuits to filter one signal from another would be nullified by the swamping effect of the greatly magnified signals.

Several methods are in general use for coupling together high-frequency valves. The most popular is transformer coupling. Fig. 1 shows the essential connections. The grid-filament circuit of the high-frequency valve is tuned, forming the aerial tuning circuit, if only one high-frequency valve is used. The anode circuit of the high-frequency valve comprises an untuned primary coil (in series with the anode and the anode supply) closely coupled to a tuned secondary coil. This secondary is connected across the grid-filament circuit of the detector or the next high-frequency valve. The primary and secondary windings are so tightly coupled that the primary anode circuit can be considered as tuned by the secondary condenser.

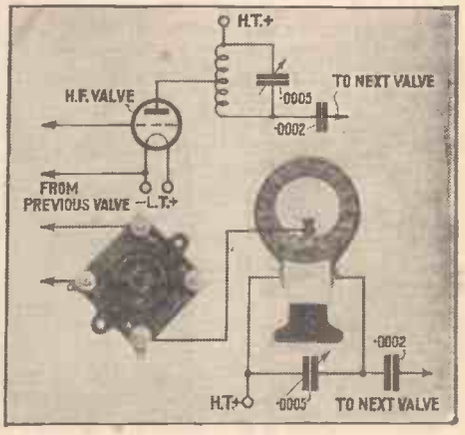


Fig. 2. The tuned-anode coupling is the simplest

Fig. 2 shows a much more simple form of high-frequency coupling. It is known as tuned-anode coupling. By using a centre-tapped coil and connecting the anode to the tap, one half of the coil acts as a primary winding, while the whole coil acts as the secondary. This is a form of auto-coupling, very popular where cheap plug-in coils are wanted.

As already mentioned, the transformer method of Fig. 1 is widely used at the present time. It has several advantages. There is a step-up of signal strength due to the 2-to-1 ratio of secondary to primary turn. This system, besides offering great amplification from screen-grid or

(*Continued in col. 3 of next page*)

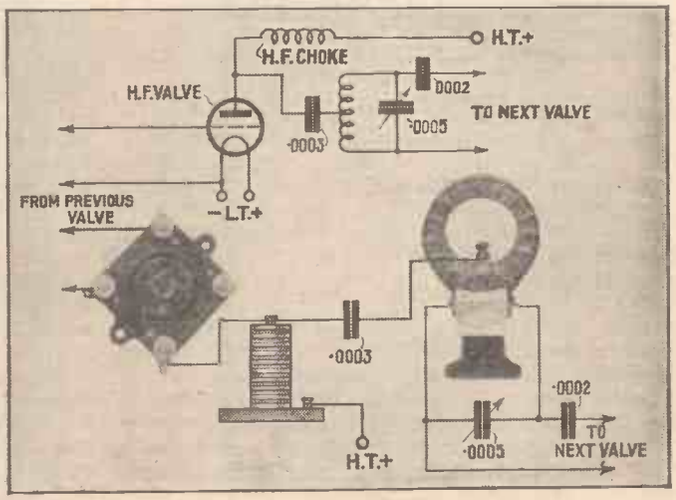


Fig. 3. Here is depicted the choke-feed system of H.F. Amplification

IN MY WIRELESS DEN

WEEKLY TIPS—CONSTRUCTIONAL AND THEORETICAL

By W. JAMES.

How Much Magnification

HOW much magnification is normally obtained from a transformer coupled stage? Knowing the ratio of the transformer and the amplification factor of the valve, we can obtain an approximate figure by multiplying them.

Thus, with a valve having a magnification factor of 20 and a transformer of 3-1 ratio, the actual magnification will be about 60 for the stage.

One must assume, of course, that the impedance of the valve is not too high relative to the size of the transformer. Also, the magnification is not uniform over the whole frequency range. The bass is sure to be less and there may be excessive magnification of the higher notes.

New Valve Ideas

I was interested to note the new form of filament suspension adopted by one of the valve makers. With rigid construction and careful manufacture, the trouble known as ringing or howling will disappear.

We must still avoid feed-back, in the set however, and also take care that the parts of the set are not thrown into vibration by the sound waves from the loud-speaker or the actual vibration of the speaker itself. Much trouble is to be traced to this cause in self-contained sets, and great care must often be taken to avoid noises.

Good Wander Plugs

In most sets we have plugs for making contact with batteries and it must be admitted that good plugs are not expensive.

A poor plug can prove very expensive, however, particularly if it happens to be included in the grid circuit of a valve. If it makes a poor contact or comes out of the grid battery, an excessive current may well start flowing through the valve.

Of course the poor reproduction ought immediately to be noted, but it is possible that something may not be considered wrong with the set for a time. Meanwhile, the high-tension supply is being over-run and the valve itself is passing a heavier current than it was expected to pass. Good plugs are therefore likely to prove well worth while in the long run.

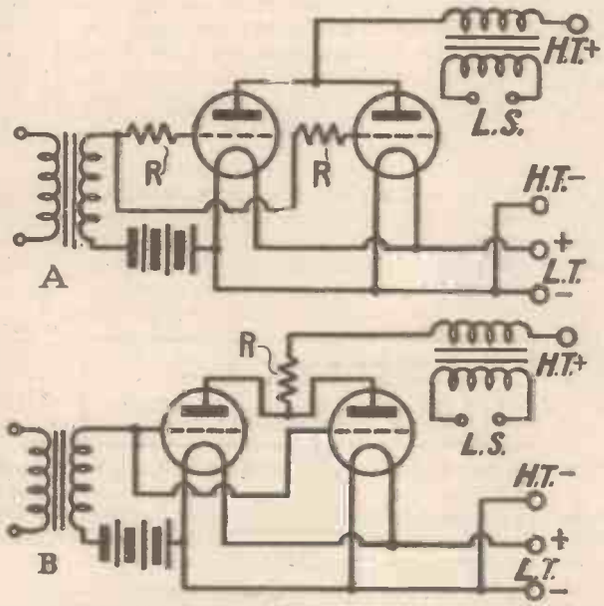
Valves in "Harness"

It is known that when valves are placed in parallel there is a possibility of high-frequency oscillations being set up.

When good transformers and modern efficient valves are used, oscillations are nearly always produced. The usual method of stopping them is by inserting the resistances R, Fig. A, in the grid-circuits. Grid leaks of 100,000 ohms are often used as stopping resistances.

The Mullard people have, however, discovered that a single resistance R, Fig. B, connected to the anode circuit is sufficient to stop oscillations. It must be non-inductive and be placed near the anodes.

A usual value is 100 ohms. Resistance wire of sufficient gauge to carry the current must naturally be used. This method is completely effective, is cheap and will no doubt be found of value, particularly in the case of large valves.



When valves are used in parallel, special precautions have to be taken to prevent high-frequency oscillation. These two methods, A and B, are described in the accompanying paragraph

Unsuitable Condensers

The small tuning condensers having leaves of bakelite or other material are not always suitable for inclusion in good sets. I have just been looking at a three-gang job and it is quite useless for the purpose of tuning these circuits together unless a separate tuning condenser is used across each.

The condensers themselves seemed fairly well made, but the capacities did not match at the few points tested. Single condensers of this pattern may be used in reaction circuits on occasions or for tuning.

You must remember, however, that losses introduced by poor parts in tuned circuits cannot be eliminated by reaction. Reaction most definitely will not compensate entirely for circuit losses.

Connecting up a Pair of Speakers

The question as to the better way of connecting a pair of speakers to a set is frequently asked. I have had it pointed out that there appears to be little difference in the volume whether the instruments be joined in series or parallel.

If there is anything in this matching business then there ought to be a difference. It may be masked to an extent by a change in the quality, but assuming similar speakers the difference in the resultant impedance between the series and parallel connections is four to one.

With a small power valve, probably being overloaded all the time, I can understand why no great difference in volume is to be noted. But a change in the quality will almost certainly be detected.

"HIGH-FREQUENCY AMPLIFICATION SIMPLY EXPLAINED"

(*Continued from preceding page*)

three-electrode valves, has the advantage of being very stable. Several good makes of six-pin transformers are available, with a reaction winding coupled to the secondary.

Yet another stable method of high-frequency amplification, again suitable for screened-grid or three-electrode high-frequency valves, is shown by Fig. 3. This is known as choke-feed high-frequency amplification, and has formed the basis of many successful sets. Here the anode circuit of the high-frequency valve consists of a high-frequency choke coil in series with the anode and the high-tension supply.

Through a small fixed condenser, the signal voltage is passed to a tuned circuit across the grid and filament of the next valve. The condenser between the anode and the grid can be made to the top of the coil or, as shown, to the centre tap, in which way a step-up of voltage is gained.

HOTSPOT.

A Weekly Programme Criticism—By SYDNEY A. MOSELEY.

Without Fear or Favour

A GREAT WEEK

SINGERS' ENUNCIATION

THE PRINCE OF WALES, the Cenotaph service, the opening of the momentous Indian Round Table Conference with the speeches of the King Emperor and the Prime Minister. A memorable week—which makes it inexplicable when I am told by people who can well afford it that they "can't see the real need of wireless"!

◆ ◆ ◆

It occurred to me, while listening to Stuart Robertson during the concert of the North London District of the Manchester Unity of Oddfellows, that the enunciation of modern singers is to be commended. Thanks to wireless, I suppose!

This concert, by the way, was like all "smokers"—noted for the good humour of the guests. I cannot say, however, that the singing was as good as the humour, although the jolly old guests didn't seem to mind.

◆ ◆ ◆

I haven't been following the "Science and Religion" talks regularly. I know I ought to be thoroughly ashamed of myself. I am, but I don't like saying so publicly.

However, I listened to the latest contribution to the series by Canon Streeter, and have to say that it was a moderately toned, well argued, reasonable talk, and one well worth hearing.

◆ ◆ ◆

A record vaudeville programme composed of records made by leading American and Continental artistes was a good idea, but was only partly successful. The first two records were very good. "Two Black Crows" is, of course, a well-known record, and, as it happens is only one of the series which is really funny. The "March Song" from *The Love Parade* was also good. So was the American comedian telling the yarn of "No News."

◆ ◆ ◆

By the way, there was a good tune, also from *The Love Parade*, sung by Maurice Chevalier. Why do people who have no claim to vocal distinction spoil good tunes?

Incidentally, I see my long-standing criticism of this point with regard to vocalists and dance bands is being endorsed in other quarters.

◆ ◆ ◆

I originally gave a bouquet to Bransby Williams, but a friend of mine who listened in later on in the week thinks that he has been rather overdoing it.

◆ ◆ ◆

Leonard Henry staged quite an effective come-back and proved to us once again that he is one of the best, if not *the* best, wireless comedians. His turn was full of gentle leg-pulls against the B.B.C. I found these most amusing.

◆ ◆ ◆

"Harold" writes: "A dance band which has pleasantly impressed me is Marius B. Winter's orchestra. It has featured a lot lately, and I am glad of it. The style is different to that of most dance bands. The singing is not of the nerve-racking kind and the tunes are varied."

◆ ◆ ◆

What a treat it was to hear "Wabthorpe St. Martin's," by V. C. Clinton-Baddeley. It was a perfect skit on the average village school treat and was genuinely funny.

◆ ◆ ◆

Does Cheshire want symphonies?

By Cheshire I refer to all of you in the provinces. There is a complaint that London is particularly favoured because it gets the broadcast of the B.B.C. symphonies.

An impression of Gracie Fields

THE RECORD PROGRAMME

THE SYMPHONIES

I have replied to the critic who lives in Cheshire that a good many people in London would be very glad to give him the symphonies and to keep the lighter stuff which is discoursed from other stations.

Incidentally, although the critic lives in Cheshire, is he at all sure that Cheshire wants the symphonies?

◆ ◆ ◆

The Reid Symphony Orchestra plays well, but—my, the stuff they played!

A lady friend of mine refers to this kind of music as letting each musician play what he likes.

As one fond of music, I think it is rather overdoing things. And did you notice that when the music stopped, people in the Edinburgh audience didn't know whether to applaud or not. It is terrible not to have an ear for music—if you can call it music.

So, instead, we listened to a light orchestral concert by Joseph Lewis and his band, and this was O.K.

◆ ◆ ◆

Harold Nicolson writes better than he talks. I have now read his talk on Palestine, and it was a very fine essay. As a talk—well, I have already said I do not like his style.

A REMEDY FOR FADING

FLUCTUATIONS in signal strength due to fading are minimised in commercial long-distance signalling by what is termed "automatic gain control," in which the rectified output from the detector valve is used to regulate the grid-bias on the first H.F. amplifier, so that, as the signal strength falls off, the H.F. valve is automatically made more "sensitive" and vice versa. The idea of compensating for fading has recently been incorporated in American broadcast receivers, and will no doubt find its way over here.

Fading control is distinguished from ordinary volume-control by the fact that it operates solely to maintain the input or carrier wave at a constant strength. It does not affect the degree of modulation, so that the relative loudness of different passages in a given transmission is left unaltered, so long as the carrier-wave is being received.

B. A. R.

The MONO-DY

A ONE-VALVE LOUD-SPEA SET

GUARANTEED TO GIVE REAL LOUD-SPEA

"IS it possible to work a speaker on only one valve?"

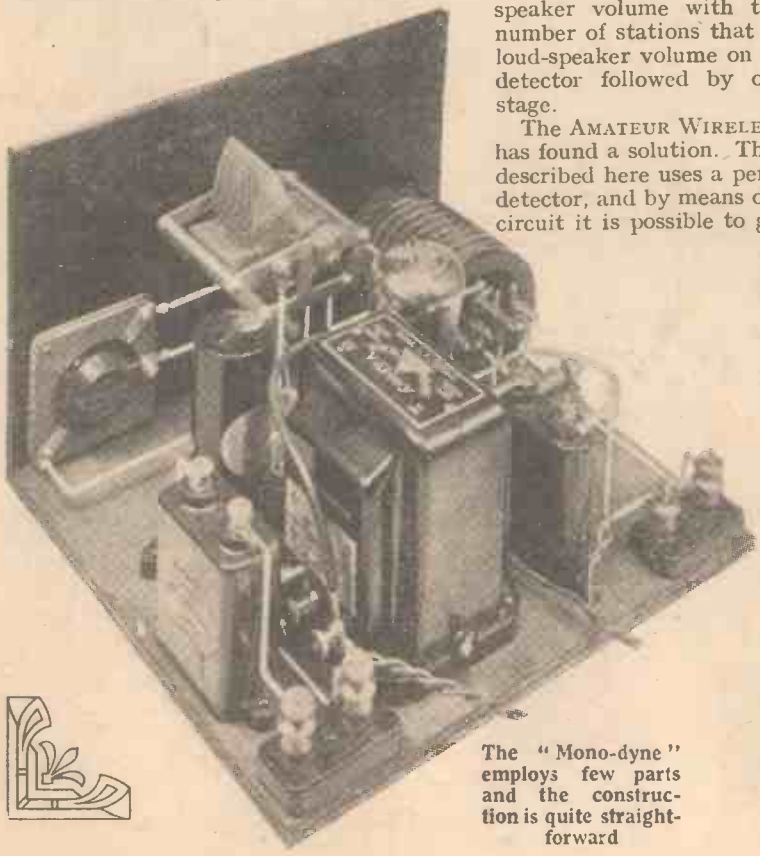
That is what many people ask when they set about trying to get loud-speaker results with the minimum outlay and running expense. Generally speaking, it is thought that there is only one way of getting true speaker volume with one valve, and that is by the use of the crystal as a detector, followed by the valve as a power amplifier

That is not a very good solution because, for one thing, it limits the speaker reception to two stations in most districts, and it is essential to have a very large aerial and a good earth. What is needed is a simple method of using a valve without a crystal detector, and a means of getting speaker volume with this on the same number of stations that would come in at loud-speaker volume on a two-valve set—detector followed by one low-frequency stage.

The AMATEUR WIRELESS Technical Staff has found a solution. The little one-valver described here uses a pentode valve as the detector, and by means of a very ingenious circuit it is possible to get in the London area, for example, the National, Regional, Midland Regional, 5XX, and Radio Paris, all at really good speaker strength. This is not a fantastic claim: it is merely a statement of the results that anyone can have, provided that the set is made up exactly as described and that a pentode valve of a good make is employed.

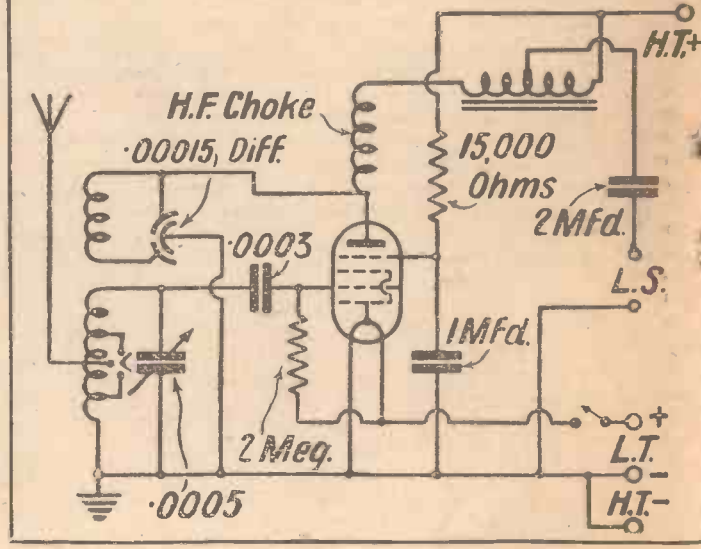
"Surely there is some snag?" an intending constructor may ask. "Is not the advantage of one-valve speaker reception offset by high initial cost or higher running costs than with an ordinary one or two-valver?"

There is no snag. The set incorporates few parts, and these are of a quite straightforward nature, such as you would have in any two-valver or efficient one-valver. The running cost is slightly greater than that



The "Mono-dyne" employs few parts and the construction is quite straightforward

THE CIRCUIT DIAGRAM AND THE COMPO



NE
E
KER

AKER RESULTS

of a simple one-valver, but is no more than that of a two-valver. Suitable battery values will be described later, but in the meantime it may be noted that the set works very well indeed with only 120 volts high-tension, and at that value requires 10 milliamperes. A standard high-tension battery will withstand this discharge rate, and there is no need to have anything expensive for the high-tension supply.

Constructors anxious to see "how it works" should study the circuit diagram. There is nothing freakish, nor any components which need values critically adjusting. The tuning arrangements are quite normal, and you will see that differential reaction is employed. This gives a nice control of oscillation and makes for easy tuning.

The pentode is connected in just the same way as a three-electrode valve, the only addition being the connection of the auxilliary grid through a 15,000-ohm resistance to the high-tension positive terminal.

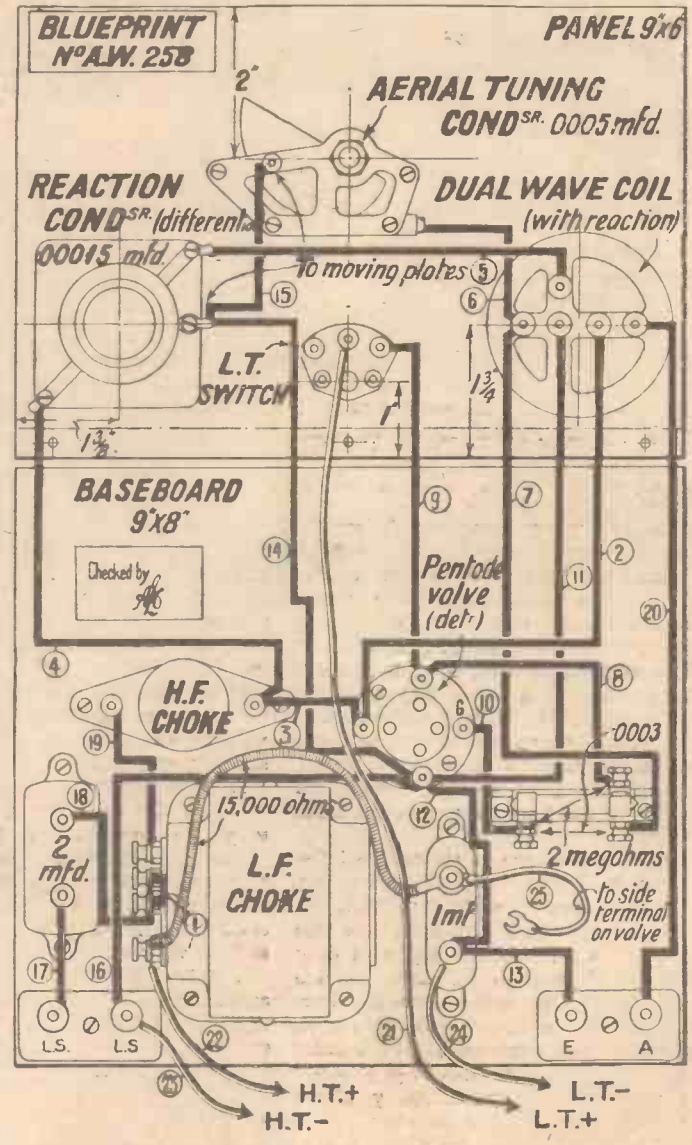
The output arrangements in the anode circuit of the valve should be noticed. With a pentode valve it is not advisable to connect a speaker directly in series with the anode, because the impedance of a pentode is high and the tone, with the speaker directly in circuit, is shrill.

An output transformer arrangement is essential, and in this circuit it has been deemed advisable to employ a choke and condenser output circuit which gives a 2-to-1 ratio; by means of the centre tapping to the choke, the coupling to the speaker being by means of a 2-microfarad condenser.

The advantage of this arrangement, in addition to the improvement in tone which it gives, is the fact that, as with an ordinary choke-output arrangement, the speaker is at earth potential. This may be of advantage if the set is to be worked from the mains, and it is always a safe plan to have the speaker insulated from the high-tension supply.

In normal working the full high-tension voltage is applied to the anode of the pentode and a slightly lower voltage is applied to the auxilliary grid, owing to the voltage drop across the 15,000-ohm resistance. This value has been chosen as it gives satisfactory results with most pentodes. There is no point in making a separate high-tension tapping for this grid, the dropping resistance being quite satisfactory. It is, for the sake of stability, shunted by a 1-microfarad condenser.

This technical description of the circuit may sound a little involved to the beginner, but really there is nothing puzzling in this



Here is the layout and wiring diagram. A plan view which will be helpful appears on the next page

NENTS REQUIRED TO BUILD THE MONO-DYNE

Ebonite panel, 9 in. by 6 in. (Becol, Trelleborg).

Baseboard, 9 in. by 8 in. (Pickett, Camco, Clarion).

High-frequency choke (Lissen, Watmel, Igranic, Telsen, Tunewell, Wearite, Lewcos).

.0005-mfd. variable condenser (J.B., Lissen, Burton, Lotus, Formo, Ormond, Polar).

.00015-mfd. differential condenser (Igranic, Burton, Ready Radio, Lotus, Polar, Formo).

Dual-range coil for panel mounting (Tunewell, Sovereign).

On-off filament switch (Benjamin, Bulgin, Ready-Radio, Lotus).

Four-pin valve-holder (Lotus, Benjamin, W.B., Igranic, Clix, Burton, Lissen, Telsen).

.0003-mfd. fixed condenser, with series clips (Telsen, Lissen, T.C.C., Dubilier, Watmel, Atlas).

2-megohm grid leak (Dubilier, Lissen, Watmel, Graham-Farish).

1-mfd. fixed condenser (Dubilier, Igranic, T.C.C., Lissen, Formo).

2-mfd. fixed condenser (Dubilier, Igranic, T.C.C., Lissen, Formo).

Centre-tapped low-frequency choke (Varley, Igranic, R.I.).

Slow-motion dial (Igranic "Minor," Formo, Brownie).

Two terminal blocks (Lissen, Belling-Lee, Junit).

15,000-ohm spaghetti resistance (Bulgin).

Four feet of thin flex (Lewcoflex).

Connecting wire (Glazite).

Two wander plugs, marked: H.T.—, H.T.+ (Belling-Lee, Igranic, Clix).

Two spade terminals, marked: L.T.—, L.T.+ (Belling-Lee, Eelex, Clix).

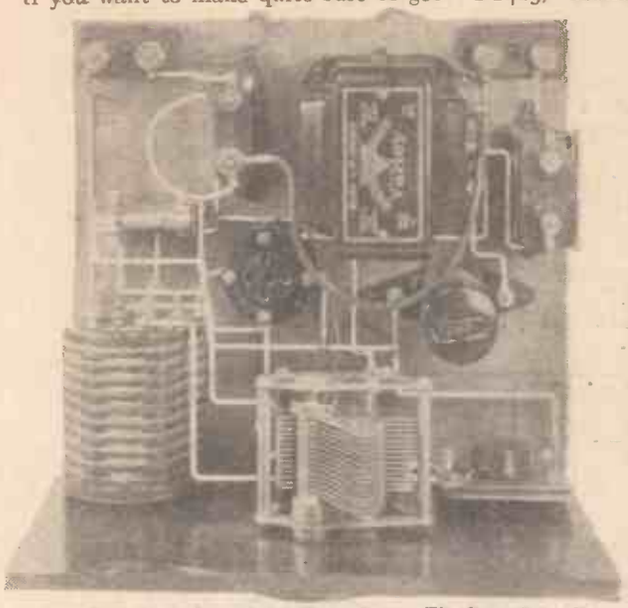
"THE MONO-DYNE—A One-valve Loud-speaker Set"

(Continued from preceding page)

one-valve loud-speaker set. It is extremely simple to build.

The photographs and the wiring plan give a good general idea of the layout. An accompanying panel shows the parts needed, the original parts in the set illustrated being given first, followed by, in most cases, a number of alternatives.

If you want to make quite sure of getting good results and of making the easiest possible job of the constructional work, then you should get the full-size blueprint, which can be obtained, price 1s., post free, from the Blueprint Department, AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4.



Here is a plan view of the Mono-dyne. The layout can be followed from the wiring diagram on the preceding page

Assembly

The set is arranged on straightforward lines, there being little panel drilling to be done, and the components are widely spaced on the baseboard. The panel carries the tuning condenser, dual-range coil, on-off switch, and reaction condenser. All these components are of the one-hole mounting variety, and so the work of drilling is simplified. You should note that three holes will be needed along the lower edge of the panel for the fixing screws, and the slow-motion dial necessitates a small hole for the fixing screw of the front of the dial.

The positions of the parts on the baseboard can be found from the blueprint. Actually there are only eight parts which need mounting, these including the two terminal strips. Terminals are used only for the aerial and earth, and for the speaker output, the high-tension and low-tension connections being made by means of lengths of flex, terminating in wander plugs and spade tags respectively.

You should have no difficulty about wiring, for the connections are easy, and it only needs a little care to see that the connections are made properly to the tuning coil. The five terminals should be wired up exactly as shown on the wiring plan. Rigid wire is used for the ordinary connections between the components.

The pentode valve should be chosen from the following: (Two volts) Six-Sixty 230PP, Mullard PM22, Marconi PT240, Osram PT240, Lissen PT240, Cossor 230PT, Mazda 230 Pen. (Four volts) Dario Pent., Marconi PT425, Osram PT425, Mullard PM24, Cossor 425PT, Mazda 425 Pen. (Six volts) Marconi PT625, Osram PT625, Mullard PM26.

It is not to be expected that the best results can be obtained from a set of this description unless a reliable valve is used. The whole output performance of the set depends on the characteristics of the pentode, which must not only be a good detector, but must also be a good low-frequency amplifier and capable of handling a fair amount of power. Unreliable valves may be the cause of poor reception, while cheap valves with a poor vacuum (valves known as "soft") may be very extravagant in their high-tension demands, and your battery may run down in a month or so. It really does pay to have a good valve; after all, there is only one.

The set is very simple to work. For first test, connect up the aerial and earth, speaker and batteries, plug-in the pentode valve, and switch on by means of the switch on the front of the panel. Set the reaction condenser at zero and slowly rotate the tuning dial until the near-by stations are located. An increase in the reaction setting will then bring up the volume to loud-speaker strength.

A little adjustment of the high tension may be needed, and, generally speaking, you will find that the more volts provided on the anode, the greater is the output volume.

The tuning is quite sharp, owing to the aperiodic coupling embodied in the tuner, and the inherent selectivity should be sufficient for all but those living right under the "shadow" of a main station.

H.T. Supply

If additional selectivity is found necessary, then you might try the simple experiment of putting a .0003 maximum-capacity pre-set condenser in the aerial lead. As the value of this is decreased, the tuning will be sharpened, but, of course, the volume will suffer slightly as the selectivity is improved.

With a standard pentode valve selected from the foregoing list and with a voltage of 120 on the anode, derived from the standard-capacity dry battery, the total high-tension current consumption is almost exactly 10 milliamperes. When the voltage was increased to 200, supplied by a mains eliminator, then the current naturally considerably increased, but for ordinary working there is no need to use a voltage so great as this. The speaker volume on 5XX and the London National and Regional stations, and 5GB, was quite pleasing with only 120 volts.

A Stable Set

The pentode valve shows no signs of instability even when the high tension is provided by an eliminator. In every respect this set is just as stable and straightforward in operation as a one-valver, and as an obvious economy is effected in the use of only one valve in place of a detector and a power valve and a coupling transformer, there is no reason why it should not be well suited to the needs of listeners, situated not too far from main stations, who want to get proper speaker volume with only one valve.

Although use is made of a pentode, the construction of the set follows ordinary practice

The set may be seen this week in a special display in the Radio Department windows of Messrs. Selfridge & Co., Ltd.

According to various sources usually well informed on such matters, October has broken previous records for radio sales in Scotland.

VOLUME DEPENDS ON IT!

UPON the fixed condensers you use both the volume and the purity of your reproduction often depend. Use Lissen Fixed Condensers throughout the circuit—they never leak, never vary in capacity, never break down in use, and they deliver all their stored up energy all the time.

That is why the Lissen R.C.C. Unit gives such wonderful purity and unusual volume—there is no condenser loss or leakage, no variation in values.

Whatever circuit you are building, whatever else is specified, you cannot do better than depend upon Lissen Fixed Condensers.

LISSEN FIXED CONDENSER

Holds its charge and delivers it without leak or loss. In any R.C.C. circuit the condensers you use should be absolutely leak-proof, otherwise 50 per cent. of volume will be lost. Lissen condensers never leak, never vary and they are accurate to within 5 per cent. of their marked capacity. ·0001 to ·001, price each, 1/-. ·002 to ·006, price each, 1/6.

LISSEN R.C.C. UNIT

Embodies a ·0r condenser which delivers all its stored-up energy and resistances that will never vary, no matter what the current load, interchangeability of resistance values. PRICE **4/-**

PURITY DEPENDS ON IT!

Obtainable of all radio dealers

Lissen Limited
Worple Road
Isleworth Middlesex

The TANNOY RADIO GRAMOPHONE

Maker : Tannoy Products

Price : 55 guineas in oak, walnut or mahogany

SO many of the radio gramophones I have heard during the last few months have been designed to give an output capable of filling the Queen's Hall that when the makers of the Tannoy instrument stated that they had average domestic requirements in mind, I was interested to carry out an extensive test. For the last week or so I have had a Tannoy radio-gramophone at my home at Streatham Hill, where it has amply proved its merits.

Record Reproduction

I find this instrument gives more than enough volume to fill the largest room in my house. And this for gramophone or broadcasting programmes. Trying out some of my favourite records, I must say how delighted I was with the tone of the reproduction. Speaking and singing records were exceptionally good. Piano records, which are very difficult to reproduce really well, came through on the Tannoy machine with greater realism than usual.

Recordings of large orchestras all too often come out on a medium-power amplifier as a vague blur of sound. But listening with a critical ear to the reproduction of records of the Berlin State Orchestra I was able to pick out the individual instruments.

Looking inside the Tannoy radio-gramophone I saw ample evidence of careful design. The nucleus is a four-valve chassis, with a screen-grid high-frequency amplifier, a detector and two low-frequency amplifiers. The whole chassis can be removed from the radio-gramophone cabinet, a very favourable point when servicing is needed. As a matter of fact, I can hardly visualise this chassis causing any trouble, at any rate for a considerable time after installation. It is one of the most robust chassis yet examined. The makers are careful to emphasize the fact that every Tannoy radio-gramophone is "hand-made" and not mass-produced.

Some special circuit points are worth noting. The tuning coils for medium and long waves are entirely separate and all coils are cut out of circuit when the switch is in the gramophone position. There is, thus, no chance of wireless signals leaking through during the reproduction of gramophone records.

The volume control is so designed that when the volume of reproduction is reduced there is no cut-off of high notes. This is one of the most attractive features of the instrument. I was able to listen to really quiet volume without being able to detect any deterioration of quality.

Another good circuit point is the inclusion of a power detector, by which is avoided all possibility of distortion due to overloading. The output is 10 watts, so considerable volume can be handled without distortion.

The general layout of the Tannoy radio-gramophone, as viewed externally, is quite conventional. The turntable is mounted at the top, the radio below and the moving-coil loud-speaker at the bottom of the cabinet. The gramophone motor is driven from the A.C. mains and is of the induction type. It works very smoothly, and with characteristic regularity.

The moving-coil loud-speaker is of American make and is well matched with the amplifying equipment. It has a slightly low-pitched timbre but high notes are handled without the slightest trace of "dither."

Control

The layout of the controls has obviously received a lot of thought. There are two tuning knobs, which, although rather small, operate easy-to-read engraved dials. Then there is a reaction knob and the volume control knob. As the volume control is on the low-frequency side it operates for radio and gramophone. It varies the volume over a wide range of audibility. Between the two tuning dials is a lever, pushed up for long-wave reception; down for medium waves; and set at its middle position for gramophone records.

A point that some radio-gramophone makers overlook is the need for an accessible volume control. In the Tannoy machine I appreciated the position of the volume control, on the panel instead of under the lid of the cabinet. Often during the playing of a record one wishes to vary the volume, but this is a tedious business if the lid has to be raised.

For flat-dwellers living within the service area of a broadcasting station the Tannoy radio-gramophone can be worked without an aerial. A special arrangement can be fitted at the back of the cabinet. In my test I used a short indoor aerial and had no difficulty in bringing in fifteen stations on the medium wavelength band and six stations on the long wavelengths. Selectivity was well up to standard. I was able to separate the two Brookmans Park stations and to get several stations between Regional and National.

I understand that there is a Tannoy Junior radio-gramophone, price 45 guineas, in oak. This gives a slightly lower output than the model tested, but it has the same type of moving-coil loud-speaker, electric turntable, and other fittings. Then the Tannoy R4 console ought to be mentioned,

Another model of the Tannoy radio-gramophone

price 39 guineas. This is similar to the radio-gramophone I tested except for the omission of gramophone-record reproduction. As a four-valve console set it should find a ready market at such a moderate price.

Scotland's new B.B.C. headquarters in Queen Street, Edinburgh, which are to be known as Broadcasting House, will be opened on St. Andrew's Eve, November 29. The new studio is in the centre of a theatre, with three galleries available for spectators. The stage is hung with green curtains, which are embroidered with the B.B.C. motto: "Nation Shall Speak Unto Nation."

PAPER v. ELECTROLYTIC CONDENSERS

In this article our Technical Editor discusses the relative merits of the two types and suggests that the electrolytic may eventually displace the paper condenser

WHEN we require a large capacity of the order of 1 or 2 microfarads or more, it is customary to use a paper dielectric condenser. These components are often referred to as Mansbridge condensers, but actually this term only applies to a particular form of construction, in which the element used is paper, with a metal deposit on one side, like tea paper, so that the condenser plate and the insulation are in one piece.

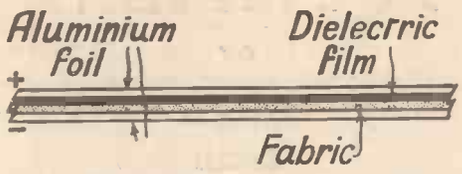
The construction of paper condensers has been described in these columns previously on several occasions. The usual form of condenser to-day consists of two strips of foil interleaved with thin strips of high-grade paper, the whole being rolled up together and subsequently compressed and thoroughly impregnated with wax to exclude all moisture and air. The finished "coil" is inserted into a suitable case and sealed up.

High Capacity

We have become accustomed to regard this as the only form of high-capacity condenser, but the electrolytic form of condenser bids fair to be a serious rival in the not very distant future. Electrolytic condensers are used in this country for L.T. eliminators. Here, owing to the very much lower voltage, the reservoir and smoothing condensers have to be several thousand microfarads, and the building up of a batch of paper condensers to give a capacity of this order is impracticable from a commercial point of view. Therefore, the electrolytic condenser was developed, and the standard units now on the market are of 2,000 microfarads or more, according to requirements. They are sold at comparatively reasonable prices, a 2,000 microfarad condenser costing 15s., which works out at just over one-tenth of a penny per microfarad. On this basis one should be able to obtain a 2 microfarad condenser for a farthing. Actually one pays between three and four shillings for it!

This disparity in the prices naturally leads one to ask whether it is not possible to use electrolytic condensers for ordinary high-voltage purposes. The 2,000-microfarad condenser referred to, however, will only withstand a D.C. voltage of 12. Otherwise the dielectric cells break down and the condenser is damaged. Whether the damage is permanent or not depends to some extent upon the method of manufacture.

It is probably as well at this point to explain the construction of an electrolytic condenser. In its simplest form it consists of two aluminium plates immersed in a solution of borax or some similar electrolyte. On passing a current through from



This diagram shows the constructional features of the paper dielectric condenser

one plate to the other (by applying a battery across the plates), a very thin film of gas forms over one of the plates. This film gradually builds up over the whole plate, which thus becomes insulated, and in this condition the system will act as a condenser. The plate itself forms one of the electrodes of the condenser, while the liquid, which is, of course, in electrical contact with the other plate, forms the second electrode. As these two are only separated by a very thin film of gas the capacity is very large indeed.

Practical forms of electrolytic condenser do not use a liquid electrolyte, but employ some form of gum or jelly. The condenser, however, has to be *formed* in the same way, and the working voltage must not exceed the voltage used in forming the condenser. If the voltage is excessive, the insulating film on the surface of the plate breaks down and the condenser becomes short circuited. This can be cured very often by re-forming, but where a semi-solid electrolyte is used instead of a liquid, this is often not easy.

Capacity and Voltage

Now it is a peculiarity of the electrolytic condenser that its capacity increases as the forming voltage is reduced. Thus a condenser which, formed at a voltage of 12 volts gives us a capacity of 2,000 microfarads, would, if formed at a voltage of 400 volts, give us a capacity of something like 50 microfarads. Therefore, once we start making these condensers for high voltages, the cost per microfarad begins to increase. Even assuming, however, that we can obtain 50 microfarads for 15s., the cost works out at about 3½d. per microfarad, giving us a 2-microfarad 400-volt condenser for 7d., somewhere about one-sixth of the price for a paper condenser capable of withstanding a similar voltage.

I should like to point out here that the prices I am considering are purely for the sake of argument, in order to show that an electrolytic condenser appears to present a possibility of "cheaper microfarads" in the future. I do not wish in any way to suggest that the prices ruling for paper condensers to-day are excessively high.

Improved Construction

The next question that arises is whether the apparent advantage of the electrolytic condenser can be justified in practice. There are evidences that this is so. Research is proceeding all the time in methods of constructing these electrolytic condensers. They are used to a greater degree in America than in this country, it being no uncommon thing to find a high-tension eliminator using an electrolytic condenser-bank, instead of paper condensers, whereas in this country there are not, as far as I am aware, any commercial units of this type.

(*Continued on page* 811)

"THIS DOUBLE-HUMP BUSINESS"—A CORRECTION

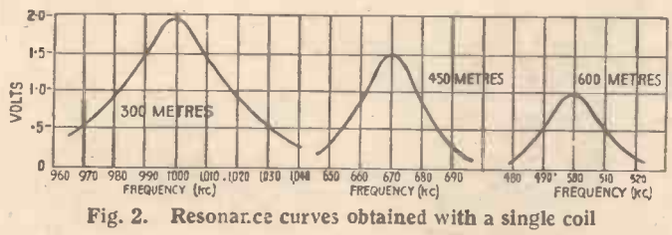


Fig. 2. Resonance curves obtained with a single coil

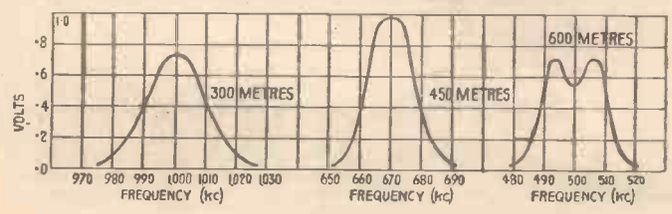


Fig. 4. Curves obtained with a capacity-coupled filter

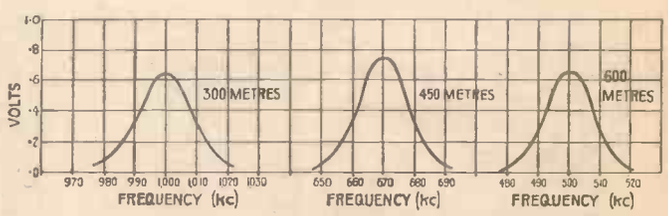


Fig. 5. Curves obtained with ohmic-coupled circuit

OWING to an unfortunate error the curves given last week in connection with the article on Ohmic-coupling were transposed, and of course did not correspond with the text. It will be seen that Fig. 2 shows curves taken at 300 metres, 450 metres and 600 metres respectively with a single coil. Fig. 4 shows the response with a capacity-coupled filter, the double hump at 600 metres being very marked, and Fig. 5 shows curves taken with an Ohmic-coupled circuit.

Linen-diaphragm Speakers

SIR,—It is my intention to make up the linen-diaphragm speaker, but I am in doubt as to how the speaker can work when there is, apparently, so much tension between the diaphragm, the Bowden wire, and the stylus rod of the speaker unit. Perhaps if you could explain the assembly a little more fully, I could more readily understand the action of the speaker.

G. J. (Cape Town).

There is no actual tension between the stylus rod of the speaker unit and the diaphragm. The only tension is that between the diaphragm and the Bowden wire. The tensioning is done by means of the nuts on the threaded rods attached between the two frames at the top and bottom. The diaphragm should be stretched during the process of applying the dope and whilst the diaphragm is still wet. Not more than two coats of dope should be applied, and the diaphragm should be stretched until, when flicked with a finger, it gives off a drum-like note or "plonk." The speaker unit should then be arranged in position until the stylus rod fits snugly and evenly into the hole through the diaphragm bush. When the speaker has been rigidly fixed into position, the chuck on the diaphragm bush can be screwed down until it clamps tightly around the stylus rod of the speaker unit.

It is best to adjust the reed of the speaker unit away from the magnets before screwing down the chuck. If the diaphragm bush has canted sideways in the tensioning, the stylus rod of the speaker unit can be bent a little to balance the defect.—ED.

Broadcast Advertising

SIR,—I am very sorry to read in your journal of this enthusiasm for the "sponsored programme." For once the miracle has happened, and I find myself entirely in sympathy and agreement with Sir John Reith in his plain, blunt statement that "advertising is neither necessary nor desirable."

In theory, the sponsored programme is exceedingly attractive, I admit, but very dangerous in practice. How long would advertisers remain satisfied with mere sponsoring? How soon would creep in references to their soap, face cream, or puppy biscuits? The next stage in the "publicity slush" we hear from Paris every Sunday night.

There will be time to consider sponsored programmes when all other methods of obtaining revenue or its equivalent have been tried and when, in addition, the licence figures have come down to the two-million mark. The Post Office should be made to disgorge.

G. W. P. (Tunbridge Wells).

"Challenge Four" Receiver

SIR,—I have considered building the "Challenge Four" receiver, but I wish to instal it in a gramophone cabinet. As it would be inconvenient to slide the back of the set away each time I wish to change wavelength, I am wondering whether it would be possible to arrange the coil switches on the front panel and so avoid delving inside the receiver each time a wavelength adjustment is made.

J. R. (Sunderland).

We see no reason why you should not arrange the coils on their sides, with the switches protruding through the front panel. Some slight rearrangement of the components will be necessary, but this should not prove to be a difficult task. All you have to be careful about is, the two S.G. valves must not be brought closer together and, the leads to the valve grid circuits must be kept as short as possible. The windings of the tuning coils must not be in the same plane as those of the H.F. choke, L.F. transformer, or output choke, etc. Direct interaction will then be avoided. Do not place the coils any nearer to the screens than at present or damping will be experienced.—ED.

Reversed Batteries

SIR,—Having just handled another reversed H.T. battery, this makes a total of six of its kind. The first two reversed batteries which came to my notice were G.B.'s, of popular make. When I discovered the first, about two years ago, I was somewhat puzzled. I wondered whether by any accident the batteries could be reversed at the factory and by some strange chance pass out without test. When, a fortnight later, I was called upon to investigate the trouble in a set giving off the utmost distortion, I found the power valve positively biased by 2.5 volts. This was contrary to the markings on the G.B. battery, so I immediately opened it, only to find that the elements were connected properly.

M. F. D. (Glasgow).

The Northern Regional

SIR,—There is some anxiety up our way as to how we shall fare when the Moorside station gets going. Now the position is that there will be five sets of twin transmitters, when the scheme is completed, and one of each is going to be a National; that is, one of each set of twins will give out the same programme, and so we shall be having this programme at five different readings on the dial, and all at great power. Now what is to prevent these Nationals from all being on *one* wavelength, something after the manner of the present relays? I think the five new Nationals, working on only half of the proposed power on one wavelength, would be heard all over the British Isles.

L. S. J. (Stoke-on-Trent).

The "Best-by-ballot Three"

SIR,—I made up the "Best-by-ballot Three." I would not be without it. The stations obtainable on the medium band are too numerous to mention; likewise the long band, notwithstanding the fact that my H.T. battery is down to 85.

As other readers have written to you and you have published the correspondence regarding other sets which have appeared I thought it time that I let you know what a good set the "Best-by-ballot Three" is

(*Continued on page* 806)

RADIOGRAMS

A RUSSIAN conductor, Nikolai Malko, will conduct a Russian programme in the Sunday Orchestral Concert which comes on November 23 (Regional). Prokofief's "Classical Symphony," which has been made known all over the world by gramophone records, is to be given, as well as Tchaikovsky's Violin Concerto in D.

Dr. Jekyll and Mr. Hyde, that famous shocker by Robert Louis Stevenson, which is to be broadcast on November 25 (Regional) and November 27 (National), has been prepared for the microphone by Barbara Burnham.

When the Rev. P. B. Clayton, Founder Padre of Toc H, broadcasts a message from the Albert Hall on December 6, the ceremony of the World Chain of Light, which starts with the Toc H Lamp at Poperinghe on December 5, will be completed.

The Philharmonic Choir, who gave a brilliant broadcast performance in Vaughan Williams' "Sea Symphony" from the Queen's Hall recently, will be heard by National listeners on December 19 in a relay of *The Messiah* from the Albert Hall.

An excerpt from the Covent Garden Opera Company's performance of *Die Fledermaus*, by Johann Strauss, will be relayed from Golder's Green Hippodrome to London Regional on November 29.

A Welsh variety programme will be given from Cardiff on December 4, when the central feature will be a sketch entitled: "*Ianto the Happy.*"

Mr. L. E. Williams gives the sports talk from Cardiff on December 1.

A running commentary on the Rugby football match, Coventry *v.* Cardiff, will be relayed to Cardiff from Midland Regional on December 2. Later on the same day, Mr. A. S. Burge will give an eye-witness account of the Welsh International trial match at Swansea.

Clapham and Dwyer will take part as "private inquiry agents" in a new musical comedy which is to be broadcast from Midland Regional on December 6. Two of the scenes take place at Croydon Aerodrome and another in a broadcasting studio.

AT THE QUEEN'S HALL

AT the fourth B.B.C. concert of this season, there was a magnificent performance of Bach's six "Brandenburg" concertos, conducted by Sir Henry Wood. The soloists and orchestra had a certain quality of straightforwardness that gives Bach exactly the right values. The concertos were not over-emphasised and at the same time were not reduced to arithmetic.

A third of the way through the programme I began to feel tired, but recovered, and finished in splendid form, wishing there had been more of it. Arthur Catterall played as usual with grace and perfection of skill; and among the others the oboe playing of Alec Whittaker was particularly fine.

L. R. J.

"Amateur Wireless and Radiovision." Price Threepence. Published on Thursdays 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.

BROADCAST TELEPHONY

Broadcasting stations classified by country and in order of wavelengths. For the purpose of better comparison, the power indicated is *aerial energy*.

Metres	Kilocycles	Station and Call Sign	Power (Kw.)
GREAT BRITAIN			
25.53	11,751	Chelmsford (GSW)	15.0
200	1,500	Leeds	0.16
242	1,238	Belfast	1.2
261.3	1,148	London Nat.	68.0
288.5	1,040	Newcastle	1.2
288.5	1,040	Swansea	0.16
288.5	1,040	Stoke-on-Trent	0.16
288.5	1,040	Sheffield	0.16
288.5	1,040	Plymouth	0.16
288.5	1,040	Liverpool	0.16
288.5	1,040	Hull	0.16
288.5	1,040	Edinburgh	0.4
288.5	1,040	Dundee	0.16
288.5	1,040	Bournemouth	1.2
288.5	1,040	Bradford	0.16
301	995	Aberdeen	1.2
309.9	968	Cardiff	1.2
356.3	842	London Reg.	45.0
376.4	797	Manchester	1.2
398.9	752	Glasgow	1.2
479	626	Midland Reg.	38.0
1,554	193	Daventry (Nat.)	35.0
AUSTRIA			
246	1,220	Linz	0.6
246	1,220	Salzburg	0.6
283.6	1,058	Innsbruck	0.6
352	851	Graz	9.5
453	666	Klagenfurt	0.6
517	581	Vienna	20.0
BELGIUM			
206	1,460	Antwerp	0.4
212	1,415	Binche	0.2
216	1,391	Chatelineau	0.25
243	1,235	Courtrai	0.1
244.7	1,226	Ghent	0.25
251.4	1,194	Schaerbeek	0.5
338.2	887	Velthem (Louvain)	15.0
509	590	Brussels (No. 1)	1.2
CZECHO-SLOVAKIA			
263	1,139	Moravska-Ostrava	11.0
279	1,075	Bratislava	14.0
294	1,020	Kosice	2.5
342	878	Brunn (Brno)	3.0
487	617	Prague (Praha)	5.5
DENMARK			
281	1,067	Copenhagen	1.0
1,153	260	Kalundborg	10.0
ESTONIA			
401	748	Reval (Tallinn)	0.7
FINLAND			
221	1,355	Helsinki	15.0
291	1,031	Viipuri	15.0
1,796	167	Lahti	54.0
FRANCE			
172.5	1,739	St. Quentin	0.3
200	1,500	Radio Roubaix	0.2
210	1,430	Radio Touraine	0.2
222.9	1,346	Fécamp	0.7
235.1	1,275	Nimes	1.0
244.9	1,224	Béziers	0.6
249.5	1,202	Juan-les-Pins	0.5
250	1,171	Toulouse (PTT)	1.0
265	1,130	Lille (PTT)	15.0
272	1,103	Rennes	1.2
286	1,049	Montpellier	2.0
287.2	1,044.6	Radio Lyons	0.5
296.4	1,012.1	Limoges (PTT)	0.08
300	1,000	Strasbourg	1.0
304	988	Bordeaux (PTT)	35.0
308	973	Neuilly-(Paris)	0.3
313	958.5	Natan-Vitus	1.0
316	950	Marseilles (PTT)	1.5
328.2	914	Grenoble (PTT)	1.2
329	911	Caen (Normandy)	0.6
329.5	910.3	Poste Parisien	1.2
345.2	869	Strasbourg (PTT)	15.0
369.3	812.2	Radio LL (Paris)	0.5
385	779	Radio Toulouse	9.0
447	671	Paris (PTT)	1.0
466	644	Lyons (PTT)	2.3
1,446	207	Eiffel Tower	15.0
1,725	174	Radio Paris	17.0
GERMANY			
31.38	9,560	Zeesen	15.0
218	1,373	Flensburg	0.6
227	1,319	Cologne	1.7
227	1,319	Münster	0.6
227	1,319	Aachen	0.31
232.2	1,293	Kiel	0.3
230	1,256	Nürnberg	2.3
246.4	1,217.2	Cassel	0.3
253.4	1,184	Leipzig	2.3
259.3	1,157	Gleiwitz	5.6
270	1,112	Kaiserslautern	0.25
276	1,085	Königsberg	1.7
283.6	1,058	Magdeburg	0.6
283.6	1,053	Berlin (E)	0.6
283.6	1,058	Stettin	0.6
316.6	947.6	Bremen	0.3
318.8	941	Dresden	0.3
325	923	Breslau	1.7
360	833	Stuttgart	75 0
372	806	Hamburg	1.7
390	770	Frankfurt	1.7
418	716	Berlin	1.7
452.1	662	Danzig	0.25
473	635	Langenberg	17.0
533	563	Munich	1.7
560	536	Augsburg	0.3
566	530	Hanover	0.35
570	527	Freiburg	0.3
1,635	183.5	Zeesen	35.0
1,635	183.5	Norddeich	10.0
HOLLAND			
31.28	9,599	Eindhoven (PCJ)	30.0
299	1,004	Hilversum (also testiug on 1.110m.)	8.5
299	1,004	Radio Idzerda (The Hague)	0.6
1,071	280	Scheveningen-Haven	5.0
1,875	160	Huizen	8.5
HUNGARY			
210	1,430	Budapest (Csepel)	1.0
550	545	Budapest	23.0
ICELAND			
1,200	250	Reykjavik (shortly testing)	16.0
IRISH FREE STATE			
224.4	1,337	Cork (1FS)	1.5
413	725	Dublin (2RN)	1.5
ITALY			
80		Rome (3RO)	9.0
247.7	1,211	Trieste (testing)	3.0
296	1,013	Turin (Torino)	8.5
312.8	1.009	Genoa	1.5
332	905	Naples (Napoli)	1.7
441	680	Rome (Roma)	75.0
453	662	Bolzano (1BZ)	0.2
501	599	Milan (Milano)	8.5
LATVIA			
525	572	Riga	12.0
LITHUANIA			
1,935	155	Kaunas	7.0
NORTH AFRICA			
363.4	825.3	Algiers (PTT)	13.0
416	721	Radio Maroc (Rabat)	10.0
1,350	222.2	Tunis Kasbah	0.6
NORWAY			
364	824	Bergen	1.0
365	821	Frederiksstad	0.7
458.2	662	Porsgrund	1.5
458.2	662	Nidaros	1.2
1,071	280	Oslo	75.0
POLAND			
214.2	1,400	Warsaw (2)	1.0
234	1,283	Lodz	2.2
244	1,229	Cracow	1.5
313	959	Wilno	0.5
338.1	887.1	Poznan	1.9
381	788	Lvov	2.2
409.8	732	Katowice	16.0
1,411	212.5	Warsaw	14.0
PORTUGAL			
240	1,247	Oporto (Teatro Apollo)	0.25
320	937.6	Lisbon (CTIAA)	0.25
ROMANIA			
394	761	Bucharest	16.0
RUSSIA			
720	416.6	Moscow (PTT)	20.0
800	375	Kiev	20.0
824	364	Sverdlovsk	25.0
937.5	320	Kharkov (RV20)	25.0
1,000	300	Leningrad	20.0
1,060	283	Tiflis	10.0
1,103	272	Moscow Popoff	40.0
1,200	250	Kharkov (RV4)	25.0
1,304	230	Moscow (Trades' Unions)	100.0
1,380	217.5	Bakou	10.0
1,481	202.5	Moscow (Kom)	20.0
SPAIN			
251	1,193	Barcelona (EAJ15)	1.0
266.7	1,125	Barcelona (EAJ13)	10.0
349	860	Barcelona (EAJ1)	8.0
368	815	Seville (EAJ5)	1.5
424	707	Madrid (EAJ7)	2.0
460	652	San Sebastian (EAJ8)	0.5
SWEDEN			
230.6	1,301	Malmo	0.75
257	1,166	Hörby	15.0
300.2	999.3	Falun	0.65
322	932	Göteborg	15.0
436	689	Stockholm	75.0
542	554	Sundsvall	15.0
770	389	Ostersund	0.75
1,229.5	244	Boden	0.75
1,348	222.5	Motala	40.0
SWITZERLAND			
318.8	943	Basle	0.65
403	743	Berne	1.1
459	653	Zurich	0.75
678.7	454 6	Lausanne	0.6
760	395	Geneva	1.5
TURKEY			
1,200	250	Istanbul	5.0
1,958	153	Ankara	7.0
YUGOSLAVIA			
306.8	978	Zagreb (Agram)	0.7
430.4	696.9	Belgrade	3.0
574.7	522	Ljubljana	2.8

"READERS' IDEAS AND QUESTIONS"

(*Continued from page* 804)

and that it is, in my opinion, without equal.

C. H. H. (London), S.W.

A Short Earth Lead and——

SIR,—Living in an upstairs flat, I have difficulty in getting a good earth connection. My friends tell me that if I have a long earth lead I shall never get a really good earth. I have tried various earth connections, such as a water pipe, a gas pipe, and also a long lead to a tube driven into the ground out in the garden. My ground earth, even with its long lead, is the best. Can you tell me why it is my results are contrarywise to all the "apparently" accepted theories? W. T. (London).

It is certainly best to have a short earth lead, provided there is a good earth connection at the end of the lead, but it is not a sound policy to accept the fact that a short earth lead, regardless of the earth connection at its end, is to be the deciding factor. The point which should be given prior consideration is the earth connection itself, the length of the lead being of secondary importance. There is moderation in everything, however, and it would be unwise to use an earth lead of more than about 30 ft., in an effort to ensure a good earth connection at the end of it. If a very long earth lead is found to be necessary to reach a good earth connection, it would be far better to dispense altogether with a direct earth connection (for reception) and to use an indoor counterpoise. The latter may consist of a length of insulated multi-stranded copper wire, one end being connected to the earth terminal of the receiver, whilst the other end should be bound with insulating tape and left "free."

—Ed.

A company has been formed at Nice (France), with a capital of 1,200,000 francs; it proposes to rebuild theNice-Juan-les-Pins broadcaster in order to provide an adequate service to the entire French Riviera.

8GF, the private station operated at Strasbourg by the Radio Club du Bas Rhin, far from feeling discouraged by the official opening of the 15-kilowatt PTT Strasbourg transmitter, is being increased in power to 1 kilowatt. Programmes are transmitted on 300 metres. The interval signal is the call of the cuckoo.

New licence regulations are to be brought into force shortly in Italy to battle against the increasing number of radio pirates in that country. In future no dealer will be allowed to supply a wireless set to any person unless a receiving licence is produced. The police authorities have also been given permission to enter private houses or flats if they suspect the existence of an illicit receiving station.

With a view of providing direct communication with Bagdad and Aden, a special short-wave transmitting and receiving set has been installed at Karachi and, in connection with civil aeroplane and airship service, a direction-finding installation has been installed at Santa Cruz, near Bombay.

Station WGY (New York) has revised the schedule of its short-wave stations, W2XAD and W2XAF. The new schedule now effective provides for the operation of W2XAF on 9,530 kilocycles or 31.48 metres, daily from 5.30 p.m. to 11 p.m. Eastern Standard Time; W2XAD, 15,340 kilocycles or 19.56 metres, will operate daily except Saturdays, from 1 p.m. to 3 p.m.

Broadcasting stations in the United States are beginning to exclude guests from the studios while they are on the air, because the clothes of the visitors serve as sound absorbers and destroy the musical balance.

More extensive use of radio as a valuable link between France and her colonies was advocated recently by the congress of French people living in other countries. The gathering voted in favour of long-distance transmission of French radio programmes and the installation of receiving and transmitting sets in all French embassies and legations.

FOR THE HOME WORKER

A Personal Note by the Editor

IN the early days of broadcasting, I was interested in a great variety of handcraft work. In those days I edited a weekly periodical with the title of "Amateur Mechanic." In this and in many book publications issued under my name, I followed up a number of wood-working and metal-working processes and took great delight in explaining in print to a very considerable audience of amateurs the hundred and one processes and operations included in the art and practice of home carpentry and cabinet making. In particular I planned and carried through an elaborate and very fully illustrated series of volumes entitled "The Practical Woodworker." I very much doubt if any book on the subject is so lavishly illustrated or so simply worded, or so really practical, or so embracing in its scope.

In the production of that work I had in mind just such an audience as week by week reads AMATEUR WIRELESS—men keen on knowing the right way to do things and ever on the look-out for a really interesting job. I tried to cover in those volumes practically everything that the home woodworker could possibly require. I gathered round me about thirty contributors, each of them a specialist in his own line.

In that book I dealt very fully with all the tools, explaining their shapes and principles and by means of photographs and drawings exactly how those tools should be used. I dealt with all the materials the woodworker uses; I explained in detail every process and every operation he would need to be familiar with; I told him how to make joints, and then explained the application of these joints in the production of useful and wanted articles about the house. I doubt if there is any prominent article of household or garden woodwork not described in detail in that series of books and illustrated by complete working drawings. These working drawings are in fact a remarkable feature of the book. Off-hand I should say that the illustrations number many thousands and cover all sorts of indoor articles from scullery fitments to bookcases and dining-room sideboards, and all sorts of outside carpentry ranging from a cycle shed to a greenhouse.

I have an idea that there are thousands of my readers who would find the books useful, and who would be all the more interested in them because of the fact that these books and AMATEUR WIRELESS are closely related.

It is at my suggestion that the Waverley Book Co., Ltd., Department A.W.E., 96-97, Farringdon Street, London, E.C.4, are announcing full particulars of this series of volumes on page 793 of this present issue. They are inviting readers to apply for a copy of a booklet in which specimen illustrations from the series of volumes are reproduced and in which the names of the contributors and titles of chapters are laid out complete.

I am sure that the mechanically-minded reader would love to have these volumes and that there could be no better present this coming Christmas for the live intelligent man fond of using tools. B. E. J.

OUR BLUEPRINT SERVICE

Constructors of receivers described in this Journal should make full use of our Blueprint Service and avoid all risk of failure.

"PAPER v. ELECTROLYTIC CONDENSERS"

(*Continued from page 802*)

A paper recently read before the Institute of Radio Engineers, by Edelman (proc. I.R.E., August, 1930), describes a new variant of the principle. Here thin aluminium sheets are used, interleaved with a strip of porous fabric impregnated with gum arabic or some similar solution. The condenser is rolled up, much in the same way as an ordinary paper condenser of to-day, but, of course, owing to the much higher capacity, only a small roll is required to obtain the necessary capacity. The condenser is then put in a case or built up into a block for an eliminator, just in the same way as an ordinary condenser, but it has the important advantage that the cost is considerably less than the paper type.

The condensers described in this paper have apparently been in operation for several years without deterioration; they are capable of working up to voltages of 700 and are little affected by variations in temperature. One of the principal disadvantages of the electrolytic condenser is the leakage current, for the film which is formed is not a perfect insulator, even when the condenser is in service, and, therefore, there is a small current which flows all the time. It is claimed that with this new method of construction the leakage current is less than half a milliampere for an 8-microfarad assembly.

This is a development of some interest. It should not be long before some manufacturer in this country produces a high-voltage electrolytic condenser, at a price distinctly cheaper than the present paper condenser.

Radio Maroc (Rabat) frequently broadcasts its evening entertainments simultaneously on 416 and 23.80 metres.

The Hegra Dynamic Speaker.—We trust that readers will not have inadvertently misunderstood the inclusion in a radio dealer's advertisement recently published by us of an announcement that the "Hegra" eight-pole dynamic loud-speaker could be obtained for 39s. 11d. We must explain that the article offered was a special bargain of the shop-soiled kind and should have been so described. Every reader of AMATEUR WIRELESS knows that the price of the "Hegra" speaker is 56s., and we understand that no dealer can properly sell it at less.

When Asking Technical Queries

PLEASE write briefly

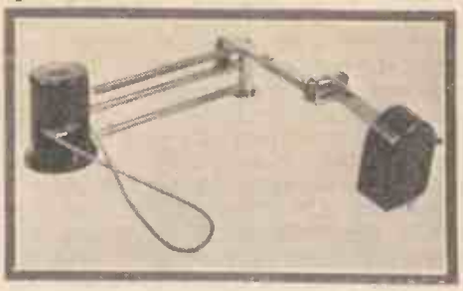
A Fee of One Shilling (postal order or postage stamps) must accompany each question and also a stamped addressed envelope and the coupon which will be found on the last page. Rough sketches and circuit diagrams can be provided for the usual query fee. Any drawings submitted should be sent on a separate sheet of paper. Wiring plans and layouts cannot be supplied.

Queries cannot be answered personally or by telephone.

HOME-RECORDING

WE described in these columns some time ago a simple outfit recently placed on the market to enable readers to make their own gramophone records at home. We recently had an opportunity of making a test of another system, that marketed by the Home-Recorder Company, of 1 Bower Street, Bradford.

This system comprises a tracking screw which is mounted in a rigid framework, some 6½ in. long by 3 in. high. This device carries an arm, on the end of which is placed a cutter for recording the groove on the disc. This apparatus is screwed at the back of the gramophone, and may be placed in such a position that it does not interfere in any way with its normal operation. When it is desired to make a



The Home Recorder employs a tracking device belt-driven from a pulley on the gramophone spindle

record a special metal disc is placed on the gramophone turntable, and a small pulley is then placed over the centre pin, and locked with a thumb-screw. A small spring belt is then slipped over this pulley, so that as the turntable rotates the tracking screw is moved round, and this carries the cutter in towards the centre of the record.

The cutter supplied with the outfit is a specially damped pick-up, the adjustment being somewhat different from that required for reproducing. A diamond cutting needle is provided.

The surface of the disc is lubricated with a special solution provided, and the arm carrying the cutter is placed in a suitable position at the outside edge of the record. If the gramophone is now started the cutter will track towards the centre of the record, and if the leads from the cutter are connected to the loud-speaker terminals of a radio set, the music or speech can be recorded.

This device has been given an extended trial, and has proved very satisfactory. The tracking is quite even, and there is no trouble with one groove fouling the next. The reproduction is surprisingly good, and only a small power is necessary. A simple 2-valve set will produce quite a good record. The gramophone motor, however, must be powerful.

The device in its simplest form sells at £3 19s. 11d. This price includes the tracking attachment, the electrical cutter with diamond point, cutting solution and 6 blank discs. The discs, by the way, should be played with fibre needles, or Burmese Colour needles, although a soft steel needle may be used.

FULL-SIZE BLUEPRINTS

When ordering, please send Postal Order, NOT STAMPS

CRYSTAL SETS (6d. each)

B.B.C. Brookman's Park Set	AW206
Regional Crystal Set	WM176

ONE-VALVE SETS (1s. each)

B.B.C. Official One	AW208
Hartley Single-valver	WM108
Monodyne	AW258

TWO-VALVE SETS (1s. each)

Talisman Two (D, Trans)	AW194
No-battery A.C. Mains Two (D, Trans)	AW230
No-battery Gramo-radio 2 (D, Trans)	AW238
1930 Talisman 2 (D, Trans)	AW239
Easy Tune Short-wave 2 (D, Trans)	AW242
Searcher Two (D, Trans)	AW245
Arrow Two (D, Trans)	AW249
Forty-five-shilling Two (D, 8 Trans)	AW250
Brookman's Two (D, Trans)	WM108
New Crusader (D, Trans)	WM182
Radio-Record Two (SG, D)	WM187
Gleaner Two (D, Trans)	WM201
Music Monitor (D, Trans)	WM208
Merlin Two (A.C. Set)	WM213

THREE-VALVE SETS (1s. each)

Wide World Short-wave Three (HF, D, Trans)	AW207
1930 Ether Searcher (SG, D, Trans)	AW211
Best-by-Ballot Three (SG, D, Trans) Price 4d. free with copy of "A.W."	AW217
Everybody's All-electric Three (SG, D, Trans) —A.C.	AW221
1930 Clarion Three (SG, D, Trans)	AW223
Beginner's Regional Three (D, 2LF)	AW233
Britain's Favourite Three 1930 (D, 2 Trans)	AW243
Car Three (D, R.C. Trans)	AW244
The "A.W." Exhibition 3	AW247
Standard Coil Three (HF, D, Trans)	WM117
Brookman's Three (SG, D, Trans)	WM161
Community Three (D, RC, Trans)	WM164
Brookman's Push-Pull Three (SG, D, Trans) 1/6	WM170
All-nations Three (D, 2 Trans)	WM178
Inceptordyne (SG, D, Pentode)	WM179
Brookman's A.C. Three (SG, D, Trans) 1/6	WM184
Music Marshal (D, 2 Trans)	WM190
Gramo-Radio D.C. Three (SG D Trans)	WM196
Concert Three (D, 2 Trans)	WM199
New Lodestone Three (HF, D, Trans)	WM205
De-Luxe Three (D, RC, Trans)	WM209
Five-Point Three (SG, D, Trans)	WM212
Falcon Three (A.C. Set)	WM217
New Brookman's Three (SG, D, Trans)	WM218

FOUR-VALVE SETS (1s. 6d. each)

Music-Lover's Gramo-radio (SG, D, RC, Trans)—1s. 6d.	AW202A
Music-Lover's Gramo-radio (Loud-speaker) 1s.	AW202B
Horizon Four (SG, D, 2 Trans)	AW237
Challenge Four (2SG, D, Trans) with copy of "A.W.," 4d. post free	AW251
Challenge Four (2SG, D, Trans, mains operated) with copy of "A.W.," 4d. post free	AW252
1930 Monodial (2SG, D, Trans)	WM158
Electric Four (All A.C.—SG, D, RC, Trans)	WM162
Brookman's Four (2SG, D, Trans)	WM174
Transportable Four (SG, D, 2 RC)	WM180
Super Q4 (SG, D, 2 Trans)	WM189
Lodestone Four (HF, D, RC, Trans)	WM193
Searcher's Four (SG, D, RC, Trans)	WM194
Invitation Four (SG, D, RC, Trans)	WM200
Regional Band-pass Four (SG, D, RC, Trans)	WM211
Five-Point Four (SG, D, RC, Trans)	WM216

FIVE-VALVE SETS (1s. 6d. each)

James Quality Five (2SG, D, RC, Trans)	AW227
All-wave Lodestone Five (HF, D, RC, Push-pull)	WM146
1930 Five (2HF, D, RC, Trans)	WM171
Dual-screen Five (2SG, D, RC, Trans)	WM185
Radio-Record Five (SG, D, Trans-parallel)	WM188
Overseas Five (3SG, D, Trans)	WM191

AMPLIFIERS (1s. each)

"A.W." Gramophone Amplifier	AW205
Two-valve Amplifier	AW216
"Mag" Gramo Unit	AW224
Radio-Record Amplifier (DC Mains)	WM183
Selecto Amplifier (HF, Unit)	WM210

MISCELLANEOUS (1s. each)

Short-wave Adaptor (1 v.)	AW183
Simplest H.T. Unit	AW197
By-pass Unit (Wavetrap) with copy "A.W."—4d.	AW218
"Twin" Brookman's By-pass (6d.)	AW222
James H. T. and L.T. Charging Unit	AW232
Simplest H.T. Eliminator for D.C. Mains	AW234
Simplest H.T. Eliminator for A.C. Mains	AW236
Choke Output Unit	AW240
Simple Tester Unit (6d.)	AW246
"A.W." Improved Linen-diaphragm Speaker	AW248
H.T. Unit for A.C. Mains	WM159
Brookman's "Wipe-outs"	WM186
Short-wave adaptor for Overseas Five	WM192
Staminator Unit for A.C. Mains	WM202
Universal Push-pull Amplifier	WM204
Outspan Short-wave Adaptor	WM207
"W.M." Standard A.C. Unit	WM214
"W.M." Standard D.C. Unit	WM215
Falcon A.C. Unit	WM219 1/-

PORTABLE SETS

Continental Portable (SG, D, Trans)	AW241 1/-
Pedlar Portable Two (D, Trans)	WM195 1/-
Pedlar Portable Three (D, 2 Trans)	WM197 1/-
James Portable SG3 (SG, D, Trans)	WM203 1/-
Foursome Portable (SG, D, 2 Trans)	WM206 1/6

Copies of the "Wireless Magazine" and of "Amateur Wireless" containing descriptions of any of these sets can be obtained at 1s. 3d. and 4d. respectively, post free. Index letters "A.W." refer to "Amateur Wireless" sets and "W.M." to "Wireless Magazine."

AMATEUR WIRELESS 58-61 FETTER LANE LONDON, E.C.4.

WE TEST FOR YOU

A weekly review of new components and tests of apparatus.

Conducted by our Technical Editor, J. H. REYNER, B.Sc., A.M.I.E.E.

"Filta" Condensers

LARGE-CAPACITY paper condensers are playing a more important part than ever in the radio apparatus of to-day. Capacities of 1 microfarad or more are used not only on mains apparatus, but in the set itself, for such purposes as shunting grid-bias batteries or resistances.

A good fixed condenser, the "Filta"

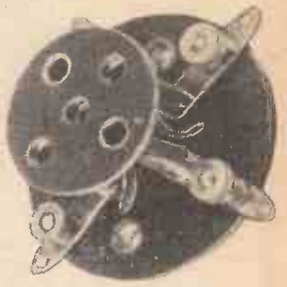
This week we have tested two samples of "Filta" condensers, British made by the Condenser and Electric Co. for the Mains Power Radio Co.

These consist of paper and foil, carefully prepared to withstand continual high-voltage work. The test voltage is specified at 500 volts D.C. and the working voltage at 240 D.C. and 160 volts A.C. The condensers are made in two types, one with a metal case and the other in a bakelite casing. For a capacity of 2 microfarads the former type measures 1¾ in. by 1 in. by 2 in. high, and costs 3s., whilst the latter measures 2 in. by $\frac{15}{16}$ in. by 3 in. high, and costs 4s. 10d.

We subjected both these condensers to a test at 550 volts D.C. continuously for two hours. The insulation resistance proved to be infinity both before and after the test. It appears that the working voltages given allow for a satisfactory high factor of safety. "Filta" condensers may be recommended.

New Clix Valve Holder

ELECTRO LINX, LTD., makers of Clix components, have specialised in plugs and sockets for many years and, therefore, fully understand the problems attached to the successful design of these necessary articles. Recently they have introduced a series of fixed valve holders; type B holder, suitable for five- or four-pin valves, has been submitted to us for test.



This new Clix valve holder has a low-loss construction

(*Continued on page 816*)

"WE TEST FOR YOU"

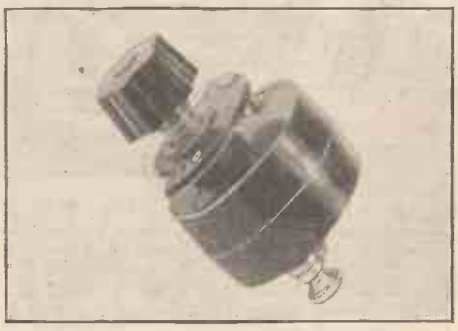
(*Continued from page 814*)

In the construction of this component, special diagonally-split sockets are mounted on a narrow circular fibre base. To prevent accidental contact with the wrong sockets when inserting a valve, a second fibre piece of smaller diameter is placed on top. Metal strips in contact with the sockets terminate in soldering tags. The price of the holder, with terminals, is 10d., and without terminals, 8d. The possibility of dust or other semi-conducting material slowly forming on the fibre base and causing a partial short circuit between high- and low-potential sockets is decreased by the presence of two semi-circular slots cut in the fibre.

For mounting this component to the baseboard two metal bushes are supplied. We found that all types of four- and five-pin valves fitted securely into the holder, making good electrical contact with the sockets. The holder can be recommended.

Bulgin Rotary Switch

IT is care and attention in the design of components that makes the construction of a high-grade set possible. A. F Bulgin & Co. have from time to time shown their ingenuity in providing the



The latest Bulgin idea—a rotary switch

right kind of component at a moderate price, and their reputation is certainly upheld by the new quick-action switch recently placed on the market.

In design this component is simple, yet in performance it is exactly what is required for wireless and mains work. The operating spindle rotates a cam, to which a small tension spring is attached. The other end of the spring is coupled to a rotating switch arm. The action is delayed until considerable tension is placed on the spring: at a critical position the combination of tension and direction of pull becomes sufficient to drag the switch over at a considerable speed. Both the "make" and "break" are exactly similar in action. As a result, there is freedom from arcing and, due to the continual tension of the spring, the contact is electrically efficient.

PREPAID ADVERTISEMENTS

Advertisements under this head are charged THREEPENCE PER WORD, minimum charge THREE SHILLINGS. DEPOSIT SYSTEM

As the Publishers cannot accept responsibility for the bona fides of advertisers in this publication, they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom double fees are charged.

The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to

"AMATEUR WIRELESS" ADVERTISEMENT DEPARTMENT
58/61 FETTER LANE, LONDON, E.C.4

ALEXANDER BLACK, Wireless Consultant, will call and cure your set. (London and Home Counties). Radio Association appointed representative. Components and McMichael Portables on hire.—55 Ebury Street, S.W.1. Sloane 1055.

ELIMINATOR TRANSFORMERS for Westinghouse H.T. 5, 6, and 7 rectifiers, 15/6. "Challenge Four" Coils, 10/6. Approval. Lists Free.—Edwards, 5 Bradford Street, Chelmsford.

TRICKLE CHARGERS, A.C. mains, for 2- and 4-volt accumulators, no upkeep; 18/6, carriage paid.—A. Benoit, 4 Manor Gardens, Gunnersbury Avenue, London, W.3.

"VERT" WIRING CLIP.—No soldering. No bending wires round terminals. Takes any number of wires to a terminal, any gauge. Tested and approved "Amateur Wireless." Gross (sufficient for 3 Valve set) 2/-. Trade inquiries invited.—W. Green & Son (A) Redclyffe, Horley, Surrey.

PAY AS YOU LISTEN.—Receivers. Kits, everything you want, cash on delivery or credit. My terms *are* lowest.—R. Hillier, 10 Brymer Road, S.E.5.

ENGINEERS.—IMPORTANT NOTICE.—Results now to hand show that 93 per cent. of our candidates pass their Exams. at the first attempt, a remarkable record, unapproached by any other organisation and showing why we alone guarantee "NO PASS—NO FEE." If 93 out of every 100 ordinary men can succeed, why should you remain in the ranks? Now is the time to "get busy" and investigate. Our handbook, "ENGINEERING OPPORTUNITIES," explains the most simple and successful home-study methods of passing B.Sc., A.M.I.Mech.E., A.M.I.C.E., A.M.I.E.E., A.M.I.A.E., G.P.O., C. & G., Matric., etc., Exams. This book outlines Courses in all branches of Civil, Mech., Elec., Motor and Wireless Engineering, shows the unique advantages of our Appointments Dept. and includes a brilliant foreword by Prof. A. M. LOW, in which he shows clearly the chances you are missing. Send for FREE HANDBOOK now (state branch, post, or Exam.). — BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY, 109 Shakespeare House, 29-31 Oxford Street, London.

WET BATTERY REPLACEMENTS.—New Process Sacs, approximately 20,000 m.a., 2/6 per dozen. Particulars free. —Scottish Batteries (A.W.), Braeside, Uphall Station.

CORRESPONDENCE COURSES OF INSTRUCTION IN WIRELESS.—Write for free particulars to the Correspondence Course Dept. of the R.M. College, 26-27 St. Mary Street, Cardiff.

WE WILL ACCEPT YOUR SURPLUS APPARATUS (making you a high allowance) in part payment for any new apparatus, your inquiry will be dealt with promptly. —Bostock & Stonnill, 1 Westbourne Terrace, S.E.23.

ELIMINATOR KITS from 28/6. Mains transformers, mains chokes, etc. Cheapest house in the trade. All high-class guaranteed material. Lists.—Clearvolt Engineering, 148 New Cross Road, S.E.14.

WIRELESS BARGAINS.—New 5-valve Portable Sets, Radio-Grams, etc., for disposal by Liquidator of well-known Wireless Company. Sets ready for immediate use and may be bought singly.—P. G. Lambirth, Chartered Accountant, 4 Broad Street Place, E.C.2. London Wall 7120.

BANKRUPT BARGAINS.—Telsen ACE, 6/6. Radiogrand, 9/6. .0005 variable, 2/6. Polar .0001, 2/-. .0003, 2/9. Differential, 2/9. Neutralising, 1/8. S.M. dials, 1/6. A.J.S. variable, .0002, 1/9. Fixed, 9d. Switches, 6d. Bullphone Cone Units, 6/6; ditto, B.A., 9/6; chassis, 1/6. Triotron, 9/6. Undy, 18/6. Volume controls, 2/-. Three-terminal type, 2/9. List free. Large complete stock.—Butlin 143b Preston Road, Brighton.

Printed in England. Published by Bernard Jones Publications, Ltd., 58/61 Fetter Lane, London, E.C.4
Sole Agents for South Africa: CENTRAL NEWS AGENCY, LIMITED. Sole Agents for Australasia: GORDON & GOTCH, LIMITED. Saturday, November 22, 1930.

MAKING A NOVEL LINEN SPEAKER

W. JAMES ON THE NEWEST AERIAL CIRCUITS

Amateur Wireless

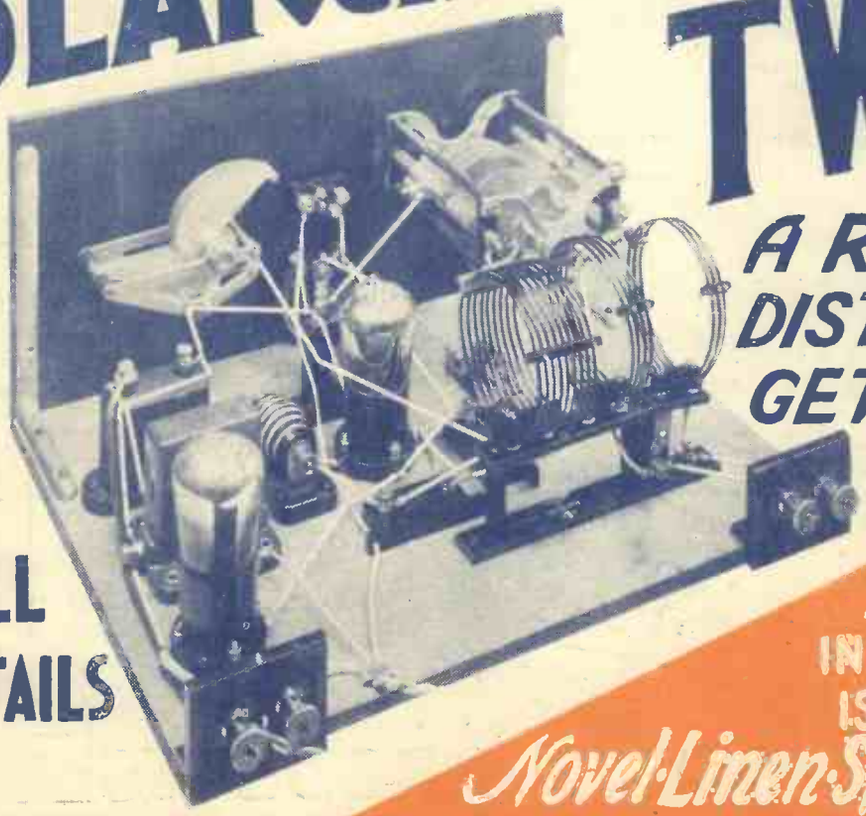
and Radiovision

Every Thursday 3d

Vol. XVII. No. 442 Saturday, November 29, 1930

The SEARCHER SHORT WAVE TWO

A REAL DISTANCE GETTER



FULL DETAILS

ALSO IN THIS ISSUE

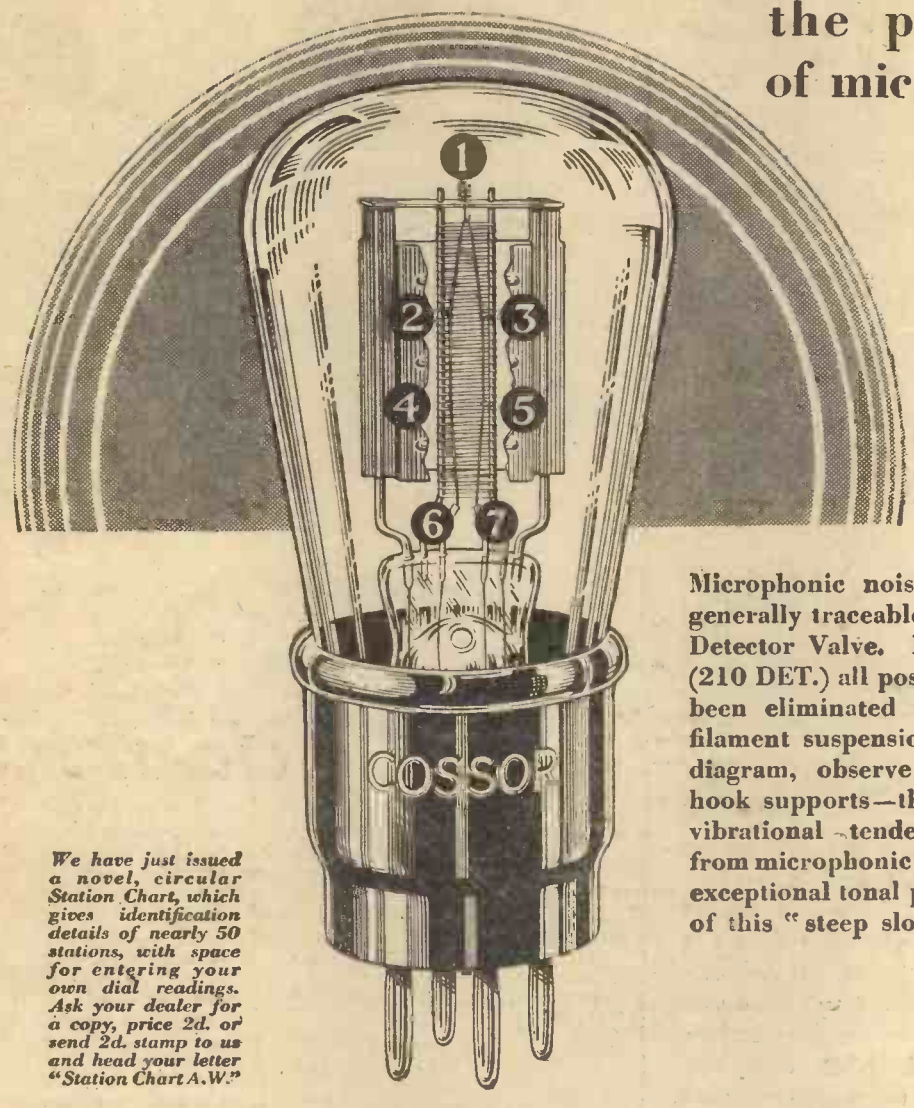
Novel Linen Speaker

Registered at the G.P.O. as a Newspaper

Seven point suspension

definitely prevents filament vibration

the primary cause of microphonic noises



We have just issued a novel, circular Station Chart, which gives identification details of nearly 50 stations, with space for entering your own dial readings. Ask your dealer for a copy, price 2d. or send 2d. stamp to us and head your letter "Station Chart A.W."

Microphonic noises in a Receiving Set are generally traceable to filament vibration in the Detector Valve. In the new Cossor Detector (210 DET.) all possibility of this vibration has been eliminated by the special seven point filament suspension employed. Examine the diagram, observe the four *extra* insulated hook supports—these effectively damp out all vibrational tendencies. Complete freedom from microphonic noises and great volume with exceptional tonal purity are ensured by the use of this "steep slope" Cossor Detector Valve.

Cossor 210 DET., 2 volts, .1 amp. Impedance 13,000. Amplification Factor 15. Mutual Conductance 1.15 m.a./v. Normal working Anode Voltage 90-150. *Price* 8/6

THE NEW COSSOR DETECTOR VALVE

DEFINITELY FREE FROM MICROPHONIC NOISES

6757

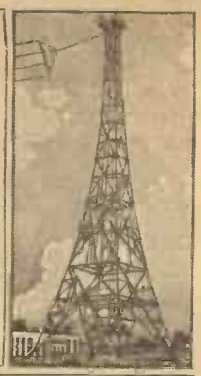
A. C. Cossor, Ltd., Highbury Grove, London, N.5

Advertisers Appreciate Mention of "A.W." with Your Order

No. 442. Vol. XVII. NOVEMBER 29, 1930

821

Amateur Wireless and Radiovision



EDITOR: BERNARD E. JONES.
TECHNICAL EDITOR: J.H. REYNER B.Sc., A.M.I.E.E.
THE LEADING RADIO WEEKLY FOR THE CONSTRUCTOR, LISTENER & EXPERIMENTER.
RESEARCH CONSULTANT: W. JAMES.
ASSISTANT EDITOR: H. CORBISHLEY.

NEWS · & · GOSSIP · OF THE · WEEK

NEXT WEEK— OUR CHRISTMAS NUMBER

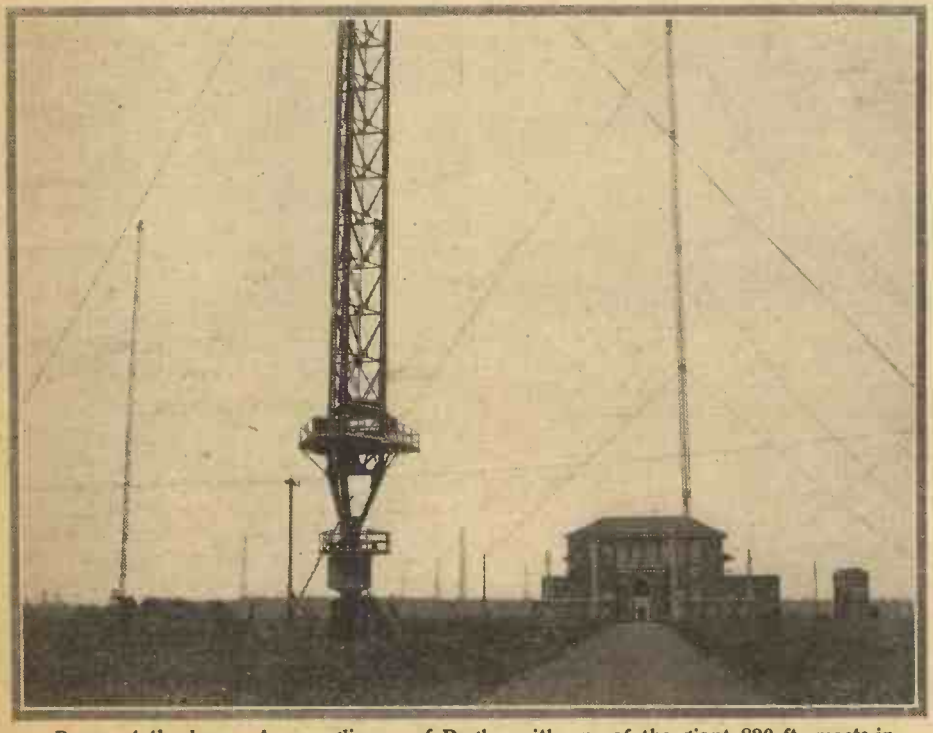
CHRISTMAS is close at hand, and next week's issue of AMATEUR WIRELESS is our Special Christmas Number, which will make you think deeply about Christmas holidays, Christmas festivities, and (last, but not least) Christmas radio! Make sure, at the newsagent's, of getting your copy of this bumper number, for it will sell like hot cakes: a coloured cover, and seventy-six pages chock full of helpful, constructional, and entertaining features; bigger than ever—but the usual price, 3d.

SPONSORED PROGRAMMES AGAIN

THE topic of sponsored programmes is on everybody's lips, and as it seems inevitable that advertising programmes of some form will come in time, it is a good thing that the listening public is now thinking deeply about it. Don't overlook the fact that there can be two kinds of sponsored programme: one the occasional big effort of an advertiser to whom cost means nothing, when he will put over an "all-star" programme, and the other the average effort of small firms, who can only afford to give broadcast matter inferior to that now offered by the B.B.C. We *do* want the big effort, because it will mean a type of programme which the B.B.C. could never hope to afford; but we don't want sponsored programmes which are no better than State-provided programmes. There are plenty of British firms who could afford to give fine programmes.

A CONSIDERED OPINION

THIS logical idea was well expressed by the Editor of AMATEUR WIRELESS when, in a leading article in the October issue of *Wireless Magazine*, he said: "Anybody with brains and money ought to be able, *just for one hour*, to put out a better show than the B.B.C. can in the nature of things put out continuously. . . . Sponsored programmes might be the spiced morsels in the regular plain but nourishing menu, and would add a new zest to listening."



Down at the base. A new glimpse of Rugby, with one of the giant 820-ft. masts in the foreground. Rugby is the transmitter for the P.O. transatlantic telephone, and a short-wave transmitter is sometimes used

PRINCIPAL CONTENTS

ANNOUNCERS' SALARIES

WHAT salary do American announcers receive? When the question was submitted to the National Broadcasting Company, a representative said: "The announcers' regular pay is nothing to speak of. It's the commercials he gets that count. For example, when Graham McNamee announces a commercial programme, he gets £50, in addition to his salary, and during the winter he usually has at least four commercial programmes a week."

IN AUSTRALIA

IF imitation really is the sincerest form of flattery, then AMATEUR WIRELESS is flattered! A popular Australian contemporary was interested in the special article which was published in AMATEUR WIRELESS No. 427, telling how it is possible to telephone from a sixty-mile-an-hour express train. As, no doubt, the article was considered of great interest also to Australian amateurs, it was reprinted word for word

NEWS · & · GOSSIP · OF THE · WEEK —*Continued*

under a different title. It is unfortunate that no acknowledgment of AMATEUR WIRELESS was made, but, then, our Australian readers who saw the article in AMATEUR WIRELESS some three months before it appeared in the Australian magazine will have no doubt as to the origination of the information.

A BRITISH PRODUCER FOR CANADA

TYRONE GUTHRIE, author of *The Squirrel's Cage*, has been engaged by the Radio Department of the Canadian National Railways to produce a number of plays specially written for the microphone. The close co-operation of the B.B.C. has been granted, and the technique which has been perfected in our studios will be closely followed. The plays will be presented either in Montreal or Toronto, and will be broadcast simultaneously by all the C.N.R. stations.

SIGN, PLEASE!

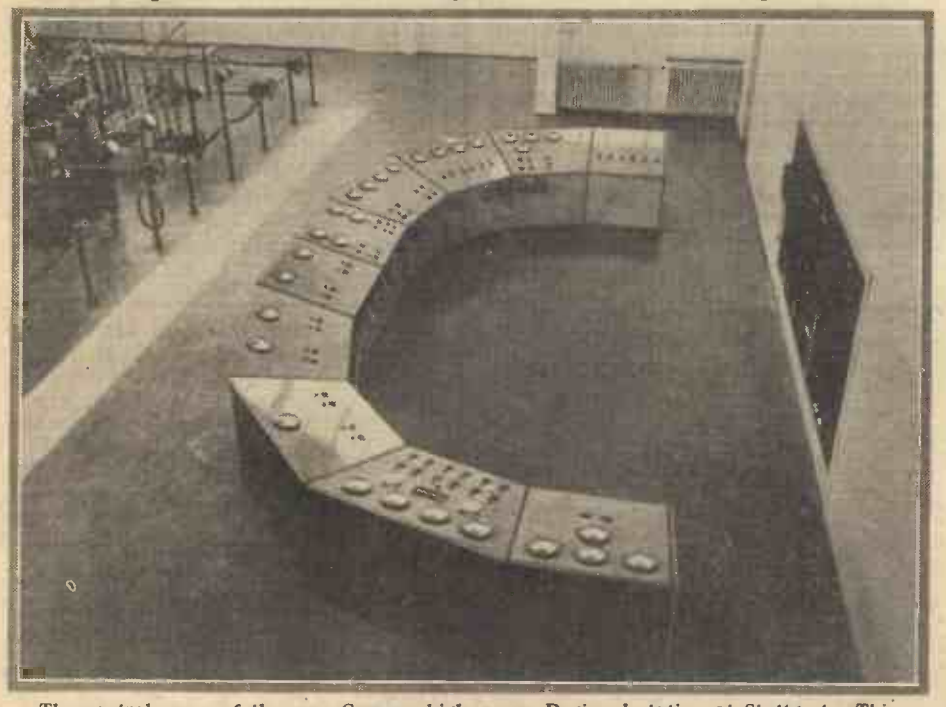
UPON entering an exhibition held recently in New York, visitors were somewhat surprised to hear a voice, coming apparently from nowhere, inviting them to sign their names in the book! When each visitor entered the exhibition he interrupted a beam of light directed on to a photo-electric cell, and thus automatically set a gramophone in motion, which was connected through an amplifier to a hidden speaker.

JAZZ RECORDS BY RADIO

RECENTLY a trapper, stationed at the Hudson Bay post at Fort Simpson, 700 miles north of Edmonton, decided that new records for his portable gramophone would be welcome. Through the Fort Simpson wireless station he broadcast a request for some of the latest dance records. His "musical S.O.S." was picked up by the Canadian National Telegraphs' operator at Edmonton, who purchased a selection and dispatched them by aeroplane. The trapper had his records within two days. Before wireless and aerial transport the records would have been out of date long before delivery.

B.B.C.'s INTERVAL SIGNAL

AS soon as the apparatus is delivered, which should be within the next two or three weeks, B.B.C. stations will introduce an interval signal. This will resemble the ticking of a clock, similar to the sound made by several Continental stations during their intervals. But it should be made clear that the B.B.C.'s interval signal is not intended as a means of identifying the station, but to reassure listeners who have switched on during a blank period in the programme that their sets are working correctly. The interval signal will generally be broadcast when a programme falls short of its scheduled time. Where the interval is more than five minutes, piano music will be broadcast in the usual way. We think that, while the B.B.C. is doing an interval signal they might as well have thought of something more distinctive, in order that foreign listeners could identify and distinguish between the various B.B.C. stations.



The control room of the new German high-power Regional station at Stuttgart. This "bird's eye" view of the control desk gives an idea of the large number of tuning controls and adjustments which have to be made in a transmitter, and it is interesting to compare this with the two simple control desks at Brookmans Park

OUTSIDE SAVOY HILL

PASSING through the portals of the B.B.C.'s Headquarters at Savoy Hill the other day, an AMATEUR WIRELESS correspondent noticed four struggling and perspiring men heaving up a grand piano to one of the studios, in preparation for a famous artiste's broadcast. After some false starts the piano was hoisted, one of the men exclaiming: "Well, Bill, I hope it goes alright over the air." Another replied: "I wish it *would* go on air; save us some (blank) trouble!"

END OF STUDIO OPERA

FOLLOWING the announcement (on page 852) of the new Covent Garden Opera scheme it seems that Broadcast opera from studios will soon be a thing of the past, apart from occasional broadcasts of new settings of old works appropriate to studios. The B.B.C. has long felt that opera broadcasts at its best from the actual opera house. The scheme assures the continuance and extension of the Covent Garden seasons, combining increased opportunities for the public to attend first-class performances of grand opera with adequate provision for those who, unable to attend the performances, are anxious to hear the broadcasts in their own houses.

ABOUT DICK SHEPPARD

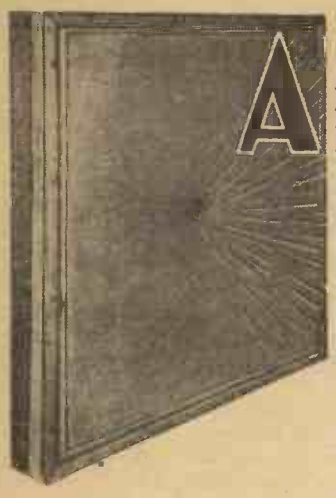
FOLLOWING Mr. Maxwell Light's deputy talk on asthma last Sunday, in which he mentioned that the Reverend Dick Sheppard was unable to give the talk owing to a crippling attack of asthma, hundreds of anxious inquiries were received from listeners. The B.B.C. wishes to reassure them that Dick Sheppard's indisposition was only temporary, although extremely exhausting, as asthma sufferers will appreciate. It is hoped that this favourite divine will soon broadcast again

A. J. ALAN AGAIN

ANOTHER inimitable story will be broadcast by A. J. Alan on December 1 from the National and on December 2 from the Regional. The title of the story is "The Well." It is related that, while listening to a rehearsal of this story, at A. J. Alan's house, an amusing affair took place. It appears that A. J. Alan was "broadcasting" his story, by speaking into a microphone situated in a different room from whence the loud-speaker reproduction appeared. Finishing "The Well," he went on to tell a story about a man who had a pet fish that used to follow him about until one day it was accidently drowned, but before he had finished speaking through the medium of the loud-speaker he appeared in person before his astonished audience. They had been listening to the reproduction of a gramophone record!

A GOOD SPORT

WHEN Walford Hyden arrived in the B.B.C. studio to conduct his Chinese scena during a recent vaudeville programme he found that one of the singers had been taken ill. Noticing another artiste standing by for another item in the programme, Hyden said: "Do you sing?" "A little," was the reply. "Right. Will you help me out?" "Let's have a look at it." So they tried over the number on the piano. "Fine! By the way, who *are* you?" "Melville Gideon." "Well, you're a good sport!" We wonder how many listeners to this particular item realised that only a "good sport" saved it.



A NOVEL LINEN-DIAPHRAGM SPEAKER

In the past we have described many linen-diaphragm loud-speakers all of which have been highly efficient. That described in this article, designed by W. A. HATCH, has several novel features and we place it before our readers with every assurance that it will give excellent results

THE big advantage of the linen speaker is that it enables amateurs to get high-quality reproduction at low cost. Furthermore, the amount of constructional work involved in the building of a linen speaker is so small that anyone capable of using ordinary wood-working tools should have no difficulty in making a very satisfactory job.

Moving-coil and dynamic speakers have their respective advantages, and the home construction of the former type, at least, is within the bounds of possibility. What deters amateurs, though, is the prospect of having to wind large "pot" coils, construct delicate moving-coil formers, and carry out rather tricky work at the diaphragm apex.

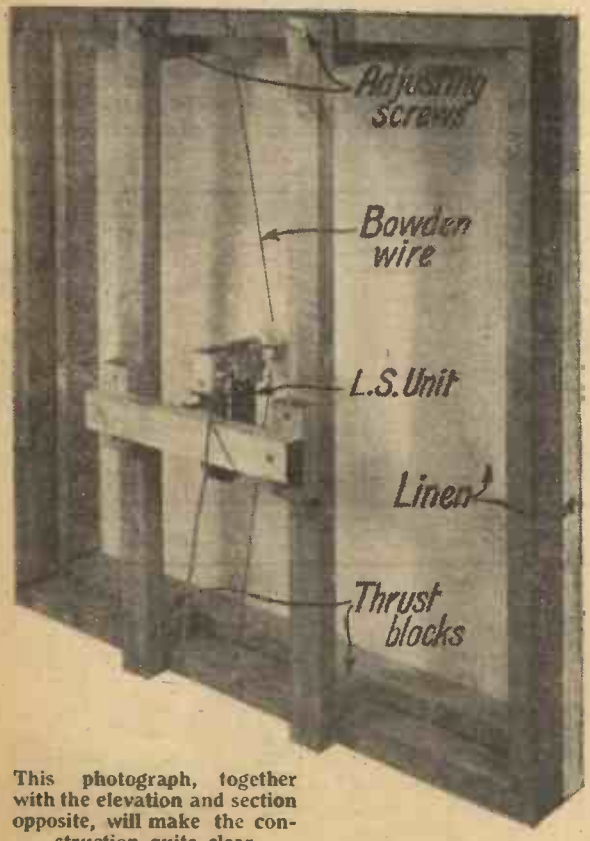
No such difficulties have to be contended with in the construction of a linen diaphragm speaker. Readers who have previously made up linen speakers will know that the principle of operation depends on the stretching of a linen sheet, rendered taut by "doping" with some cellulose compound, so that the natural period of vibration is shifted to a point of no importance on the frequency scale.

With some instruments the tension on the diaphragm is obtained by means of a smaller diaphragm, also of doped linen, the two being joined at their apexes. In other designs the smaller diaphragm has been dispensed with and the tension obtained by means of a run of stranded Bowden wire stretched tightly on the framework at the back and joined at its mid point to the apex of the diaphragm.

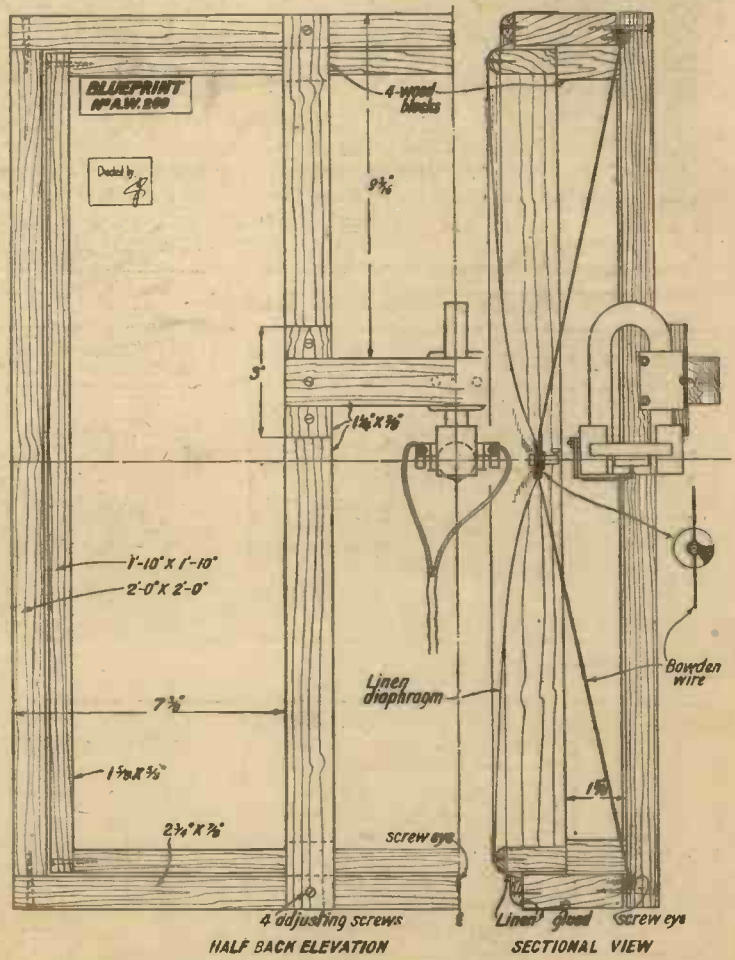
The degree of success obtained with a linen speaker depends very largely on correct tensioning. If the method of tensioning is not properly arranged, or if the dope used is of an inferior quality, not capable of tensioning the linen strands, then the diaphragm will be flabby and will not transmit sound vibrations over a useful portion of its area.

The new design of linen speaker shown here employs a novel method of tensioning.

(*Continued on next page*)



This photograph, together with the elevation and section opposite, will make the construction quite clear



A full-size blueprint of this drawing is available, price 1/-

"A NOVEL LINEN-DIAPHRAGM SPEAKER"

(*Continued from preceding page*)

It is still necessary to use the proper dope in order to get good results. No method of stretching can compensate for imperfect tensioning, by the dope, of the individual strands of the linen. In this new speaker the Bowden wire system of tensioning the diaphragm is employed, and the novelty consists in the way in which the diaphragm is stretched at its outer edges.

Examination of the constructional diagram given here shows that the linen diaphragm, which is firmly secured to a rectangular wooden frame, is stretched by means of an inner frame pressing against the edges of the diaphragm and forcing it outwards. The centre of the diaphragm is held by means of Bowden wire to the outer frame. The wire used for this tensioning must have a considerable tensile strength, for if it is affected by the constant strain on it then the speaker will be constantly needing adjustment and the diaphragm tensioning screws will need frequent attention. It is important, also, that the wire used for tensioning should not vibrate of its own accord, for were it to do so a resonance would be set up which would nullify the good frequency characteristic of a tightly-stretched diaphragm.

The novel tensioning system can clearly be seen in this photograph

Bowden wire is very suitable; use the kind covered with a protective compound, which has a deadening effect on any resonance which the stranded wire alone may exhibit.

The Linen

Practically any type of unit may be employed, but naturally only the best results can be expected with a driving mechanism capable of standing to quite a considerable amount of volume, and at that point showing no signs of overloading.

Complete kits of materials for making up this speaker can be obtained from specialists in linen speaker construction; the Kone-Dope Co., for example. If you are purchasing your own linen, then take care to get material of good quality, which will not burst its threads when the tensioning is being carried out.

Good quality Irish handkerchief linen is the proper material to use. It is unfair to expect good results from a diaphragm made up from poor linen.

The Framework

The frames can be constructed of any good hard wood and all measurements can be obtained from the accompanying drawing, which shows the speaker frames in part section. The outer frame is used as the support for the linen and the smaller frame is used for tensioning. It will be seen that the diaphragm is attached along its edges to the larger diaphragm with glue, and is further secured by means of stout beading, which should be screwed in place when the diaphragm has been stretched, evenly but not at drum tightness, across the frame.

The Bowden wire is secured at its ends by small screw eyes, the ends of the wire being twisted over and soldered. The connection to the chuck in the centre of the diaphragm can be made either by dividing the strands and pushing the chuck through, or, alternatively, a special chuck, supplied complete with the Bowden wire fixing, and which can be obtained from most wireless dealers, can be employed.

Doping

Doping and stretching should be carried out alternatively as with previous linen speakers. The final stretching should be carried out while the diaphragm is still wet with dope. As the fixing screws of the smaller diaphragm are tightened, the diaphragm is forced outwards, so increasing the tension on the Bowden wire. When the diaphragm is dry, it should be then at drum tightness and should emit a "plonk" when tapped with the finger.

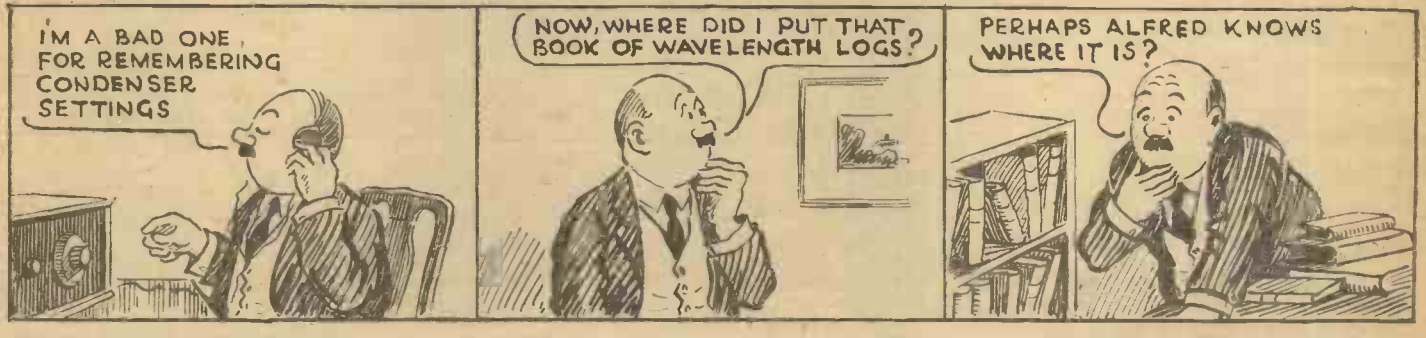
With some of the special linen diaphragms supplied by kit manufacturers, the tightening can be carried out simply by damping the diaphragm with water. When it dries, the tension of the threads is increased.

When fixing the unit to the diaphragm, take care to get the driving rod exactly central with the chuck in the centre of the diaphragm. If there is any eccentric strain on the driving rod, then the working of the unit may be upset, and in any case the diaphragm and driving mechanism will be acousticly damped by this side strain.

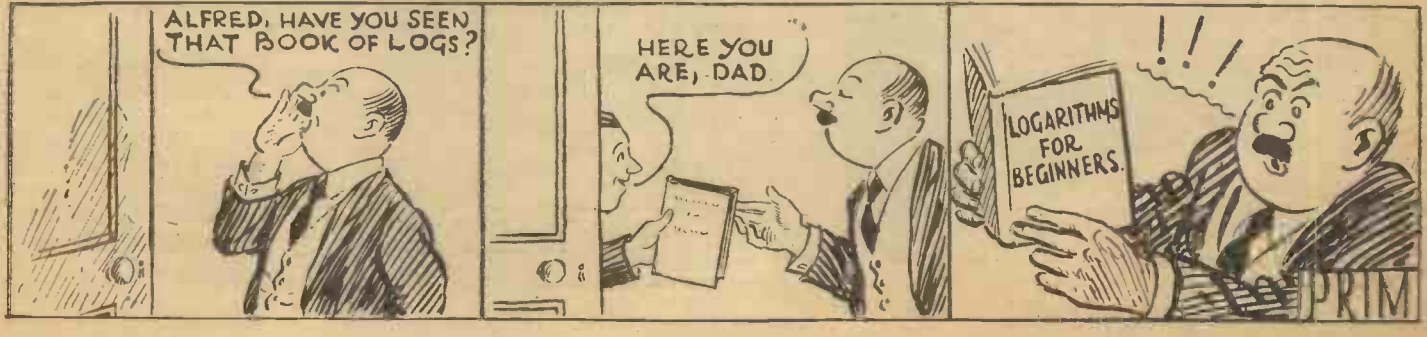
The unit must be very firmly secured to its supporting batten and the driving rod must be firmly attached to the chuck. Any looseness at either of these points may set up a disturbing chatter.

Constructors who want to make quite sure of getting good results and of eliminating any constructional difficulties should get the blueprint, which can be obtained, price 1s., post free, from the Blueprint Department of AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4.

MR. FLEX WANTS HIS LOG BOOK—



—AND GETS ALFRED'S



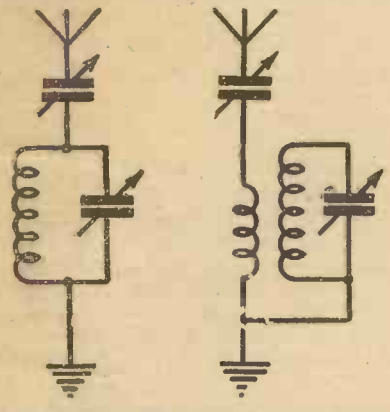
The NEWEST AERIAL CIRCUITS

Some notes on the best methods of obtaining selective tuning

By W JAMES

AT last it is being realised that from the local station we may receive several volts across the aerial tuning coil. Voltages of 6 are common, given an outdoor aerial and a good coil.

Relatively few people receive so great a voltage, but even a volt or two is enough to upset many screen-grid valves. These valves, as normally used, simply will not deal properly with signals of a volt or more.



Figs. 1 and 2. These are two usual aerial circuits but neither is very selective

The result is that distortion is introduced in the very first stage of the set and the tuning is made flat.

Volume Control

With a correct volume control we could avoid these difficulties to an extent, but the best practice is first to select the signal and then to magnify it. With this arrangement the screen-grid valve is not likely to be overloaded and broad tuning and distortion are, therefore, minimised.

The usual aerial circuit, Fig. 1, or perhaps Fig. 2, is really not very selective. You may have a good coil and tuning condenser, but the fact remains that the shape of the tuning curve is not really satisfactory.

The local station comes through even when the circuit is tuned, perhaps, 40 or 50 metres off. It is, therefore, magnified along with the signal to which the circuit is actually tuned and interference results.

In the early days of broadcasting we used to employ two-circuit tuners (Fig. 3). The position of one coil relative to the other could be altered. We used a two- or three-way coil holder and plug-in coils, and pretty good selectivity was obtained—actually much better than with some of our present-day arrangements.

To adjust the coupling of the pair of coils for the best results at every wavelength and to keep the circuits in tune demanded a little patience. Nowadays the smallest number of controls must be used, and so the old method is not used.

Instead, we try and fix a value of coupling which will be fairly good over the whole tuning range. Sometimes we use a magnetic coupling and sometimes a condenser coupling, while it is quite possible to use a mixture of both.

In the coupled circuit having a magnetic coupling we may fit a small coil L (Fig. 4), and shield the pair of tuning coils.

With similar coils and tuning condensers one knob tuning is practicable. The only difficulty is that if the size of L is made most satisfactory at 500 metres, the circuit is too tightly coupled at 200 metres and broad tuning results. If, on the other hand, the coupling is fixed at 200 metres, the circuit as a whole is far too sharp at 500 metres.

We can of course, obtain an average result by setting the circuit at, say, 350 metres, depending upon the kind of coils used and how their resistances vary with wavelength.

Condenser Coupling

When a condenser is used as the coupling, as in Fig. 5, the reverse tuning characteristics are obtained. Thus, if we set the condenser for the best results at 500 metres, the tuning is probably too sharp at 200 metres. We must remember, however, that an ordinary tuned circuit tunes more broadly at the lower wavelengths. It is, therefore, possible that the combined tuning of a set may be perfectly satisfactory and, so long as the characteristics of the aerial circuit are reasonably good, the method is suitable. The best value for the coupling condenser C depends upon the wavelength range being covered and the characteristics of the coils. A usual value with 2-in. coils of No. 26 or No. 28 wire, covering 200 to 550 metres, is .015 microfarad.

With a larger value the tuning is sharper, and if a lower capacity is used, the aerial circuit tunes more broadly. Thus there is room here for experiment and it might even pay to have a second condenser to switch in over part of the tuning range in order to secure the finest results.

Filter Circuits

Aerial filter circuits are greatly used in American sets, and as a rule they have good characteristics. They must of course, be carefully set up or the two circuits will not tune properly.

With the two condensers and coils matched, we have to adjust on the one hand for the effective capacity of the aerial and on the other hand for the capacity of the valve and its holder, to which must be added the wiring.

It is obvious that if, with both tuning condensers set at zero, the total capacities of the circuits are alike, the circuits will tune properly, because at any point over the range the capacity in both circuits is equal.

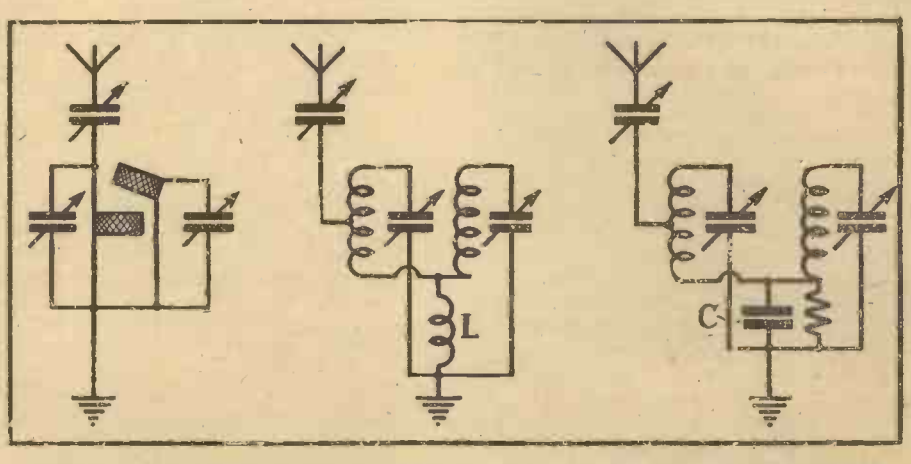


Fig. 3. An early double-tuner arrangement. Fig. 4. A coupled circuit with magnetic coupling. Fig. 5. A coupled circuit with condenser coupling

Perhaps the easiest way of testing is with a meter in the anode circuit of the detector valve. With a leaky-grid detector the meter will read less current when a signal is tuned in, and when the anode-bend method of detection is used the current increases with a signal.

Tune to the local station first and adjust the pre-set condenser in the aerial circuit

(*Continued at foot of next page*)

A HOME-MADE PICK-UP

MOST amateurs have all the necessary "ingredients" for the making of an excellent pick-up lying among the junk in their possession, only waiting to be assembled and put into commission.

For the pivot bar use the third contact stud (5BA this time to reduce weight) and, after cutting to the correct length to pass between the pivot points, slightly countersink both ends dead centre.

20 gauge, cut to cover both pole pieces and drilled in the centre to take the brass tag (D). Take a little care in assembling these parts in order to get the armature exactly over the pole pieces and parallel

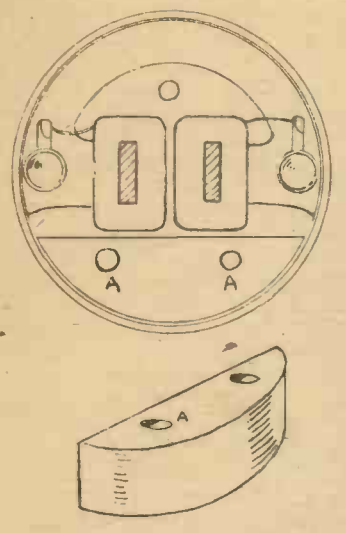


Fig. 1 (left). The earpiece and block

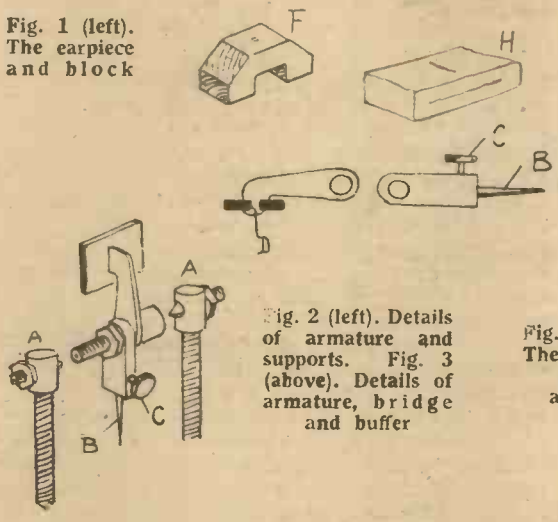


Fig. 2 (left). Details of armature and supports. Fig. 3 (above). Details of armature, bridge and buffer

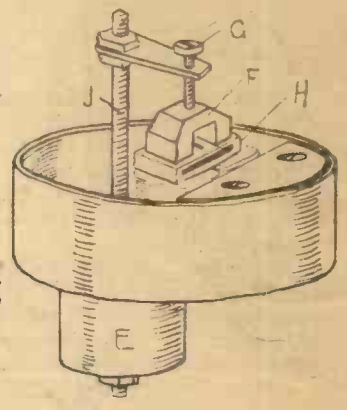


Fig. 4 (right). The pick-up partly assembled

You will need nothing but a single earpiece from a pair of headphones, three contact studs, some small pieces of wood, brass and iron, a piece of rubber sponge, and a few odd screws and nuts.

The principle used in the pick-up to be described is that used on the ordinary gramophone sound-box, the only alteration being the substitution of the light iron armature for the mica diaphragm.

Detach the earpiece and remove the cap and diaphragm. You will find that, apart from the pole pieces in the centre, one-half of the aluminium casing is unoccupied. Cut a piece of hard wood to fit snugly into this space (Fig. 1), the level of the small platform thus formed being brought to the height of the pole pieces. This block forms the anchorage of the mechanism operating the small armature.

Through both block and casing drill two 4BA clearance holes to accommodate two 4BA contact studs (A) about ¾ in. apart and parallel with the pole pieces. After tapping a 6BA thread through their heads (Fig. 2), insert the two contact studs and pull down tightly by means of nuts behind the casing, taking care to have the threaded holes in direct line. Two 6BA screws pointed at one end, and complete with lock nuts, are now inserted, points inwards, and we have everything in readiness for the moving parts.

Now study Fig. 2, and it will be seen that, while the brass needle holder has to be of sufficient substance to take both the hole for the needle (B) and that for the anchor screw (C), the small bar carrying

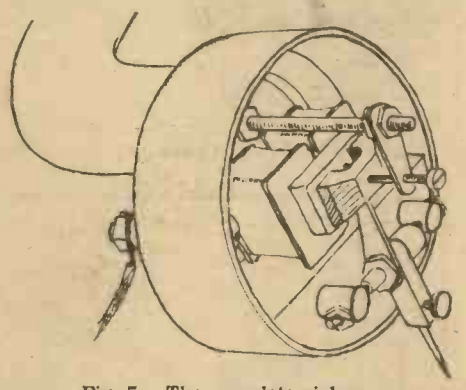


Fig. 5. The complete pick-up

the armature is much lighter, as it is here we have to keep down the weight. This bar must be of such a length that the armature shall be immediately over the two pole pieces (Fig. 4). File the end of the brass bar as shown in Fig 3, leaving a small tag (D) for riveting on the armature. Both bars are now drilled to fit on to the pivot bar and screwed up tightly.

The armature is of soft iron, about

to their surface when about ⅛ in. away from them.

If the movement is now assembled at the pivot points it will be found that, while the whole mechanism works freely, there is nothing to prevent the armature leaving the magnets. This must be kept close, at the same time leaving play for the movement to operate.

Here we kill two birds with one stone, by fixing a piece of 4BA rod through the other half of the casing J, one end holding a wooden boss E for inserting into the tone arm of the gramophone, while the other end holds the movement in place.

For this I have used a wooden bridge F, the size of the armature, held in place by an adjustable 6BA screw G in a small brass plate at the top of the rod. This bridge, which must clear any moving part, presses on a rubber sponge buffer H, and as the sponge is cut to envelop the iron it will be seen that not only is the movement held in place, but that a most useful damping adjustment can be made at the screw G. Cut the rubber sponge with a sharp chisel.

The pick-up is now complete and, provided all nuts are well tightened up to prevent undue rattle, you can fix the unit to your gramophone and connect up to your set.

C. H. SHARKE.

"THE NEWEST AERIAL CIRCUITS"

(*Continued from preceding page*)

Afterwards, tune to a fairly strong distant station and once more adjust the pre-set condenser to obtain good tuning.

A point to note now is that with the setting of the pre-set condenser found in this way the signal strength may not be the maximum. To try this, increase the capacity of the pre-set condenser a little and also that of the trimming condenser connected across the second tuning condenser, that is, the one joined to the grid of the valve. In this way the circuits will be kept in tune and the strength of the signal will be varied.

It is most important that the tuned circuits be properly ganged, and this can hardly be carried out unless a system is used. To adjust the trimming condensers without method will only end in confusion, and I believe the poor results sometimes obtained from a filter circuit are due solely to the circuits not being carefully ganged.

The Scottish Orchestra is again to broadcast a number of its concerts during the season. The arrangement includes the stipulation that a certain number of contemporary Scottish works will figure on the programmes

For all round service in a domestic receiver, the combination of a screened grid high frequency amplifying valve, a detector and a pentode output valve cannot be bettered. In a correctly designed receiver, these three valves give results definitely superior to the best 5-valve set of a few seasons ago, from the point of view of range, sensitivity and quality—and for a very much lower expenditure of both low and high tension current.

Such a combination, even in the hands of the merest novice, should render possible the reception, at good speaker strength, of a reasonable number of foreign transmissions as well as the local stations.

The following types should be employed in a screened grid, detector and pentode combination:—

L.T. Supply	Mullard Screened Grid	Mullard Detector	Mullard Pentode
2-volt accumulator	P.M.12	P.M. 2DX	P.M.22
4-volt accumulator	P.M.14	P.M. 4DX	P.M.24
6-volt accumulator	P.M.16	P.M. 6D	P.M.26
A.C. Main	S.4V or S.4VA	354V.	P.M.24 or P.M.24A

Mullard

THE · MASTER · VALVE

Advt.: The Mullard Wireless Service Co., Ltd., Mullard House, Charing Cross Road, London, W.C.2.

Arks.

On Your Wavelength!

THE LOUD-SPEAKER TRIUMPHS

THE loud-speaker is gaining ground everywhere. Not so very long ago, musicians, especially those with "extremist" minds, looked upon the loud-speaker and broadcasting with suspicion and distrust. Sir Thomas Beecham said most unpleasant things about them. But the time has come when it is, in many cases, more satisfactory musically to sit at home and listen to a concert on a good loud-speaker than it is to go to the concert-hall. While it must be admitted that the loud-speaker does not put over the personal contact and personality of the artistes at the concert-hall, this drawback of not being able to see what is happening at the other end is frequently advantageous. Some of the finest vocalists, choirs, and orchestras are not very pleasing to look upon; and, again, many instrumentalists obtain effect —and subsequent applause—by means of physical flourishes and facial contortions.

HANDSOME CONDUCTORS

THE question of appearances works both ways, of course. Orchestral conductors are invariably aided by their personal appearance and the dignity which is inspired by command. Sir Thomas Beecham, Sir Hamilton Harty, Sir Henry Wood and others are good to look upon and fascinating to watch. But in watching them control their large orchestras, the eye is again taking the mind away from something which should be exclusively for the ear. When listening to the orchestra on a good loud-speaker, one is hearing it under conditions which permit concentration on the music itself, and, with the microphone placed ideally for picking up every instrument, the listener at home is frequently much better off than brother listener in the actual hall.

ABSORPTION

THE performance of a receiver in a town is usually much less satisfactory than the performance of the same receiver on an equally good (or bad) aerial in the suburbs or country. Quite apart from the question of local station interference, static and other noises, H.F. pick-up from distant stations is appreciably less. This is due to the screening effects and absorption of buildings, especially those with girders and metal frameworks.

RETAILED RADIO

THE plan of having a central receiving station and sending the radio programmes to subscribers by telephone line is spreading. There is a class of listener who does not want to be bothered with a receiving set however simple, and there are cases where acute local interference from trams, electric signs and the like make radio reception practically impossible. For these listeners the local broadcast suppliers are catering, and they provide their subscribers with a loud-speaker and switch; a broadcast programme is always on the line, in the same way as the distribution of broadcast music was made at the Radio Exhibition. Blackpool is the latest town to have such a central receiving station, and I hear that very fine results are being obtained. But if this practice spreads, the B.B.C. would do well to extend a little tactful aid to their self-appointed retailers. Badly designed receivers, with inadequate power stages and incorrect feeding of land lines will cause disappointment. The B.B.C. has done a great deal of work in this particular field, and the circulation of the design of their super Olympia receiver would protect listeners who wish to make use of this new kind of service. It should be added that a broadcast licence has to be taken out for each radio line used, so that the B.B.C. will lose nothing by the increasing use of "retailed radio."

FAULTY CONDENSER EFFECTS

THE most effective remedy for a broken condenser, of course, is to replace it with another one. The symptoms in a grid circuit, are no signals and failure to oscillate. It is perhaps a good thing when one finds a receiver not working properly to suspect some of the fixed condensers, perhaps replacing them with other ones in order to see if this clears up the difficulty. If the trouble still remains, of course, the condenser can be assumed to be O.K., but if there is a defect, then the substitution of another condenser will often cure the fault and save a good deal of bother.

"DUD" COMPONENTS

I WONDER if components to-day are really as reliable as we think they are. In the early days of wireless we often expected a component to be faulty. The wise birds would test all their parts before putting them in a set. To-day, owing to the great improvements which have been made, not only in methods of manufacture, but in the testing adopted by the manufacturers, before the products are sent out, we are inclined to take all components at their face value.

Nevertheless, cases do arise where trouble is experienced due to actual defects, and because of the state of mind into which we have allowed ourselves to be lulled, these defects are much more difficult to detect. Let me quote an instance which occurred only the other day when I was experimenting with a hook-up containing quite a number of valves. I was, in fact, trying out a little idea of my own. The preliminary experiments had worked out so well that I thought that it would perhaps be better if I built up the components more or less properly to avoid lots of straggly leads. This, by the way, is often a useful thing to do, partly because it shows definitely whether the effects being obtained are really due to the causes you imagine. If the same result is obtained when the set is wired up properly, then everything is in order, but if the results are much worse than they were in the hook-up stage, it shows that unsuspected effects were coming into play before, and one must, therefore, go back and find out what these effects were. It is only by proceeding in this manner that one can really determine whether any particular new stunt is of any value or not.

CAUGHT NAPPING

HOWEVER, when I built the arrangement up for the second time I found the results not just worse than they were before, but practically hopeless. I could get nothing through except the local station, and try as I would, the old liveliness had completely vanished. I searched everywhere for a cause, but I could hardly believe that the mere alteration of the layout had completely destroyed what had originally seemed a very promising hook-up. After considerable playing about I suddenly found that the grid condenser in my detector was not a condenser at all, but a piece of bakelite without any inside. I do not mean to say that there were no condenser plates at all, but that there was a complete disconnection internally. Replacement of this condenser certainly improved matters, but it did not altogether overcome the difficulty, and I therefore had to resume my search. Strange as it may seem I subsequently found *another* fixed condenser in exactly the same condition. Two completely broken fixed condensers in one hook-up is rather an extraordinary state of affairs, and I must admit that it was the first time it had happened in my experience for some considerable period. At the same time I have had trouble with fixed condensers before, which goes to show that, particularly in these days of cheap construction, errors in assembling may creep in, and defective components may pass the test bench.

OUTWARD APPEARANCES

I HEAR a certain amount of criticism levelled from time to time against the designers of sets for their apparent lack of artistic inspiration in the matter of "externals." Certainly many of the sets now on the market do strike a dead-level of mediocrity as regards outward shape and size. This is a drawback to those—especially the ladies—who feel that an obvious "box of tricks" is somewhat out of place in the living-room. In the case of loud-speakers, designers seem to be able to give their imagination freer rein. One can buy a speaker disguised as a hanging picture or wall-plaque, or even as a lampshade.

On Your Wavelength! (continued)

But a set is always the same old brick-shaped piece of work. I know of more than one instance where a harassed pater-familias has been compelled by "she who must be obeyed" to hide the wretched thing behind a screen, out of sight. Only by doing so could he preserve the harmony of the furniture, of the B.B.C., and of domestic life. Now, perhaps, the manufacturers will sit up and take notice.

SPLENDID CONDITIONS

AT the time of writing, conditions for receiving foreign stations are, and have been for some days, just about as good as I have known them at the time of year. The receiving set seems absolutely alive, and if you have one decent stage of high-frequency amplification, there is hardly a tick on the dials that doesn't bring in something. Atmospherics are conspicuous by their absence, except at rare moments, and there is undoubtedly far less morse interference on the broadcast band than there was even a year ago. This is generally speaking, for there are evenings when spark morse is a perfect nuisance for considerable periods. The other night our old friend, FFB, using the flattest tuning that I have ever come across, was messing up the patch of the broadcast band which contains some of the best received European stations. Sometimes, too, sparks spoil one's reception of Budapest and Vienna.

SOME NEW STATIONS

THERE are some fine new stations in operation on the broadcast band just now which the DX-minded reader should certainly look out for. Two of the best are Genoa and Strasbourg. Genoa has been working lately on a wavelength of about 312 metres—just above Cardiff—and he comes in with something like the punch of Turin. Strasbourg is supposed to have a wavelength of 346 metres, but when I found him the other night he was operating above 370 metres. You cannot mistake Strasbourg, for all announcements are made first by a woman in French and then by a man in German. Both Genoa and Strasbourg are at work on Sunday evenings during the close time of the home stations, and you shouldn't, therefore, have much difficulty in finding them. Strasbourg is a PTT station. Genoa, like Turin, relays the Milan programmes. These, by the way, are jolly good, particularly on Sundays.

WHAT A PIONEER SAYS

AN exceedingly interesting article by Sir Ambrose Fleming, the inventor of the diode valve, appeared the other day in one of the lay papers. The subject was the progress of wireless in 1930. Sir Ambrose dealt first of all with the big improvements in selectivity that had been made, and referred particularly to the Stenode, in which he sees the solution of one of the greatest problems of television. With ordinary receiving gear and sideband ideas of wireless, one of the difficulties about television is that the transmission of any but the smallest image will necessitate the use of a channel from five to ten times as wide as that allowed to any broadcasting station under the present wavelength plan. With the Stenode no trouble results, and large images can be transmitted and received without there being any interference with stations working on frequencies as near as 5 kilocycles on either side of the television station.

A VALVE SUGGESTION

I WAS wondering the other day whether it would not pay valve makers to grade their products. You will see what I am driving at in a moment. Supposing that you are buying a fixed condenser by a first-rate firm, you will probably purchase one of ordinary quality whose capacity is guaranteed to be within 5 per cent. of the stated value. Standard quality fixed resistances, again, are guaranteed accurate to within 5 per cent. Thus, if you pay five shillings for a wire-wound 50,000-ohm resistance made by a reputable firm, you know that its value lies between 47,500 and 52,500 ohms—limits which are quite near enough for ordinary purposes. But if you want a condenser or a resistance accurate to 2 per cent., or even 1 per cent., you can obtain these by paying a little extra for them.

Now for valves. I would like to see these classed in much the same way. The tolerances allowed in the impedance, amplification factor, and mutual conductance by valve makers' test departments are small. They are on a par with the 5-per-cent. accuracy of resistances. In the ordinary way, the very slight differences between one valve and another of the same make and type are so small that they do not affect the working of a receiving set. But in very sensitive high-frequency circuits, or in low-frequency circuits designed for special purposes, one does sometimes require valves either to match one another or to show none but the most minute divergencies from standard curves and figures. What I would like to see, then, is a standard-grade valve sold at the present price, or perhaps a little less, and a precision valve of guaranteed close accuracy sold at, say 25 per cent. more.

TROUBLE-SAVING

I BELIEVE that the precision grading of valves would pay makers well, and it could be quite easily carried out. It would mean simply that in the test department any valve which showed characteristics identical with the standard, or only minutely different from it, would pass into the precision class, whilst others with slightly greater variations would be graded as of standard quality. This kind of thing would be a very great saving of time and trouble to experimenters who wanted to match valves accurately. As matters are, it is often a lengthy and fiddling business to do so—and an expensive one. You must have a pretty large stock of valves and you have to go through them with the utmost care until you find a pair that are identical or almost so. Matched valves are becoming more and more in demand, since, in the search for quality, push-pull low-frequency amplification is constantly adding to its adherents, and the push-pull method of detection has now many devotees. I am quite sure that there would be a useful and a growing market for precision valves.

THERMION.

Wireless on slow trains in Italy is being installed on the line between Rome and Turin. Earphones will be available to passengers at a small charge.

THE HOW AND WHY OF RADIO

XI—THE ABC OF LOW-FREQUENCY AMPLIFICATION

If you are a beginner in wireless, now is your chance to gain a clear conception of its theory and practice. In this series of articles, specially prepared for the beginner, no previous knowledge of wireless is assumed. It is intended to deal with every aspect of the subject and the whole series will endow the beginner with sufficient knowledge to enable him to derive the greatest possible interest from the fascinating hobby of wireless

BETWEEN the detector and the output valve an intermediate valve is nearly always required. This is because the low-frequency voltage, separated by the detector from the high frequency of transmission, is not big enough to load the power valve,

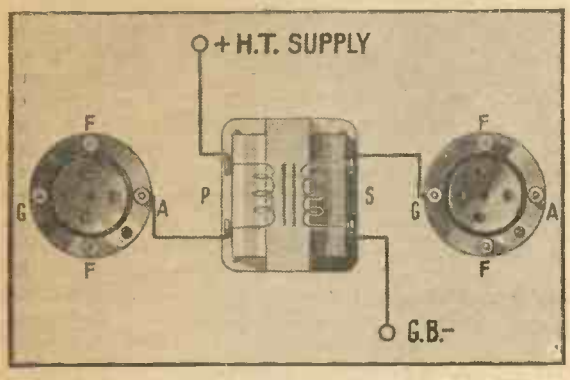


Fig. 1. Transformer coupling is the most commonly used type

which cannot, therefore, operate the loud-speaker.

Yet a study of the average three-valve set of to-day will not, at first, show the presence of a low-frequency valve. The first valve may be the high-frequency amplifier, the second the detector, and the third the power valve. Where, then, is the low-frequency valve?

The answer is that the detector and the power valve, in addition to their main functions, also work as low-frequency amplifiers. So much so that, with a suitable coupling between the detector and power valves, a further valve for the express

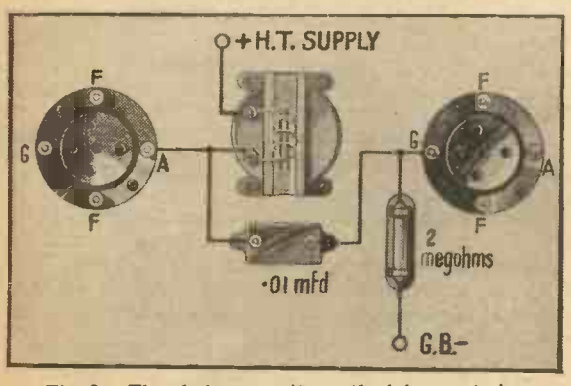


Fig. 2. The choke-capacity method does not give a voltage step-up

purpose of low-frequency amplification is often not wanted.

Before we talk about the different methods of coupling together low-frequency valves, let me emphasise two guiding rules. Firstly, we must ensure an even response curve. That is a technical way of saying that we must make sure that the output from the low-frequency amplifier is of the same form as the input, differing only in amplitude. At the input the high notes, middle register, and low notes will bear a certain relative prominence to one another. This same relative make-up of the musical scale should appear at the output. The job of low-frequency amplification is to amplify, not to modify. Sometimes the input is not pure, in that certain notes are unduly prominent. Only then can low-frequency amplification be allowed to distort the input, in order to overcome some initial and undesirable emphasis.

Firstly, then, an even response curve; secondly, to obtain even amplification, an observance of the impedance rule. The impedance in the anode circuit of the low-frequency valve must be not less than twice the impedance of the valve itself. Now the great difficulty about this rule is hardly ever referred to, but I intend to put beginners on their guard. It is all very well to say the impedance of the anode circuit must be twice that of the valve, but just what *is* the impedance of the valve under working conditions?

No amateur has any way of answering that question. The impedance of the valve is usually measured at zero grid volts and 100 anode volts. Assuming that the anode voltage actually applied to the valve is about 100 volts, one must think of the altered conditions brought about by the bias on the grid, often very different in value from the zero volts determining the nominal impedance of the valve.

In practice, the impedance of the valve is usually something greater than the value given in the maker's list of characteristics. By making the anode impedance three times the impedance of the valve, one can usually be sure that the impedance requirement for good quality is being observed.

Just what is this anode impedance?

It may be the primary of a transformer, a choke winding, or a non-inductive high resistance, depending on whether transformer, choke-capacity, or resistance-capacity coupling is employed. The transformer is by far the most used low-frequency amplifying coupling. Its simple connections, with the two valves it is coupling together, are shown by Fig. 1.

The primary winding forms the anode impedance of the valve preceding it. If the valve has an impedance of 20,000 ohms, the primary of the transformer should have an impedance of not less than 60,000 ohms, at a stated frequency. Here the beginner will again find a snag in relating theory with practice, for the transformers on the market are seldom accompanied by any useful data. Only a general rule can be observed to conform with the impedance

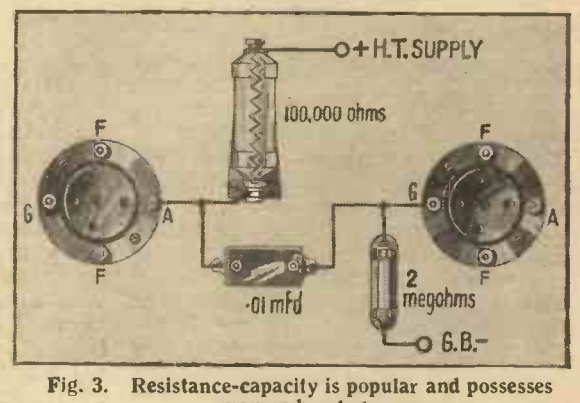


Fig. 3. Resistance-capacity is popular and possesses many advantages

ratio requirement.

This rule is based on a limitation common to all transformers, namely, that only a certain amount of wire can be used for the secondary, beyond which very bad effects are produced. So when a high ratio of secondary to primary turns is wanted, the primary is reduced, instead of increasing the secondary. The fewer the primary turns, other things being equal, the lower the impedance of the primary. So if a high-ratio transformer is used, in order to gain a big step-up in voltage, it is wise to choose a medium-impedance valve, say 20,000 ohms. A low-ratio transformer is more likely to have a high-impedance primary than one with a high ratio. But with a good low-ratio transformer one can use a much higher impedance valve. And since a high-impedance valve usually has a high amplification factor, it greatly offsets the disadvantage of the low ratio.

(Continued at foot of next page)

ALL ABOUT B.B.C. AUDITIONS

By SAVOY HILLER

Auditions are usually given in either No. 4 or No. 8 studios. This is a photograph of No. 8

THERE are, of course, several varieties of auditions at the B.B.C.—vaudeville, dramatic, instrumental, musical comedy, operatic and concert, and even talks.

Each of these sections is run by a different department and each body of officials responsible for auditions is allowed to use its own method of procedure.

Let us take vaudeville, for example. The B.B.C. is only too willing to give every applicant an audition, but such applicant must have what is known on the music hall stage as "an act."

It is not a bit of good just saying, "Oh, I sing comic songs," or, "My partner and I do cross-talk" your work must have been properly rehearsed and arranged into a five-, ten-, or fifteen-minute item.

Originality Necessary

Once you can show that you have got something like this, the B.B.C. will at once give you an audition, and if you do well, you are more than likely to get dates.

Of course, it is not easy for a new "act" to, shall I say, get away with it, because to be successful you must have something about you which is different to anyone else. Imitation, although the sincerest form of flattery, is no use. You must remember that the B.B.C. has the services of a great many stars already.

As an example: suppose you are a guitar player—well, it is not a bit of good just being a good player. You must have originality or personality or new method to "put it over." You see, the B.B.C. already has Mario de Pietro and his guitar playing is just about the best in the country.

Vaudeville auditions are run under the following system. A studio is connected via the microphone to a listening room in another part of the building, where sit one or two experts. As soon as everything is ready, the first "turn" is shown in and another official in the studio announces to the listeners that, "No. 1—a comedian—will sing."

Judged on Capability

During and after No. 1's performance, the listening experts make notes independently of each other for comparison later.

After No. 1 comes No. 2—a xylophone player, for instance—and so on for perhaps a dozen different tests.

You see, the advantage of the listening room is that the auditors, as we might call them, never *see* the artistes, so that everyone is judged by their broadcasting capabilities only, appearance, bad or good, not entering into it at all. As well as making notes on performances, the listening experts also each jot down their opinion as to an artiste's worth in guineas, so that when the verdicts are compared later, the booking manager can get some idea as to what amount to offer them.

I am sorry to say, however, that the percentage of successful auditions is depressingly low. Last year only one per cent. passed the tests.

Dramatic auditions, or auditions for play-acting are also conducted by means of a listening room. In this case candidates are required to read a few lines from a chosen play, recite a little poetry, do something from Shakespeare (this is optional), and give a reading from a daily newspaper. If, of course, they should know languages or dialects, they are allowed to render a passage or two from these, also.

A Committee of Experts

Now that the B.B.C. has a repertory company for plays, however, there is not much call for outside talent in dramatic work.

Vocal and instrumental auditions for orchestral, concert and, operatic work are held by a committee of experts and in the listening room there are often as many as eight or nine persons "taking" an audition.

The biggest bug-bear in vocal auditions is, of course, "wobble," or more technically, "vibrato," and any one with the slightest trace of it has little chance of success.

Of course, hundreds of artistes who have not passed these tests are still wondering why, because the B.B.C. never gives a reason for failure, being content with the words: "We regret to inform you that your voice was not considered suitable for our 'medium' (microphone)," or something equally non-committal, but in my opinion, and I have attended many auditions at Savoy Hill, in the capacity of spectator of course, the B.B.C. system represents fairness itself; and as for the studio officials who conduct the tests in the studios, they are the last word in courtesy.

"THE A B C OF LOW-FREQUENCY AMPLIFICATION"

(*Continued from preceding page*)

In the choke-capacity method of coupling there is no step-up in voltage. The overall amplification of a stage of choke-capacity coupling, as shown by Fig. 2, cannot be greater than the amplification of the first valve, and in practice is always less. Variations in this method of coupling provide for a step-up in voltage by tapping the choke coil. This system is now seldom used, but the third form of coupling, shown by Fig. 3, is still a good second to transformer coupling. This is the resistance-capacity coupling, widely adopted to ensure good-quality amplification. But that was before the existing high-quality transformers were available.

In resistance-capacity coupling it is easy to conform with the impedance rule already mentioned, because there is no difficulty in making a high resistance free from unwanted capacity effects. The value of the resistance should be not less than three times the valve impedance. And that value determines the value of the coupling condenser and grid leak.

We have so far been dealing with the low-frequency valve preceding the coupling, but we must end these notes by a reminder that the power valve following the coupling is also a low-frequency amplifier, subject to the same impedance rule as applied to the preceding valve. In the anode circuit of the power valve is the loud-speaker. Its impedance should be greater than the impedance of the valve, or at any rate not less.

Sometimes the impedance of the loud-speaker differs so much from the impedance of the power valve that the two can only be reconciled by using an output transformer, the primary matching the valve impedance and the secondary matching the impedance of the loud-speaker.

HOTSPOT.

THREE NEW MARCONI VALVES!

COMPLETING A WONDERFUL 2-VOLT SERIES!

S2/c

A new screen grid valve which at last provides, in perfectly blended unison, every feature required in the ideal H.F. amplifier. Marconi S2/c combines a very high amplification factor with very moderate impedance; enormous magnification is thus easily obtainable in any receiver; at the same time the minute self capacity ensures perfect stability. Rigidly constructed and unvarying in characteristics, S2/c will set new standards in successful H.F. amplification **20/-**

L2/b

Remarkably high mutual conductance—1.55 MA/volt—excellent amplification combined with particularly fine reproduction—these are outstanding points in the performance of Marconi L2/b, a new 2-volt low frequency and general purpose valve of exceptional efficiency. L2/b is a sensitive heavy duty detector, and a supreme initial L.F. amplifier; its low impedance permits of perfect reproduction with transformer coupling, the very high stage gain greatly increasing the overall efficiency of any receiver. **8/6**

P2/b

A new 2-volt super power valve of amazing efficiency with characteristics superior to those of any equivalent 6-volt type—truly a crowning achievement of Marconi research! Marconi P2/b successfully unites a high amplification factor with the low impedance of only 1,850 ohms, a figure ideally suited to the average cone or moving coil speaker. Exceptionally steep slope renders it the foremost output valve for every battery operated receiver in which ample volume, pure tone and strict economy in current must combine for perfect reception. **13/6**

CHARACTERISTICS.	S2/c.	L2/b.	P2/b.
Amp. Factor	330	15.5	6.5
Impedance	300,000	10,000	1,850
Mut. Conductance	1.1	1.55	3.5
Fil. Volts	2.0	2.0	2.0
Fil. Amps.	0.15	0.1	0.2
H.T. Volts—(max.)	150	150	150
Price	20/-	8/6	13/6

USE MARCONI VALVES

The Valves the G. Marconi Experts use!

A Weekly Programme Criticism—By SYDNEY A. MOSELEY.

Without Fear or Favour

THE RIDGEWAY PARADES

THE TALKS

AN extraordinary speech by Mr. Ridgeway, throwing bouquets at the B.B.C. through the B.B.C. microphone, concluded a series of mediocre productions. But Mr. Ridgeway apparently seems to be proud of them. Look how they were announced: "The Ridgeway Parade," "Including additional number by Philip Ridgeway," "Devised, written, and produced by Philip Ridgeway." But all this was not enough, apparently. Mr. Holt Marvel must come in to his aid.

◆ ◆ ◆

As I say, the funniest part of the production was the speech, which apparently was *not* censored. Reminded me of the sort of thing that goes on on the boards, where hysteria seems to be part of the show. "I love you all, my lovely audience!"

◆ ◆ ◆

The next series of talks, "Electricity in Our Bodies," by Mr. Bryan H. C. Matthews, bids fair to be interesting. Certainly the first one was arresting, if a bit gruesome.

◆ ◆ ◆

The St. George Singers may be good; but, oh, the dreary stuff they sang!

◆ ◆ ◆

In the National programme I noticed that from 7 o'clock to 7.30 there was a talk on new novels, and when that was finished another talk until 7.45. This hardly seems to be a good arrangement.

Two good speakers, however, are Professor Ernest Barker, who spoke on "What is Liberty?" and Dr. J. B. Orr, who began a series on "The Future Supply of Animal Products."

◆ ◆ ◆

In regard to this last talk, supposing you had not read it was being relayed from Aberdeen, would you have guessed it?

◆ ◆ ◆

Holt Marvel is one of the most energetic and enterprising young men I know, but I think he will admit that *Give Me New York* is not the best of his productions. I really do not think it was worth £2 a minute. Why does not Mr. Marvel put over his musical plays based on the music of famous masters? At Savoy Hill, however, they tell me that his numbers in any show are the best. And *they* ought to know!

◆ ◆ ◆

I prefer the playing of the Luton Red Cross Band to their singing even as Persians. It didn't sound much like "A Persian Market," but rather like Club Row.

◆ ◆ ◆

I think we are getting to the climax of the annoyance of hearing Cockney singing during dance-band music. The latest 'orrible example was during the relay of Jack Kerr and his band from Birmingham. Apart from the fact that there was an "extra special request," there was another song about "seeing you dye by dye." I admit that "dye by dye" sounds better than merely "day by day"; but, then, this is contrary to the teaching of the B.B.C. official pronunciation, which in a moment of weakness I vowed to accept.

◆ ◆ ◆

I ought to make mention of *Brigade Exchange* since we are likely to have more war plays. Now, I submit that *All Quiet on the Western Front* and *Journey's End* told us the worst about war, and therefore a play like *Brigade Exchange* sounds rather tame. The little gadgets which were meant to freeze our blood had all been heard before.

◆ ◆ ◆

But I notice in this play a tendency to use a method (probably it was the same man) which is merely shouting—or no doubt the producer would prefer to use the word "declaim"—imagining that this is dramatic emphasis when it is merely irritating confusion.

Lissenden's idea of Archie Pitt

"GIVE ME NEW YORK"

DANCE BAND PLAYING

I may be wrong, but the same sort of man shouted in the same way in other productions, and I wish they would cut it out.

◆ ◆ ◆

By careful manipulation I switched on Midland Regional to hear an operatic programme from *Faust* by the Birmingham Grand Opera Society, but I am afraid the singing of Siebel rather broke one of the important tenets of the B.B.C. regarding *tremula*, and put me completely off.

◆ ◆ ◆

"The 1914-1918 Chronicle" was beautiful in conception, even if now and then the renderings seemed to be too sombre. It was a privilege to hear the best work from some of our best writers.

◆ ◆ ◆

I have often paid tribute to Joseph Lewis and his orchestra, and therefore I congratulate him, and London, on his promotion.

◆ ◆ ◆

Certainly the B.B.C. are getting away with it with their new symphony orchestra.

I paid another visit to the Queen's Hall. Although the programme was full of Bach, there was not a slackening of interest among the audience from beginning to end. Sir Henry Wood conducted, and, watching him, I thought: "How well this man is wearing!" When you are sitting in the hall, thinking back twenty-five years, when you saw him on the same platform, it makes you feel rather old!

◆ ◆ ◆

I listened, too, to the Sunday concert, and I think that both listeners and those who saw the concert are equally fortunate.

◆ ◆ ◆

I still seem to be out of luck whenever I switch on to the Saturday 1 till 2 o'clock programmes. What I heard last Saturday was a sort of jazzy riot, and in the past one had been accustomed to quiet music of the better sort.

And, by the way, the announcer in closing down corrected himself when he said the orchestra was "conducted by" Joseph Muscant. "Directed by" was his corrected expression.

Can anyone explain the difference between these terms beyond the possibility that ordinary orchestras have conductors and grand orchestras directors?

The SEARCH SHO

By THE "A.W." TECHNICAL STAFF

IF you have not previously contemplated listening on the short waves, then now is the time to do so.

Short-wave reception conditions vary from time to time, just like their broadcast band counterparts, and all regular short-wave listeners are agreed at the moment that the present time of year is productive of a whole crop of short-wave stations easily receivable on simple sets at good speaker strength. Do not be deterred by friends who tell you that short-wave listening is beset by technical difficulties, that the results are not worth while, and that you will have to spend a deal of time in listening with phones.

These things are relics of a day when short-wave reception was not properly understood and before valves and tuning circuits were as efficient as they now can be.

It is quite possible to convert your present broadcast-band set to short-wave reception, but that is not always the most efficient way of going about the job. After all, there is little difference between making up a special set for short-wave reception and the construction of an adaptor unit to make your present set workable on the short waves. Both necessitate new parts and both are used with existing batteries and valves. You can use the valves, high-, low-tension, and grid-bias batteries, speaker, aerial, and earth as are employed for broadcast-band reception.

The set is arranged on straightforward and conventional lines, with a panel supporting the main controls, and a baseboard.

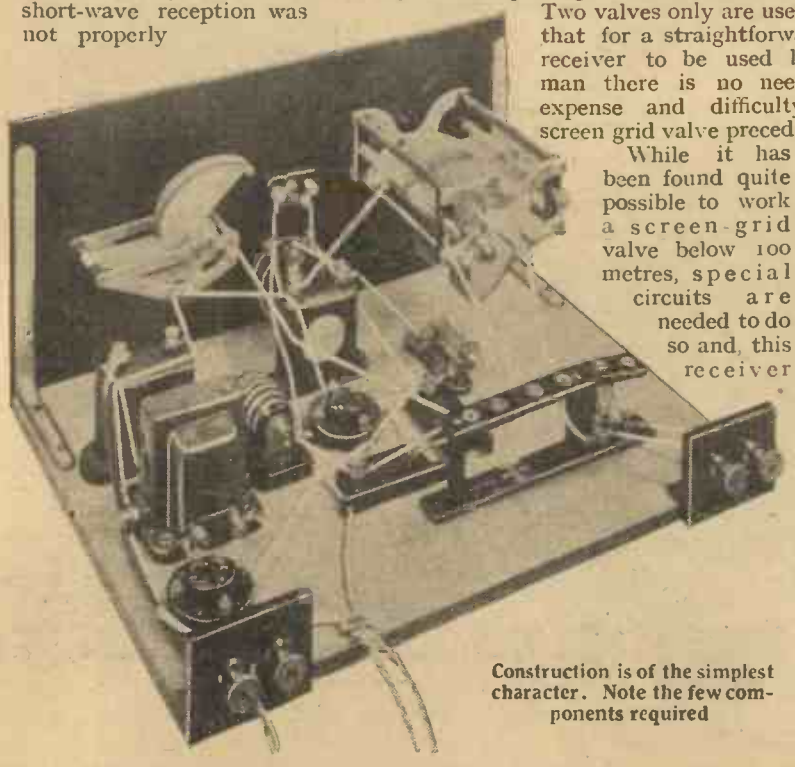
Two valves only are used, for it is felt that for a straightforward short-wave receiver to be used by the average man there is no need to go to the expense and difficulty of fitting a screen grid valve preceding the detector.

While it has been found quite possible to work a screen-grid valve below 100 metres, special circuits are needed to do so and, this receiver being mainly as a stand-by for occasional short-wave listening, the use of an expensive screen-grid stage would not be justified. For this set you just use your ordinary detector and power valves.

Do not think, however, that any feature has been overlooked which would appeal to the technical folk well acquainted with short-wave working. On the contrary, the AMATEUR WIRELESS Technical Staff has taken a deal of pains to make this two-valve short-wave set a real success and to ensure that it can be worked by novices and experts alike.

Novel Features

Short-wave connoisseurs will appreciate a novel idea which has been incorporated in the tuning circuit. If you have previously used a short-wave set, you will have noticed that, when searching below 50 metres or so, some condensers give rise to crackling noises in the speaker when the slightest variation in capacity is made. This makes tuning very difficult, of course, and rather unpleasant. Poorly-made condensers exhibit this fault on all short-wave reception, while others do not give trouble until the wavelengths below 50 metres, or thereabouts, are tried; but on



Construction is of the simplest character. Note the few components required

THE COMPONENTS AND THE CIRCUIT

Ebonite panel, 14 in. by 7 in. (Becol, Trelleborg).

.00015-mfd. short-wave condenser (Cyldon).

Special .0002-mfd. reaction condenser (J.B, Lissen, Igranic, Readi-Rad, Dubilier, Burton, Polar, Formo).

Two slow-motion dials (Utility type W.181, Ormond, Igranic, Astra).

400-ohm panel-mounting potentiometer (Lissen, Igranic, Rotor, Varley).

On-off filament switch (Readi-Rad, Bulgin, Junit, Benjamin, Lotus, Lissen, Igranic).

Two anti-microphonic valve holders (Lotus, Telsen, Benjamin, Igranic, W.B., Clix, Wearite, Burton).

2-mfd. fixed condenser (Lissen, T.C.C., Igranic, Dubilier, Formo).

1-mfd. fixed condenser (Lissen, T.C.C., Dubilier, Igranic, Formo).

High-frequency choke (Burton, Igranic, Lewcos, R.I., Lissen, Wearite, Varley, Telsen).

Two .0001-mfd. fixed condensers (Lissen, Telsen, Dubilier, T.C.C., Watmel, Formo, Igranic).

3-megohm grid leak (Dubilier, Lissen, Rotor, Igranic).

Grid-leak holder (Lissen, Bulgin, Wearite, Graham-Farish).

Short-wave inductance unit (Eddystone type 585).

Low-frequency transformer (Telsen Ace, Lissen, Igranic, Burton, R.I., Lotus, Varley).

15,000-ohm spaghetti resistance (Bulgin).

Two terminal blocks (Junit, Lissen, Belling-Lee).

Four terminals, marked: A, E, L.S.+, L.S.— (Eelex, Belling-Lee, Clix, Igranic, Burton).

Four wander plugs, marked: H.T.—, H.T.+, G.B.—, G.B.+ (Clix, Belling-Lee, Eelex, Burton, Igranic).

Pair panel brackets (Bulgin, Keystone, Readi-Rad).

Glazite for wiring.

Rubber-covered flex (Lewcos).

CHER ORT-WAVE TWO

There is no need to have anything elaborate for short-wave reception, and a glance down any official list of below 100-metre stations shows what a galaxy of transmissions there is now on the ether, and which is at the disposal of any amateur who is enterprising enough to make up a simple set for this special work.

25 metres and below it is safe to say that practically every condenser gives rise to these noises—not an inherent fault in the component itself, but one due to the fact that at these very high frequencies the slightest variation of capacity caused by the movement of a pigtail connection, or by a resistance change caused by the movements of the condenser, gives rise to crackling noises.

Special Tuning Arrangements

A special dual condenser is used in this short-wave set and a novel method of connection prevents this from giving rise to "atmospherics." You will see that the two sets of fixed vanes (the condenser has dual sections) are taken to the tuning points of the circuit and that the variation of capacity is produced solely by the movement of the two sections of the moving vanes.

A little thought will thus show that variation of capacity is produced not by any moving part in connection with the outside circuit, and there is, therefore, nothing to cause noisy working. Even when this set is worked down on 15 metres the condenser control is quite silent.

Other little features which will appeal to knowledgable short-wave enthusiasts are the inclusion of a grid-leak potentiometer, which gives a nice control of oscillation and keeps the detector at its proper working point, and the use of a dropping resistance in series with the detector anode; this is a sure guard against threshold howl.

You need have no worry on the score of expense, for the parts needed are few. A full list of components is given in an accompanying table.

You are advised to get the full-size blueprint which is available for this receiver, price, 1s., post free, from the Blueprint Department, AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4, for accurate layout is of paramount importance in a "wavelets" set. The blueprint, which is full size, makes it easy for any constructor to follow the layout exactly.

You will see from the photographs that the layout of the set is well spaced. Care should be taken not to crowd the parts together, and the arrangement of the parts on the baseboard should be followed with meticulous care.

Easy Construction

Constructional work has been simplified by the use of flex connections for the high-tension, low-tension, and grid-bias batteries. Terminal strips are used only for the aerial and earth and the output to the speaker.

Panel drilling is quite a simple job, and the blueprint should be used as a guide to show the centres for the tuning and reaction condensers, the filament on-off switch, and the potentiometer.

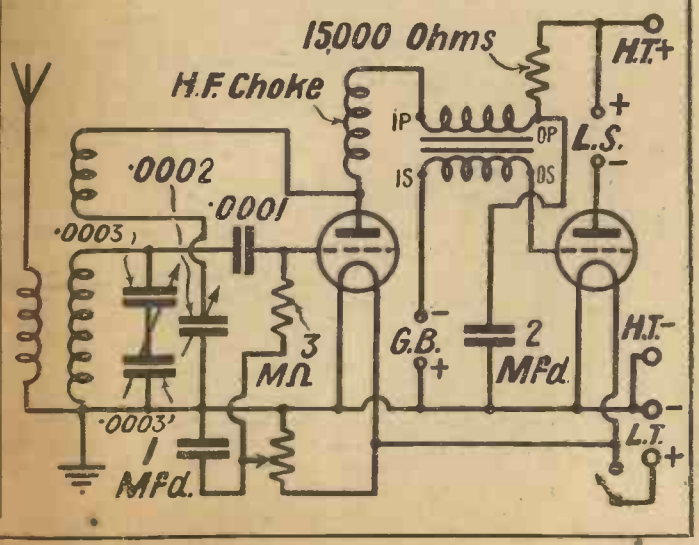
Do not mount these parts until the panel has been firmly fixed at right angles to the baseboard. Panel brackets are used in order to keep the panel rigidly at right angles, for any loose movement in a short-wave set is apt to make tuning difficult. For this reason the wiring should be carefully done and all the joints made so that a good electrical and mechanical connection is provided.

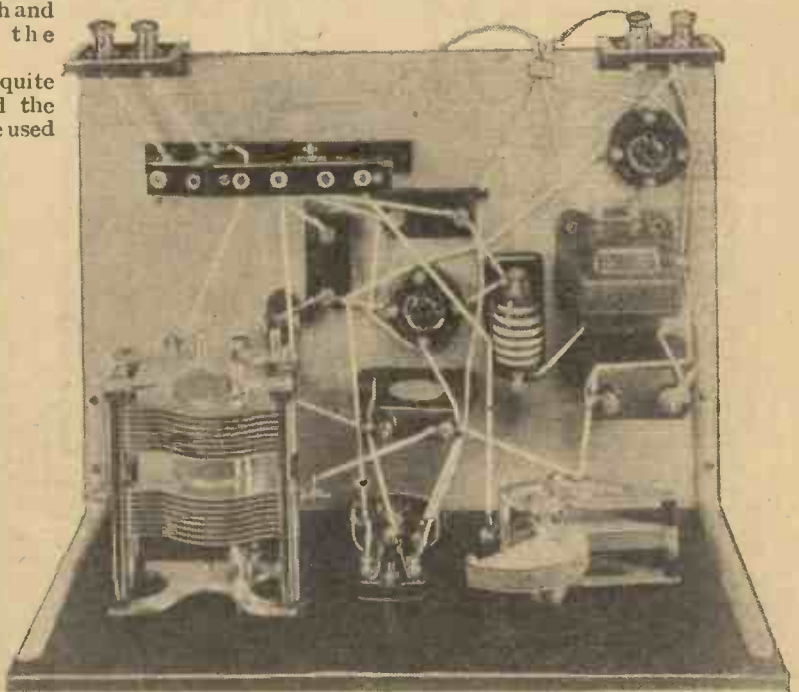
Rigid wire is used for making connections, except to those points to which the battery flexes are taken. The 15,000-ohm dropping resistance in the detector anode circuit is one of the new flexible resistances, and this is connected directly between high-tension positive terminal and one of the terminals on the 2-microfarad by-pass condenser. This condenser, by the way, should not be mounted until connections have been made to the low-frequency terminals, for otherwise a little difficulty will be experienced in soldering to the transformer terminal tags.

Make sure that you connect the coil supporting strip exactly as shown by the layout diagram. A special method of connections has been employed to work in conjunction with the novel condenser tuning arrangement.

In the set shown by the photographs the point-to-point wiring system has been adopted and soldered connections have been made. The point-to-point system is very

F THE "SEARCHER SHORT-WAVE TWO"





This plan view shows the easy wiring ; compare it with the layout diagram on the next page

convenient in this particular receiver, for it makes for short, direct connections and a minimum of internal capacity in the set. The appearance may not be so pleasing to the eye as that obtained by the square-corner system, but then we are out for the maximum of efficiency and "prettiness" must be a secondary consideration.

It should be unnecessary to emphasise the importance of making a test of the wiring when all the leads have been connected. There is nothing very difficult about this, the scheme of connections being so simple.

Suitable Valves

So far as valves are concerned, you will, in practically every case, find that standard detector and power valves are quite suitable, but if you are buying special valves for the set, then you will find the following recommendations helpful. The detector valve may be chosen from the following:

Two volts: Mullard PM2DX, Cossor 210HF, Dario Univ., Marconi HL210, Osram HL210, Six-Sixty 210HF, Mazda HL210, Lissen HL210. Four volts: Mullard PM3, Six-Sixty 4075HF, Osram HL410, Marconi HL410, Dario Univ., Cossor 410HF. Six volts: Mullard PM5X, Cossor 610HF, Marconi HL610, Osram HL610, Mazda HL607.

The power valve need not be of the super type, for it will not have to deal with large grid swings, and the following power valves will be quite suitable and will not consume an excessive amount of high tension:

Two volts: Mullard PM2, Cossor 220P, Dario SP, Marconi P2, Osram P2, Six-Sixty 220P, Mazda P220A, Lissen P220. Four volts: Mullard PM4, Cossor 410P, Dario SP, Marconi P410, Osram P410, Six-Sixty 410P. Six volts: Cossor 610P, Marconi P610, Osram P610, Six-Sixty 610P, Mullard PM6.

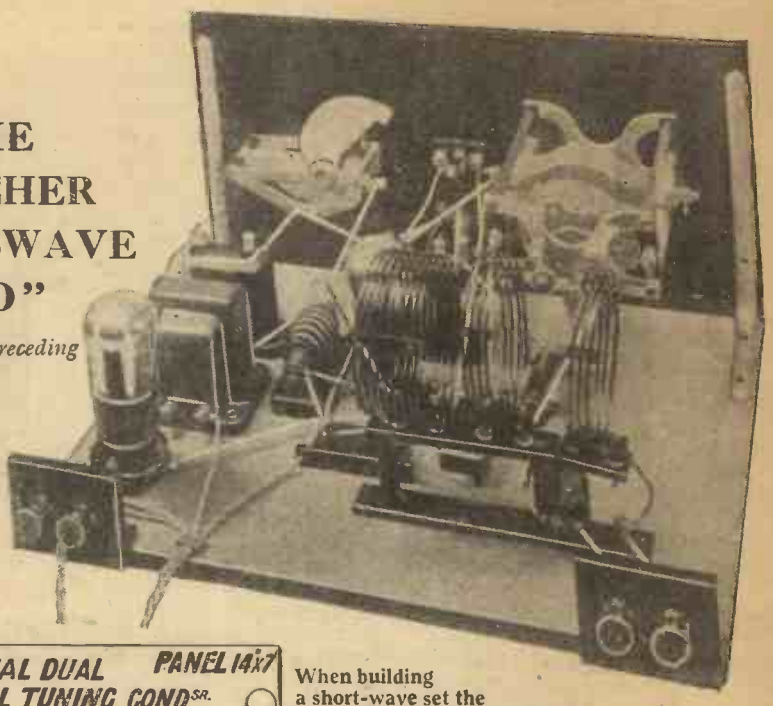
Proper use of the coils plays an important part in getting good results. With the standard Eddystone coils used it will be found that the lowest range, from 14 to approximately 31 metres, is covered by a 3-turn coil in the aerial socket, a similar coil in the grid socket, and a 2-turn coil in the reaction socket. The next range, from 25 to approximately 52 metres, is covered by a 3- or 6-turn coil in the aerial socket, a 6-turn coil in the grid socket, and a 3-turn coil in the reaction socket. A range of 46 to about 98 metres is covered by a 6-turn coil in the aerial socket, a 15-turn grid coil, and a 5-turn reaction coil.

There should be no difficulty in obtaining reaction. Various settings of the potentiometer and of the aerial coil with respect to the adjustment of the grid coil should be tried. If there is any tendency to motor-boat when the reaction condenser is adjusted, then a new setting of the potentiometer arm should be tried.

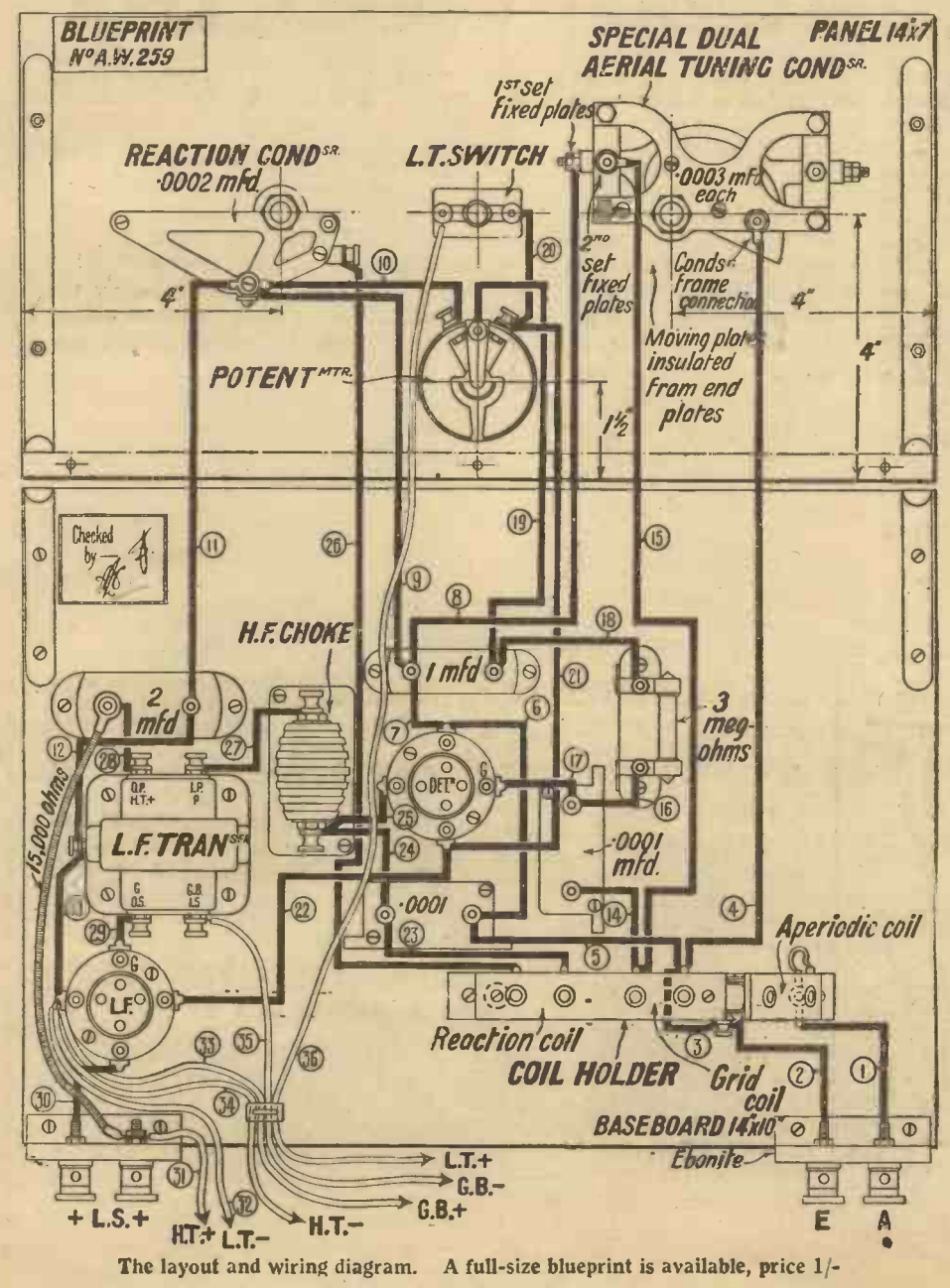
The high-tension voltage may also be adjusted, but, generally speaking, it will be found that good results will be obtained with 100 or 120 volts, and 7 or 9 volts should be applied to the grid-bias plugs.

"THE SEARCHER SHORT-WAVE TWO"

(*Continued from preceding page*)



When building a short-wave set the tried layout should be followed closely if the best results are to be obtained



The layout and wiring diagram. A full-size blueprint is available, price 1/-

MEASURE THE PRICE OF YOUR BATTERY BY THE MONTHS OF ITS LIFE—

THE QUALITY OF ITS CURRENT AND THE ABUNDANCE OF ITS POWER

60 VOLT 7/11

100 v. 12/11

Also made in all sizes, all capacities, all voltages to suit your needs.

WHEN you get a high tension battery for radio that lasts so long that you forget the date you bought it—when that battery delivers pure clean current that will keep every note of music, every word of song so distinct and loud—when the power of that battery is so abundant that your loudspeaker was never so loud before—and when the output from that battery is obtained at a cost acknowledged to be the lowest cost known per unit of output, can you expect to get more from any battery?

In a Lissen Battery you get the advantage of all this abundant power, all this clarity of tone in your loudspeaker, and all this economy of current cost. No battery will do more for you than a Lissen Battery, and it will take a long search to find one that will do anything like so much.

You can secure all the advantages of a Lissen Battery by asking by name for a "Lissen New Process Battery" and showing you are firm about it by the way you say "Lissen." Obtainable at 10,000 radio dealers.

IT PAYS TO BUY LISSEN—THE POWER THAT LASTS

THE REASON FOR THE SUPERIORITY OF THE LISSEN BATTERY

Big cells—a process and chemical combination known only to Lissen, which packs those cells with the largest oxygen content found in any battery—giving a stamina and a resistance to volt drop over such prolonged periods of time that the battery seems everlasting, and yielding only pure power all the time.

LISSEN LIMITED, Worple Road, Isleworth, Middlesex

IN MY WIRELESS DEN

WEEKLY TIPS—CONSTRUCTIONAL AND THEORETICAL

By W. JAMES.

A Coil Puzzle

THE point often crops up as to whether it is better to connect the long and medium wavelength coils in parallel or to short-circuit the long-wave part when tuning over the medium waves.

Actually, sometimes one method is better than the other, and it seems to depend upon the position of the coils and their shape and size. A long-wave coil when short-circuited may have a natural wavelength within the medium wavelength band. And if the long- and medium-wave coils are fairly near together the effect may be to reduce materially the strength of the signals.

When the coils are not too close together and are astatically wound, the chances of one circuit affecting the other are remote. At the same time, curious effects are produced by slight couplings. When experimenting, one should try joining the coils first in series and then in parallel, for a rule cannot be given. Some good dual-range coils have been made with the windings arranged both in series and in parallel, and, let me add, some bad ones as well.

All-metal Sets

The practice of using a metal base or of covering the baseboard with copper foil for shielding purposes seems to be on the increase. Valve holders and other parts are screwed down in the usual way, and the point that these parts were probably designed for a wooden baseboard is overlooked.

The result is that live contacts often lie very near the earthed metal, and on occasions a contact is actually made. Valve holders, for instance, sometimes have terminal screws which only just clear. In tightening down wires the screws may work down a little, when contacts will be formed.

It is a good plan when in doubt to place a sheet of insulating material below the valve holders, so as to avoid the chance of this fault occurring. Care is also needed with some other parts.

Coils, for example, may have contacts beneath them with only just enough clearance. Screw heads should therefore be examined, and if they seem too near the lower surface of the base, the precaution of using a sheet of insulating material should be taken.

Those Cheap Transformers

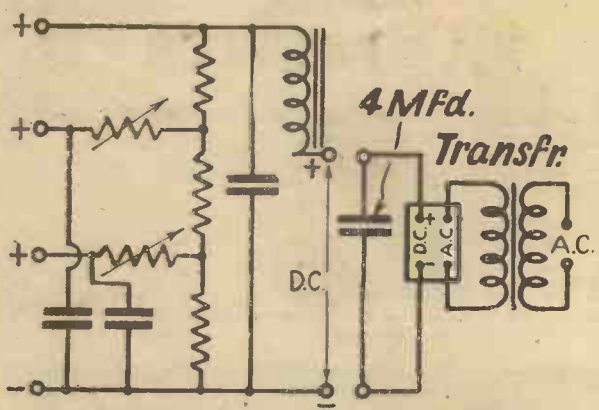
Cheap transformers, having but few turns of wire in their primary coils, often will pass a surprisingly large current before saturation of the core commences.

This means that a fairly low-impedance valve may be used with them. The quality of the reproduction may, therefore, be fair, but you should not forget that when poor quality iron stampings are used there may be more or less bad distortion.

Whether this is noticed depends upon the rest of the set and the loud-speaker. There may be so much distortion elsewhere in the set that transformer distortion is not noticeable. With small sets the last valve may be so overloaded that other distortions are of no great account.

From D.C. to A.C.

There are one or two difficulties in the way of changing over a direct-current mains unit to alternating current.



This is the circuit of a typical mains eliminator

DO YOU KNOW—

that in a mains-driven set there are two advantages in having a choke or transformer output for the speaker? One is that the speaker is insulated from the mains current and the other is that the smoothing and elimination of hum are materially improved.

that if the reaction control of your set is tricky, you might try fitting a differential condenser in place of the plain two-vane type? Differential reaction control does not upset tuning to the same extent as plain control.

that if your mains eliminator hums and you do not want to interfere with the connections then you might try putting a 2-microfarad condenser across the mains input wires? The condenser should be capable of standing up to the full mains voltage.

It is not safe simply to connect a transformer and rectifier unit to the D.C. unit, for the reason that the D.C. unit may have unsuitable parts.

Thus, in some types a potentiometer is fitted, as indicated in the accompanying diagram. This will pass a fair current—perhaps too much for the rectifier. Then, again, the choke may have a very high resistance, this not being of great importance when the D.C. voltage is relatively high.

When the output from the A.C. part is limited, however, the choke may too seriously restrict the supply to the set. A by-pass condenser should be provided across the output from the rectifier and the potentiometer ought to be removed if it passes more than a few milliamperes. As a rule, the D.C. unit should be re-built for the best results and proper anode resistance and condenser filters be added.

Your Aerial

I have often wondered whether the size of the wire used as the aerial is of great importance, and now I am inclined to believe that this is perhaps the least important feature of the aerial circuit.

Most of the resistance seems to be localised in the earth. Many people use earth tubes and neglect them, so that the actual earth-circuit resistance is pretty high. A copper-wire aerial of not smaller than, say, No. 24 gauge seems satisfactory with average tuning coils and earths.

There seems no electrical advantage in using stranded wire or very thick wires unless, of course, a highly efficient aerial and earth circuit is being constructed. The mistake usually made is in the earth circuit. A wire wrapped round a pipe seems to suit many people; but, really, is not good. A clip which grips a pipe going to earth is much better.

The outstanding feature of the day's music from Midland Regional on December 10 is a programme of works by British composers by the studio orchestra.

"The Kingdom," by Sir Edward Elgar, will be given at the first concert for the season of the Cardiff Musical Society in the Park Hall, Cardiff, on December 7 The coming season is the forty-third of the society's existence, and for the third year the National Orchestra of Wales will take part in the concerts.

SETS OF DISTINCTION

The VARLEY JUNIOR TWO

Makers : Varley Ltd. *Price : 15 gns.*

AMONG the host of two-valve all-electric sets of the season, the Varley Junior Two is outstanding. Its rather high price needs some justification in these hard times. Well, in my opinion, the performance justifies the extra guinea or so. There will always be people, no matter how hard the times, who insist on something a little better than the average.

Like all Varley sets, this two-valver is good to look at. The makers must have a fine aesthetic sense. And a good idea of the housewife's outlook when the mere male goes to buy a set. I have authentic experience of sets turned down by the lady of the house on account of poor cabinet work.

Very Attractive

The picture shows how modern is the conception of the cabinet work of the Varley set. I can add that the burr-walnut finish is extremely attractive. In fact, the fine appearance of the set alone justifies the price asked.

The controls are, naturally, simple and few in number. In the centre of the front of the cabinet is a slow-motion tuning dial, with an operating knob mounted below. To the left of the tuner is a handy knob for controlling reaction. I am glad to see this knob is plainly engraved "reaction" and that an arrow indicates the direction for turning the knob to increase reaction. Likewise the knob on the right of the tuner is engraved to show that when the knob is moved to the left the medium waves are in tune and when moved to the right the long waves. This is undoubtedly a fine set for family use.

The top half of the back of the cabinet can be removed, by undoing two screws, to get at the valves and mains connections. A look round the interior showed an unsparing use of the very best material. An extremely large tuning coil for the medium waves was noted with interest. As far away from it as possible I noted the long-wave coil. Both look highly efficient, as indeed they are.

In an accessible position is the mains transformer, with three plug sockets marked 200 v., 220 v., and 240 v., to make the set suitable for all A.C. supplies between 200 and 250 volts. The detector valve and the power valve are fitted close together at one side of the cabinet. The rectifying valve for deriving the high-tension from the supply is fitted near the mains transformer.

The terminal strip just below the removable back is unusually free from confusion. The two loud-speaker terminals are at the left and the earth terminal at the extreme right. Near this is the socket for gramophone pick-up, and further to the left are four aerial terminals, providing for every conceivable length of aerial.

The makers have wisely fitted small fuses in each of the two mains connections. And I see a small packet of spare fuse wire is thoughtfully pinned inside near the mains transformer. There is a negligible chance of the fuse being wanted, but the makers are taking no chances.

Now the reader will want to know what sort of results can be expected from this set. Firstly, I would like to emphasise that this is more than a set ; it is a very fine gramophone amplifier as well. The facilities for amplifying records are the same in this two as in the Varley and other threes, where the high-frequency amplifier is cut out of circuit for gramo-radio work. I tried the Varley Junior as a gramophone amplifier, using a B.T.H. pick-up and a Ferranti permanent-magnet moving-coil loud-speaker. The quality was wonderful.

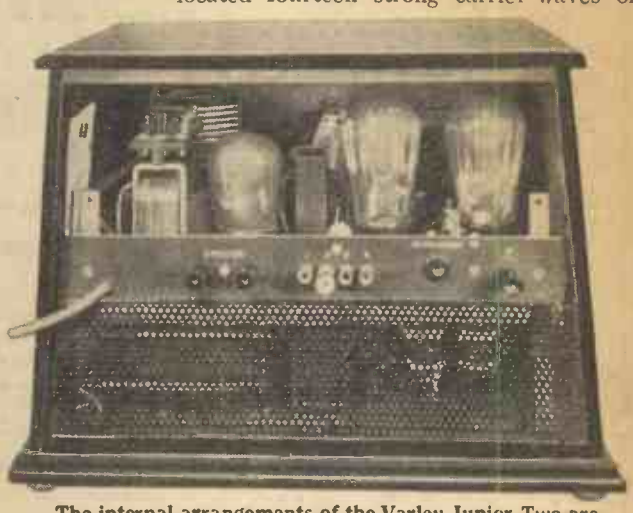
On the radio side this fine quality is well maintained, the two Brookman's Park stations coming through with great clarity. The first thing I established was the selectivity, a property that is just as important in a two-valver as in a larger set. At worst, the set must be able to separate the two Regional programmes, so that each can be clearly heard without an obligato from the other. At best, the set will do this without sacrificing volume. And that is where the very fine tuning coils of the Varley set distinguish themselves. The following readings speak for themselves :—

The National London station was tuned in at maximum strength at 31 degrees on the dial. It was entirely inaudible at 33 and 27, indicating a spread of only 6 degrees. The Regional London station was at its maximum at 56 degrees and had gone at 65 and 45, a spread of 20 degrees. For this test I was using the No. 1 aerial terminal, which gives the greatest volume and the least selectivity.

As the aerial was a full 70 feet long, I consider the set behaved extremely well. And by changing over to No. 2 aerial terminal the tuning was made razor sharp, without much loss of volume. The tests show that this little set is inherently selective and that local regional stations can be separated without loss of signal strength.

A Good Trier

The Varley Junior is also a good trier; in addition to the Midland Regional at 93 on the dial, a good loud-speaker signal, I located fourteen strong carrier waves of foreign stations. Rome at 81 was almost as strong as the Midland. Toulouse, Cologne and Nürnberg were also quite strong.



The internal arrangements of the Varley Junior Two are particularly neat : note the accessibility of the valves and the efficient disposition of the mains apparatus

On the long waves the set works well. Daventry at 75 was very strong. Huizen at 95 could just be called a loud-speaker signal, while Eiffel Tower at 62 was easily heard at good strength and quite clear of Daventry.

So although intended as a local set, the Varley Junior can, in the hands of an operator who understands the funny ways of reaction, bring in not a few foreigners.

This set is made for D.C. and A.C. mains. Two separate models are listed. My notes refer to the A.C. set. The D.C. model is a guinea more.

SET TESTER.

A light orchestral programme will be given by the National Orchestra of Wales from the Cardiff studio on December 8.

GREATEST RADIO SENSATION

NEW 3-VALVE SET OBTAINS OVER 50 STATIONS ON LOUD SPEAKER WITH DAVENTRY 5GB WORKING

This is the new Northampton Plating Co. Super Selective 3-Valve Loud Speaker set, which is now offered to the public. After months of careful research a circuit has been designed superior in selectivity to a screen-grid set, and yet remarkably simple. It can be used, not only for cutting out the local station, but for other disturbances such as Morse. It is the simplest, cheapest, and most selective in the world. No soldering required or coil changing. Experts have declared it absolutely unique. Over fifty stations have been obtained on loud speaker with aerial 20 feet high using cheap valves, including Cardiff, Paris, Madrid, Manchester, Stuttgart, Toulouse, Hamburg, Glasgow, Frankfurt, Rome, Langenberg, Berlin, Brussels, Hilversum, Kalundborg, Konigswusterhausen, Radio Paris. These were obtained 3 miles from Daventry while 5GB was working. Thousands of novices with no knowledge of wireless have built the old Northampton Plating Co. Super 2 and 3 in all parts of the world, and have been astounded by the results even with cheap components, but the new Super Selective 3 makes other sets old fashioned, and marks the greatest improvement in valve sets for years. Orders have poured in from all parts of the world, including America, Turkey, Gold Coast, and Nigeria. In order to give everyone the opportunity of testing out the new circuit, two 6d. Blueprints, one for new Super Selective 2 and one for Super Selective 3 Valve, will be supplied for 3d. each.

NEW SUPER 4-VALVE PORTABLE SEPARATES TWO BROOKMANS PARK STATIONS UNDER THE AERIALS

This is the latest model circuit by the Northampton Plating Co. offered to the public for the first time. It has been specially designed to satisfy the requirements of the new regional stations. Owing to its wonderful selectivity, it requires no wavetrap and obtains under favourable conditions a large number of Continental stations at loud-speaker strength, including Toulouse, Hilversum, Eiffel Tower, Konigswusterhausen, and Radio Paris. At less than half the price of a high-class portable set, it is acknowledged under severe technical tests to be far superior. In order to show what marvellous results can be obtained the set was placed between two aerials at the entrance to Brookmans Park, and the two programmes were easily separated. The set was also taken on a 1,000-mile motor tour over England and Wales. On the south coast and east coast many stations were easily obtained on loud-speaker at good strength. Even in Wales, where reception is difficult, excellent results were also obtained. In order that everyone may be able to construct this unique portable set, a full-size shilling Blueprint, with details and instructions, can be obtained from Northampton Plating Co. for 6d. Letters must be fully stamped. NAME AND ADDRESS IN BLOCK LETTERS.

TRADE SERVICE AGENTS WANTED.

READ THE LATEST REPORTS BY THE LEADING RADIO EXPERTS OF THE DAY :—

I refer to the receiver marketed by the Northampton Plating Co. as a kit set at a price that is more than reasonable. I had a pleasant surprise when I first operated it. I found there were 12 or 13 stations easily brought in at loud-speaker strength on the medium waves, in addition to 5GB. The set has remarkable qualities of selectivity and sensitivity, two characteristics rarely coupled in any one receiver. It must be set down as a definite advance.

("NOTTINGHAM JOURNAL," December 21, 1929.)

Those who are too far from a station to use a crystal and are deterred from wireless by the present high cost of valves, will find it best to make a set from the Northampton Co.'s blueprints for two or three valves, price 3d. each. If they cannot afford a Mullard, the same company supply excellent valves at 4s. 11d., which give admirable reception, though so cheap. A thoroughly good two-valve set ought not to cost more than £2 10s., including everything, and a three-valve about 11s. more. ("REYNOLDS'S NEWS," January 12, 1930.)

READ THESE TESTIMONIALS.

I have had your Super 3 since Sept., 1929, and have had wonderful results, about 50 stations at full loud-speaker strength, and can get most of these any night of the week, chief among them being : Paris, Eiffel Tower, Budapest, Prague, Belgrade, Stockholm, Madrid, Toulouse, Stuttgart, Barcelona, Turin, Maravstra-Ostrava, Rome, Algiers, Langenberg, Oslo, Lahti, and Kaunsas. Wishing you every success.—W. T. Emsworth, Hants, 17/1/30.

I must write and tell you I am more than pleased with your three-valve set I have just made. It is the most wonderful bargain I have ever known in wireless, and it is all that you claim of it. I wish to recommend it to my friend, who is a keen wireless enthusiast.—W. F. T., Derby, 16/1/30.

I have now built up your Super Three Valve set, and, independent of price, I have never heard or seen a set to beat it. We are still getting fresh stations, and up to the present have logged 20 at full loud-speaker strength. As I am writing we are hearing an Aria from Rome. My last set cost me about £25. Your Super Three has cost me less than £5, including accumulators.—W. A. P., Norwich,3/2/30

Referring to the 3-valve set recently supplied, I have pleasure in informing you how satisfied I am with it. I recently put an up expensive 4-valver, and had such bad results. I may say I have had many circuits in use up to 5 valves with very good results—that means quality of reception, volume, and distance. I purchased your Super 3 really for local use. As you will see, I am on top of the Brookmans Park Transmitter. The results I am getting are equal to my best with 4 and 5 valves. I can still have my Continentals on the loud-speaker, and with perfect quality. Wishing you every success. —Yours faithfully, V. M., Cheshunt, Herts.

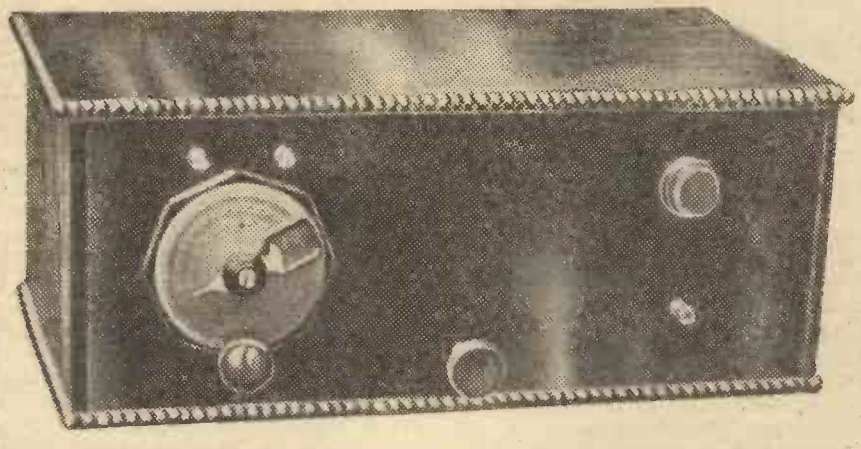
I feel I must write and congratulate you on a wonderful circuit. I have now had your "Northampton 3" only two nights, but in those two nights it has fully justified itself. I have the poorest of poor indoor aerials, and I have in 10 minutes logged 16 stations on the Loud-speaker. I have had to insert a volume control because of the power of the local station (Bournemouth, 70 miles away) and 5GB. I have just received Oslo, Paris (2), Hamburg, Berlin, Budapest, and many others. Your "3" gives 90 per cent. better results than you specify. Wishing your sets the best of luck in the future.—Yours very satisfied, C. D. N.

I have examined the above testimonials and am satisfied that these are genuine communications.— Advertisement Manager, "News-Chronicle."

THE NORTHAMPTON PLATING CO. SUPER A.C. ELIMINATOR

SPECIAL OFFER

Seven days approval to test. This A.C. eliminator, value £4, will be sent to any address on payment of 59s. cash or C.O.D., with the guarantee that if it is not superior to any other eliminator on the market and not giving complete satisfaction the money will be instantly refunded if returned in good condition and undamaged. It is guaranteed to be most silent in operation, giving over 20 milliamperes, and suitable for all 2-, 3-, and 4-valve sets. Test it for yourself. Trade inquiries invited.



SPECIAL WIRELESS AND CYCLE BARGAINS

Usual Price.		Sale Price
10/-	Latest Type Cabinet, 12 by 8	4/11
5/-	Ebonite for same, 12 by 8	3/-
5/11	Transformer	3/6
4/6	.0005 Variable Condenser	2/11
2/-	.002 Condenser	1/3
1/6	.003 ,,	10d.
1/-	Grid Leak, 2 meg.	10d.
1/-	Anti-Mic. Valve Holder	9d.
2/3	Rheostat	9d.
2/-	Indoor Aerial	9d.
5/-	Earth Tube	1/6
10/-	Guaranteed Phones	4/11
3/6	S.M. Dial	1/11

Usual Price.		Sale Price.
17/6	New Cossor Type Long-wave Coils, pair	9/6
7/6	Volume Control	3/11
7/6	H.F. Choke	3/11
2/6	Daventry 5GB Coil	1/3
10/6	6-volt Amplion Valve	3/11
12/6	Cone Unit	6/11
12/6	Cone Speaker Cabinets	7/11
2/-	12 in. Cone Speaker Frets	11d.
3/-	15 in. Cone Speaker Frets	1/11
7/6	Old Cossor Type Coils	3/11
15/-	Old Cossor Type Cabinets, 21 by 7	7/11
	Ebonite for same	3/11

Usual Price.		Sale Price.
12/6	Mullard Type Cabinet, 18 by 7	6/11
7/6	Aluminium Panel. 18 by 7	3/11
17/6	Dual Coil for M.M3	12/6
	Triotron Dull Emitter Valve	4/11
5/-	Cycle Tyre	2/6
2/6	Cycle Tube	1/3
6d.	Panel Transfer	3d.
6/6	Double-reading Voltmeter	3/11
	Triotron Super Power Valve	6/6
15/-	Titan Coil	9/11
9/-	60-volt H.T. Battery	4/11

Usual Price.		Sale Price.
12/6	100-volt H.T. Battery	8/11
5/6	2-volt Accumulator	3/6
2/-	Accumulator Carr.	11d.
4/6	Neutralising Condenser	2/11
4/-	Reaction Condenser	2/6
5/-	Dif. Reaction	2/11
2/-	Loud-speaker Cord	11d.
2/-	'Phone Cord	11d.
6/-	S.L.F. Condenser	3/11
21/-	D.C. Eliminator, 15 milliamps	17/6
£4	A.C. ,, 20 milliamps	59/-
17/6	Electric Iron. Weight, 5 lb.	7/11
30/-	Cone Speaker	9/11
	'Phones Repaired	2/6

New Cycles, Guaranteed, 59/11; with 3-speed, 79/11; with Dunlop Tyres, 10/- extra.

Parts supplied for all sets at Reduced Prices. Send now to avoid disappointment. Cash with order or C.O.D. Special terms to those making sets. All goods guaranteed and exchanged if not satisfactory. Inquire for anything you want. Trade supplied. Send for our wonderful Bargain Price List, A.W.

Trade Service Agents Wanted.

Owing to the enormous number of inquiries and orders, write clearly Name and Address in Block letters to the firm that made Radio popular. Letters must be fully stamped.

NORTHAMPTON PLATING CO. (Radio & Cycle Manufacturers), NORTHAMPTON

IS RESISTANCE COUPLING OUT OF DATE?

By J. H. REYNER, B.Sc., A.M.I.E.E.

RESISTANCE-CAPACITY coupling was one of the earliest forms of intervalve coupling used in valve amplifiers. It is still one of the most popular forms of coupling, although it has passed through many phases. The values of anode resistance have varied from a few ohms to several megohms, and the other constants in the circuit have varied accordingly. In fact, there are in use to-day resistance-coupled amplifiers having values as widely different as those just stated and probably all working with a certain degree of satisfaction.

This has created the impression that resistance-capacity coupling is not critical as regards the choice of values. Actually nothing is farther from the truth. This form of amplifier requires as careful design as any other form. Admittedly it is somewhat easier to vary the values of the components, for the average user cannot vary the inductance of the transformer at will, nor can he alter the characteristics to suit his requirements, whereas a change in the value of his resistance or coupling condenser will often make a very material difference

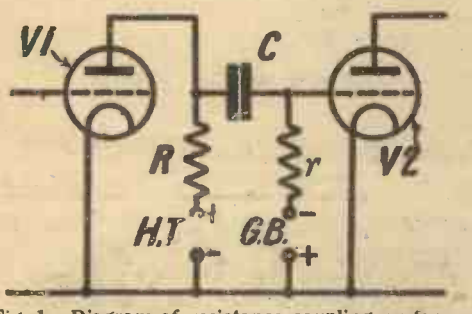


Fig. 1. Diagram of resistance-coupling system

to his quality. The purpose of this article is to suggest that in many cases the values used for this form of coupling are quite incorrect in the light of modern experience, and that from this point of view the system, as put into practice in the majority of cases, is out of date.

A QUESTION OF DESIGN

The design of a resistance-coupled amplifier can be divided into two distinct stages. In the first place, one may, by paying attention to the general details, produce an amplifier which is capable of giving good quality under normal conditions. The second stage results from an analysis of the working of such an amplifier under abnormal conditions, such as transient phenomena produced by cymbals or pizzicato strings and such-like effects. The benefits obtained here from the use of correctly-proportioned parts are only discernible on a good loudspeaker and to a good musical ear. I propose in the present article to discuss the first stage in the design and to review quite briefly the modern ideas on the subject. In a later and second article I propose to discuss those factors which affect the more critical listener, dealing with the phase shift or time lag which is experienced with this form of coupling.

There are three main components in a resistance-capacity coupled system, namely, the anode resistance, the grid leak, and the coupling condenser. The system is shown in skeleton form in Fig. 1, and its action is as follows. If varying voltage is applied to the grid of the first valve V1, similar but magnified voltages are produced across the anode resistance R due to the varying anode current of the valve. This voltage is applied across the grid and filament of the next valve V2, through a coupling condenser C, which serves to prevent the high-tension voltage from reaching the grid of the next valve. The grid-leak resistance R is necessary in order to see that the grid of the second valve is working with its correct bias point, the bottom end of the grid leak being connected to the grid-bias battery as shown.

THE ANODE RESISTANCE

The value of the anode resistance is determined by the valve with which it is to be used. If the resistance is small, most of the voltage developed is absorbed by the valve itself. As the external resistance is increased, so a larger proportion of the voltage is developed external to the valve, but beyond a certain point the increase is only relatively small. The amplification obtained from the valve in terms of the anode resistance is shown in Fig. 2.

On the other hand, if we start with a limited high-tension voltage, as is usually the case, then the larger we make the anode resistance, the less the voltage actually applied to the valve. Most of the voltage is wasted on the anode resistance, and only a small fraction is left for the valve. If we make the anode resistance three times that of the valve, we shall obtain one-quarter of the total voltage on the valve itself. Using a 120-volt battery, this means 30 volts only on the valve, which is quite small enough, and a lower value than this is not desirable.

In most cases the valve which is being followed by the resistance coupling is used as a detector. If, as is usual, a grid detector is employed, 30 volts is none too much if one lives near a local station or if there is any high-frequency amplification before the detector. An H.F. valve with 30 volts on the anode will handle a grid swing of 1 volt H.F. without detector distortion setting in, but it will be clear that this involves a resistance of between 50,000 and 80,000 ohms only, with the average H.F. valve of to-day. This value in itself is distinctly smaller than is usually employed. If an R.C. valve is used, resistance may be increased to 150,000 ohms, or perhaps a little more, but a valve of this nature is only satisfactory where one is receiving relatively weak signals, and the modern tendency is to use an H.F. valve for a detector, even when R.C. coupling is being used.

Let us now consider the grid leak. Since the grid leak is virtually in parallel with the anode resistance, it must not be made too small or it will reduce the effective anode

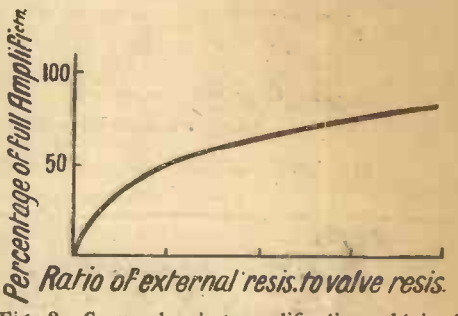


Fig. 2. Curve showing amplification obtained from a valve in terms of anode resistance

resistance and so cause a loss in signal strength. If the grid leak is made five or more times as great as the anode resistance, however, no trouble will be experienced on this account.

The grid leak must not be made too large, however, or there is a danger of what is known as "grid choking."

The value of the grid leak is actually wrapped up with that of the coupling condenser. It is essential that the coupling condenser shall act practically as a short circuit to all the speech currents, while still, of course, acting as a barrier to the high-tension steady voltage. The table given herewith shows the size of coupling condenser necessary to preserve the amplification at frequencies as low as 50 cycles. This value of coupling condenser will be seen to vary with the grid leak, becoming larger as the value of the grid leak is reduced.

At first sight it might seem economical, therefore, to use the largest value of grid leak permissible and use a smaller value of coupling condenser. I shall show in the concluding article, however, that this value of coupling condenser is the minimum which can be used, and that for the best results a distinctly larger value should be employed. This being the case, it pays to use a smaller value of grid leak.

Table showing relative values of coupling condenser and grid leak

Grid Leak (megohms)	*Coupling Condenser (microfarads)*
0.25	0.05
0.5	0.02
1.0	0.005
2.0	0.0035

WE TEST FOR YOU

A weekly review of new components and tests of apparatus.

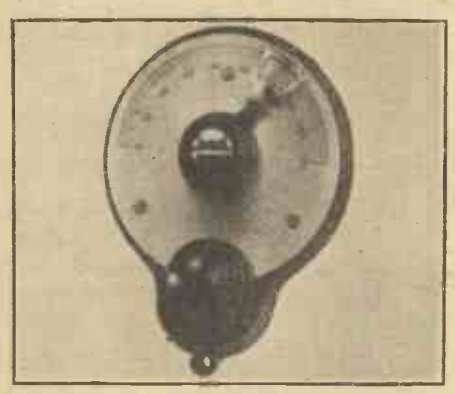
Conducted by our Technical Editor, J. H. REYNER, B.Sc., A.M.I.E.E.

Astra Slow-motion Dial

SLOW-MOTION dials have been sufficiently long on the market for their faults to be fully discovered and remedied. In consequence the discriminating user of to-day demands a slow-motion dial that will provide a suitable reduction ratio, absolute smoothness in motion, and freedom from any form of backlash. In addition he may require to work three or four condensers in cascade, and the mechanism must, therefore, take such a load without a tendency to slip.

We have no fault whatsoever to find with the Astra geared vernier dial Type 1, which is marketed in this country by the Emkabe Radio Co., Ltd.

The operating knob of this component is fitted below the centre of the dial and drives a 13-1 ratio reduction tooth gearing. The teeth are well cut, and the driving shaft is constrained by a spring to bear on the larger driven wheel, with the object of avoiding backlash. By giving the knob a slight push upwards, the gear is brought out of engagement and the main spindle can be readily rotated from the central knob, which also carries a cursor moving over a scale in black lettering on a silvered metal front plate. As far as we can discover there should be nothing whatsoever to go wrong with this mechanism, since the device for putting the operating spindle in and out of gear is quite foolproof.



Astra geared vernier dial

For mounting on a panel two holes only need be drilled, one for the main condenser spindle, and the other to take a metal support, which is also attached to the metal front plate, and may, therefore, be earthed. The condenser spindle fits into a split bush and is firmly fixed by screwing up an accessible knob on the front of the dial. A positive stop is provided in the minimum and maximum positions.

(*Continued on page* 848)

WE TEST FOR YOU

(*Continued from page* 846)

Owing to the smoothness of motion the dial is particularly pleasant to operate, and one may obtain a very fine graduation of tuning without a sign of backlash. The external appearance is quite attractive, whilst the diameter of the external moulding measures 3 in. The price of this component is 3s. 6d., and we recommend it for fine tuning.

Lewcos Constant-inductance Transformer

UNTIL quite recently the efficiency of a low-frequency transformer was often gauged from the inductance of the primary winding: whilst this inductance is of

Lewcos constant-inductance transformer

extreme importance, particularly when used in conjunction with high-impedance valves, it is now recognised that there are other factors requiring equal attention. Almost all iron-cored inductances vary in value when the current flowing through the winding is increased. If the variation is small throughout the working values of anode current, no perceptible distortion will result.

On the other hand if the inductance varies, as it often does, more than 50 per cent., due to the change in polarising current caused by speech modulation, the effect may be serious, since the amplification will be different for different strengths of signal, thereby detracting from the natural qualities of reproduction.

In the new Lewcos constant-inductance transformer, steps have been taken to overcome this source of distortion throughout a wide range of polarising currents. When tested in our laboratories the inductance without polarising current was found to be 35.7 henries. This had risen to 37 henries at 4 milliamps, and fallen again to 35 henries at 14.5 milliamps. Even with a current of 30 milliamps through the windings, the inductance did not fall below 30 henries.

We have had considerable experience of constant-inductance chokes and transformers and can vouch for their advantages when used under normal conditions.

The price is 20s. and it may certainly be recommended.

Postcard Radio Literature

Gecophone Speakers

I LIKE the new Gecophone inductor dynamic speaker, which can be had eithe in chassis or complete cabinet forms. A little folder which I have received describe this, together with the "Stork" an "Junior Plaque" Gecophone speakers.

105

A Portable for Indoors

The Amplion portable has two screen grid stages, and experts tell me that it ha an excellent range. A folder which I hav illustrates it well, and shows that it is in neatly finished case, making it quite suit able for indoor use.

106

Batteries Catalogued

Ever-Ready have sent me their lates catalogue of batteries and this seems t give the whole Ever-Ready range, fro midget pocket lamp batteries to super capacity high-tension batteries, low-tensio accumulators and car-starter batteries.

107

For Home Builders

Home constructors will be interested i the new parts marketed by Edison Bell There are some handy plugs, jacks, valv holders, R.C. couplers, transformers an resistances listed in a new catalogue.

108

The New Melody-Maker

The new Cossor four-valve Melody Maker seems to be making a name for itself It is so low priced. A new Cossor folder give full details of this set and it will interes anyone who is on the lookout for a good ki receiver.

109

A "Baby" Portable

The term "baby" seems to be justified by a new portable produced by V. Zeitlin and Sons, Ltd., for it weighs only 14 lb. an measures 9½ in. by 9 in. by 8 in. It is a three-valver and is fitted with a speaker. A two-valve headphone model is also available

110

A Useful Catalogue

A good general catalogue of handy accessories for set builders is that produced by Superlamp, Ltd. This gives details of al the new parts for the 1931 season.

111

OBSERVER

GET THESE CATALOGUES FREE.

Here "Observer" reviews the latest booklets and folders issued by well-known manufacturers. If you want copies of any or all of them FREE OF CHARGE, just send a postcard giving the index numbers of the catalogues required (shown at the end of each paragraph) to "Postcard Radio Literature," "AMATEUR WIRELESS," 58-61, Fetter Lane, E.C.4. "Observer" will see that you get all the literature you desire.

GERMANY RELAYS OUR DANCE MUSIC

ON two or three occasions recently the Berlin and Frankfurt broadcasting stations have given landline relays from Savoy Hill of dance bands engaged for the B.B.C. The other evening Germany took one and a quarter hours of dance music from Grosvenor House. It is interesting to remark that, since dance tunes seem to sweep from west to east, arriving in Germany several months after they are dead in this country, radio is in this instance not only killing space, but time as well. Judging by some of the direct broadcasts we occasionally pick up from German broadcasting stations, they are in dire need of good dance bands, such as those we import from America!

THE B.B.C. YEAR BOOK 1931

This annual, published on November 28, represents even a bigger attempt than has been made in previous years to chronicle the radio events and developments of the year and present them, with a wealth of photographs and illustrations, in the form of a year book. The period covered by the 1931 edition is from November 1, 1929, to October 31 of this year, and it is notable that in the short space of time allowed before going to press ample attention has been paid to the most topical radio happenings. The year book deals with each phase of the B.B.C.—programmes, policy, and engineering. It can be obtained, price 2s., from any bookstall or from the B.B.C. Bookshop at Savoy Hill.

Landline Balancing.—Apropos the article on B.B.C. landlines in our previous issue, there is a technical distinction that might have been made between "balancing" and "equalising." When a landline is balanced, the background noises due to cross currents and other causes are eliminated. But when the characteristic of the line is altered to enable it to handle the wide range of frequencies required for broadcasting, it is said to be equalised.—A. S. H.

Vert Wiring Clip.—It should be noted that the price of this handy wiring device is 2s. for a half-gross, sufficient for a three-valver, and not a gross as stated last week in the advertisement of W. Green and Sons (A), of Redclyffe, Horley, Surrey.

"Paper v. Electrolytic Condensers."—In connection with this article, which appeared on page 802 of last week's issue, it will be obvious that the sectional sketch shown illustrates the constructional features of an electrolytic condenser, and not a paper condenser, as stated.

It is estimated that 6,000,000 inhabitants living in German frontier provinces can only listen to foreign stations. In order to bring them in range of their own country the German Government is erecting three powerful broadcasting stations in Muehlacker, near Stuttgart: in Heilsberg, near Koenigsberg, and in the Rhineland.

During a Thunderstorm

SIR,—I wonder whether if any of your readers have experienced a phenomenon which happened about two months ago? I was listening-in to the Manchester programme during a thunderstorm. There was a vivid flash of lightning and also a loud click in the loud-speaker, which is of the cone type. A red glow accompanied the loud click in the speaker, which seemed to come out for about a foot all round the speaker. I am using an indoor aerial. The speaker was not damaged in any way whatever. W. M. (Manchester).

"The Exhibition Three"

SIR,—I have made up the "Exhibition Three" receiver and, whilst it works and gives reception, the tuning is flat and I seem to get a number of stations coming in at the same time. It seems that it is impossible to get selective tuning from the receiver. I am using Atlas plug-in coils and have wired the receiver exactly as described. Is there any way in which the selectivity can be improved?

F. S. (Oldham).

If you have wired up the pins and sockets of your coil holders exactly as shown in our blueprint, then please note the following. The tappings on the Atlas coils are nearest the pin or plug end of the coil, which means that for proper selectivity the aerial coil holder should be wired so that its socket is connected to the earth terminal. If you will completely reverse the connections to all of your coil holders in the receiver, you will overcome your present trouble. In other words, the wire now going to the terminal which is connected to the plug of each coil holder should be taken to the terminal which joins the socket, and vice versa. —ED.

"A.W." Solves your Wireless Problems

The Limit in High Tension

SIR,—Last November you gave particulars of how to build the B.B.C. one-valve set, and in the instructions you mentioned that 120 volts H.T. could be used, but that the set would work satisfactorily on 60 volts.

A Lissen 60-volt battery has worked this set quite satisfactorily since last March, but for some time particular clarity of tone has been observed.

Testing the battery last week, I could only find 2½ volts. Testing this on three different voltmeters, I was still not satisfied that it was correct.

Having a second 2-volt accumulator at hand, I used it on the H.T. connections and found the set worked perfectly with full volume on phones. The valve is a Mullard PM1LF, which has been in constant use since December, 1928.

N. T. H. (Balham).

BROADCAST TELEPHONY

Broadcasting stations classified by country and in order of wavelengths. For the purpose of better comparison, the power indicated is *aerial energy*.

Metres	Kilocycles	Station and Call Sign	Power (Kw.)
GREAT BRITAIN			
25.53	11,751	Chelmsford (G5SW)	15.0
200	1,500	Leeds	0.16
242	1,238	Belfast	1.2
261.3	1,148	London Nat.	68.0
288.5	1,040	Newcastle	1.2
288.5	1,040	Swansea	0.16
288.5	1,040	Stoke-on-Trent	0.16
288.5	1,040	Sheffield	0.16
288.5	1,040	Plymouth	0.16
288.5	1,040	Liverpool	0.16
288.5	1,040	Hull	0.16
288.5	1,040	Edinburgh	0.4
288.5	1,040	Dundee	0.16
288.5	1,040	Bournemouth	1.2
288.5	1,040	Bradford	0.16
301	995	Aberdeen	1.2
309.9	968	Cardiff	1.2
356.3	842	London Reg.	45.0
376.4	797	Manchester	1.2
398.9	752	Glasgow	1.2
479	626	Midland Reg.	38.0
1,554	193	Daventry (Nat.)	35.0
AUSTRIA			
246	1,220	Linz	0.6
246	1,220	Salzburg	0.6
283.0	1,058	Innsbruck	0.6
352	851	Graz	9.5
453	666	Klagenfurt	0.6
517	581	Vienna	20.0
BELGIUM			
206	1,460	Antwerp	0.4
212	1,415	Binche	0.2
216	1,391	Chatelineau	0.25
243	1,235	Courtrai	0.1
244.7	1,226	Ghent	0.25
251.4	1,194	Schaerbeek	0.5
338.2	887	Velthem (Louvain)	15.0
509	590	Brussels (No. 1)	1.2
CZECHO-SLOVAKIA			
263	1,139	Moravska-Ostrava	11.0
279	1,076	Bratislava	14.0
294	1,020	Kosice	2.5
342	878	Brunn (Brno)	3.0
487	617	Prague (Praha)	5.5
DENMARK			
281	1,067	Copenhagen	1.0
1,153	260	Kalundborg	10.0
ESTONIA			
401	748	Reval (Tallinn)	0.7
FINLAND			
221	1,355	Helsinki	15.0
291	1,031	Viipuri	15.0
1,796	167	Lahti	54.0
FRANCE			
172.5	1,739	St. Quentin	0.3
200	1,500	Radio Roubaix	0.2
210	1,430	Radio Touraine	0.2
222.9	1,346	Fécamp	1.0
235.1	1,275	Nimes	1.0
244.9	1,224	Béziers	0.6
249.5	1,202	Juan-les-Pins	0.5
258	1,171	Toulouse (PTT)	1.0
265	1,136	Lille (PTT)	15.0
272	1,103	Rennes	1.2
286	1,049	Montpellier	2.0
287.2	1,044.6	Radio Lyons	0.5
296.4	1,012.1	Limoges (PTT)	0.08
300	1,000	Strasbourg	1.0
304	988	Bordeaux (PTT)	35.0
308	973	Neuilly (Paris)	0.3
313	958.5	Natan-Vitus	0.7
316	950	Marseilles (PTT)	1.5
328.2	914	Grenoble (PTT)	1.2
329	911	Caen (Normandy)	0.6
329.5	910.3	Poste Parisien	1.2
345.2	869	Strasbourg (PTT)	12.0
369.3	812.2	Radio LL (Paris)	0.5
385	779	Radio Toulouse	9.0
447	671	Paris (PTT)	2.0
466	644	Lyons (PTT)	2.3
1,446	207	Eiffel Tower	15.0
1,725	174	Radio Paris	17.0
GERMANY			
31.38	9,560	Zeesen	15.0
218	1,373	Flensburg	0.6
227	1,319	Cologne	1.7
227	1,319	Münster	0.6
227	1,319	Aachen	0.31
232.2	1,292	Kiel	0.3
239	1,256	Nürnberg	2.3
246.4	1,217.2	Cassel	0.3
253.4	1,184	Leipzig	2.3
259.3	1,157	Gleiwitz	5.6
270	1,112	Kaiserslautern	0.25
276	1,085	Königsberg	1.7
283.6	1,058	Magdeburg	0.6
283.6	1,058	Berlin (E)	0.6
283.6	1,058	Stettin	0.6
316.6	947.6	Bremen	0.3
318.8	941	Dresden	0.3
325	923	Breslau	1.7
360	833	Stuttgart	75.0
372	806	Hamburg	1.7
390	770	Frankfurt	1.7
418	716	Berlin	1.7
452.1	662	Danzig	0.25
473	635	Langenberg	17.0
533	563	Munich	1.7
560	536	Augsburg	0.3
566	530	Hanover	0.35
570	527	Freiburg	0.3
1,635	183.5	Zeesen	35.0
1,635	183.5	Norddeich	10.0
HOLLAND			
31.28	9,599	Eindhoven (PCJ)	30.0
299	1,004	Hilversum (also testing on 1,110m.)	8.5
299	1,004	Radio Idzerda (The Hague)	0.6
1,071	280	Scheveningen-Haven	5.0
1,875	160	Huizen	8.5
HUNGARY			
210	1,430	Budapest (Csepel)	1.0
550	545	Budapest	23.0
ICELAND			
1,200	250	Reykjavik (shortly testing)	16.0
IRISH FREE STATE			
224.4	1,337	Cork (1FS)	1.5
413	725	Dublin (2RN)	1.5
ITALY			
80		Rome (3RO)	9.0
296	1,013	Turin (Torino)	8.5
312	916.2	Genoa	1.5
332	905	Naples (Napoli)	1.7
441	680	Rome (Roma)	75.0
453	662	Bolzano (1BZ)	0.2
501	599	Milan (Milano)	8.5
LATVIA			
525	572	Riga	12.0
LITHUANIA			
1,935	155	Kaunas	7.0
NORTH AFRICA			
363.4	825.3	Algiers (PTT)	13.0
416	721	Radio Maroc (Rabat)	10.0
1,350	222.2	Tunis Kasbah	0.6
NORWAY			
364	824	Bergen	1.0
385	821	Frederiksstad	0.7
453.2	662	Porsgrund	1.5
453.2	662	Nidaros	1.2
1,060	283	Oslo	75.0
POLAND			
214.2	1,400	Warsaw (2)	1.9
234	1,283	Lodz	2.2
244	1,229	Cracow	1.5
312.8	959	Wilno	0.5
338.1	887.1	Poznan	1.9
381	788	Lvov	2.2
409.8	732	Katowice	16.0
1,411	212.5	Warsaw	14.0
PORTUGAL			
240	1,247	Oporto (Teatro Apollo)	0.25
320	937.6	Lisbon (CTIAA)	0.25
ROMANIA			
394	761	Bucharest	16.0
RUSSIA			
720	416.6	Moscow (PTT)	20.0
800	375	Kiev	20.0
824	364	Sverdlovsk	25.0
937.5	320	Kharkov (RV20)	25.0
1,000	300	Leningrad	20.0
1,073	279.6	Kostov	4.0
1,103	272	Moscow Popoff	40.0
1,200	250	Kharkov (RV4)	25.0
1,304	230	Moscow (Trades' Unions)	100.0
1,380	217.5	Bakou	10.0
1,481	202.5	Moscow (Kom)	20.0
SPAIN			
251	1,193	Barcelona (EAJ15)	1.0
266.7	1,125	Barcelona (EAJ13)	10.0
349	860	Barcelona (EAJ1)	8.0
368	815	Seville (EAJ5)	1.5
413.8	725	Radio Espana	1.0
424	707	Madrid (EAJ7)	2.0
460	652	San Sebastian (EAJ8)	0.5
SWEDEN			
230.6	1,301	Malmo	0.75
257	1,166	Hörby	15.0
300.2	999.3	Falun	0.65
322	932	Göteborg	15.0
436	689	Stockholm	75.0
542	554	Sundsvall	15.0
770	389	Ostersund	0.75
1,229.5	244	Boden	0.75
1,348	222.5	Motala	40.0
SWITZERLAND			
318.8	943	Basle	0.65
403	743	Berne	1.1
459	653	Zurich	0.75
678.7	454.6	Lausanne	0.6
760	395	Geneva	1.5
TURKEY			
1,200	250	Istanbul	5.0
1,595	188.1	Ankara	7.0
YUGOSLAVIA			
306.8	978	Zagreb (Agram)	0.7
430.4	696.9	Belgrade	3.0
574.7	522	Ljubljana	2.8

NEW OPERA PLANS AND THE B.B.C.

LISTENERS who are anxious to have more broadcast operas will be pleased to hear of an arrangement made between the Covent Garden Opera Syndicate, Ltd., and the B.B.C. for carrying out a scheme of grand opera production over a number of years.

The undertaking will be administered by a company to be known as the Covent Garden Opera Syndicate (1930), Ltd., under the chairmanship of Mr. F. A. Szarvasy, the originator of the proposal.

More than two hundred performances will be given yearly, allocated between the grand season of ten weeks at Covent Garden, autumn and winter seasons there of six weeks each, and two-week seasons in at least six other centres throughout the country.

Except for the grand season, popular prices will be charged at all performances and the artistes employed will be almost exclusively British.

An income of £30,000 has been guaranteed from various sources, and all the funds and earnings of the new company will be devoted to furthering the scheme.

Arrangements are in the course of being completed for the participation of Sir Thomas Beecham and the Imperial League of Opera. At least sixty performances per annum will be broadcast.

RADIOGRAMS

A SERIES of old musical comedies will provide the material for a programme which is to be broadcast nationally on December 9. The title of the programme is "Theatrescope," and it will be presented by John Watt.

The symposium by distinguished medical men who have broadcast on the special aspects of medicine with which they are principally concerned will be brought to a close on December 1 by Sir Humphry Rolleston, who will summarise the problem as a whole. Sir Humphry is one of the King's physicians.

"Seasonal" music and poetry are very popular, and on December 7 Manchester and Leeds listeners will hear a concert called "Winter Landscape," performed by the Northern Wireless Orchestra.

On December 11 the Hallé Society are giving a performance of Gustav Mahler's "Song of the Earth" for broadcast from the Manchester and Leeds transmitters.

When Mr. L. du Garde Peach and Mr. E. W. Lustgarten join issue on December 10, on the important question of whether it is better to live in the North Country or in a Northern town, listeners in Manchester and Leeds may be sure of enjoying a very amusing and witty forty minutes.

"Contrasts," which is to be broadcast on December 3 (Regional) and December 6 (National) is the work of Derek McCulloch.

The third talk in the series "Talks to Amateur Dramatic Societies" is entitled "How to Dress a Play" and will be broadcast from Cardiff by Miss Mariam Radford on December 8.

Scissors for Luck, by Dorothy Howard Rowlands, will be given from Cardiff by the Bristol Drama Club on December 9 during a programme which is introduced by the National Orchestra of Wales.

Mr. C. B. Cochran will take the chair at a studio discussion on December 8 between Mr. Hugh Walpole and Mr. Osbert Sitwell.

(*Continued on page* 856)

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.

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.

Queries *cannot* be answered personally or by telephone.

FULL-SIZE BLUEPRINTS

When ordering, please send Postal Order, NOT STAMPS

CRYSTAL SETS (6d. each)

B.B.C. Brookman's Park Set	AW206
Regional Crystal Set	WM176

ONE-VALVE SETS (1s. each)

Monodyne	AW258
Hartley Single-valver	WM198

TWO-VALVE SETS (1s. each)

Talisman Two (D. Trans)	AW194
No-battery A.C. Mains Two (D, Trans)	AW230
No-battery Gramo-radio 2 (D, Trans)	AW238
1930 Talisman 2 (D, Trans)	AW239
Easy Tune Short-wave 2 (D, Trans)	AW242
Searcher Two (D, Trans)	AW245
Arrow Two (D. Trans)	AW249
Forty-five-shilling Two (D. 8 Trans)	AW250
Searcher Short wave 2 (D, Trans)	AW259
Brookman's Two (D, Trans)	WM168
New Crusader (D, Trans)	WM182
Radio-Record Two (SG, D)	WM187
Gleaner Two (D, Trans)	WM201
Music Monitor (D, Trans)	WM208
Merlin Two (A.C. Set)	WM213
Five-Point Two (D, Trans)	WM220

THREE-VALVE SETS (1s. each)

Wide World Short-wave Three (HF, D, Trans)	AW207
1930 Ether Searcher (SG, D, Trans)	AW211
Best-by-Ballot Three (SG, D, Trans) Price 4d. free with copy of "A.W."	AW217
Everybody's-All-electric Three (SG, D, Trans) —A.C.	AW221
1930 Clarion Three (SG, D, Trans)	AW223
Beginner's Regional Three (D, 2LF)	AW233
Britain's Favourite Three 1930 (D, 2 Trans)	AW243
Car Three (D. R.C. Trans)	AW244
The "A.W." Exhibition 3	AW247
Brookman's Three (SG, D, Trans)	WM161
Community Three (D, RC, Trans)	WM164
Brookman's Push-Pull Three (SG, D, Trans) 1/6	WM170
All-nations Three (D, 2 Trans)	WM178
Inceptordyne (SG, D, Pentode)	WM179
Brookman's A.C. Three (SG, D, Trans) 1/6	WM184
Music Marshal (D, 2 Trans)	WM190
Gramo-Radio D.C. Three (SG D Trans)	WM196
Concert Three (D, 2 Trans)	WM199
New Lodestone Three (HF, D, Trans)	WM205
De-Luxe Three (D, RC, Trans)	WM209
Five-Point Three (SG, D, Trans)	WM212
Falcon Three (A.C. Set)	WM217
New Brookman's Three (SG, D, Trans)	WM218

FOUR-VALVE SETS (1s. 6d. each)

Music-Lover's Gramo-radio (Loud-speaker) 1s.	AW202B
Horizon Four (SG, D, 2 Trans)	AW237
Challenge Four (2SG, D, Trans) with copy of "A.W.," 4d. post free	AW251
Challenge Four (2SG, D, Trans, mains operated) with copy of "A.W.," 4d. post free	AW252
1930 Monodial (2SG, D, Trans)	WM158
Electric Four (All A.C.—SG, D, RC, Trans)	WM162
Brookman's Four (2SG, D, Trans)	WM174
Transportable Four (SG, D, 2 RC)	WM180
Super Q4 (SG, D, 2 Trans)	WM189
Lodestone Four (HF, D, RC, Trans)	WM193
Searcher's Four (SG, D, RC, Trans)	WM194
Invitation Four (SG, D, RC. Trans)	WM200
Regional Band-pass Four (SG, D, RC, Trans)	WM211
Five-Point Four (SG, D, RC, Trans)	WM216
Regional A.C. 4 (SG, D, RC, Trans)	WM221

FIVE-VALVE SETS (1s. 6d. each)

James Quality Five (2SG, D, RC, Trans)	AW227
All-wave Lodestone Five (HF, D, RC, Push-pull)	WM146
1930 Five (2HF, D, RC, Trans)	WM171
Dual-screen Five (2SG, D, RC, Trans)	WM185
Radio-Record Five (SG, D, Trans-parallel)	WM188
Overseas Five (3SG, D, Trans)	WM191

AMPLIFIERS (1s. each)

"A.W." Gramophone Amplifier	AW205
Two-valve Amplifier	AW216
"Mag" Gramo Unit	AW224
Simple Gramophone Amplifier	AW257
Radio-Record Amplifier (DC Mains)	WM183
Selecto Amplifier (HF, Unit)	WM210

MISCELLANEOUS (1s. each)

Short-wave Adaptor (1 v.)	AW183
Simplest H.T. Unit	AW107
By-pass Unit (Wavetrap) with copy "A.W."—4d.	AW218
"Twin" Brookman's By-pass (6d.)	AW222
James H. T. and L.T. Charging Unit	AW232
Simplest H.T. Eliminator for D.C. Mains	AW234
Simplest H.T. Eliminator for A.C. Mains	AW236
Choke Output Unit	AW240
Simple Tester Unit (6d.)	AW246
"A.W." Improved Linen-diaphragm Speaker	AW248
Handy L.T. and G.B. Unit for A.C. Mains	AW254
Ohmic-coupled DX Unit	AW255
Brookman's "Wipe-outs"	WM180
Short-wave adaptor for Overseas Five	WM192
Staminator Unit for A.C. Mains	WM202
Universal Push-pull Amplifier	WM204
Outspan Short-wave Adaptor	WM207
"W.M." Standard A.C. Unit	WM214
"W.M." Standard D.C. Unit	WM215
Falcon A.C. Unit	WM219 1/-

PORTABLE SETS

Continental Portable (SG, D, Trans)	AW241 1/-
Pedlar Portable Two (D, Trans)	WM195 1/-
Pedlar Portable Three (D, 2 Trans)	WM197 1/-
James Portable SG3 (SG, D, Trans)	WM203 1/-
Foursome Portable (SG, D, 2 Trans)	WM206 1/6

Copies of the "Wireless Magazine" and of "Amateur Wireless" containing descriptions of any of these sets can be obtained at 1s. 3d. and 4d. respectively, post free. Index letters "A.W." refer to "Amateur Wireless" sets and "W.M." to "Wireless Magazine."

AMATEUR WIRELESS 58-61 FETTER LANE LONDON, E.C.4.

"RADIOGRAMS"

(Continued from page 854)

They are going to try to find the answer to the question, "What's Wrong with the Theatre?" and their remarks will be heard by listeners to the National programme.

"The Foursome's" vaudeville programme on the National on December 1, to be repeated regionally on December 5, will open with the "Two Pairs" (Claude Hulbert and Enid Trevor, with Paul England and Pat Paterson), followed by Harold Waldon in stories and songs, Halina Bruczowna, Gillie Potter (comedian), and Elizabeth Pollock.

Speeches following the luncheon given by the English Speaking Union in honour of American Thanksgiving Day will be relayed from the Park Lane Hotel to London Regional on November 27. Listeners will hear Lord Burnham and Sir John and Lady Simon.

A concert by the Afan Glee Society will be relayed to Cardiff from Port Talbot on December 11. The vocalists will be May Huxley and Dennis Noble.

Cardiff listeners heard the City of Bristol Police Band during Bristol Radio Week, and this band returns to the studio on December 13. Their performance will be followed by a Christmas concert by the University of Bristol Madrigal Singers.

The fifth talk in the series "Wales To-day and To-morrow" will be given from Cardiff by Professor J. Saunders Lewis on "The National Standpoint" on December 6.

"Amateur Wireless and Radiovision." Price Threepence. Published on Thursdays 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. **Queries** should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed. **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.

PREPAID ADVERTISEMENTS

Advertisements under this head are charged THREEPENCE PER WORD, minimum charge THREE SHILLINGS. DEPOSIT SYSTEM

As the Publishers cannot accept responsibility for the bona fides of advertisers in this publication, they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

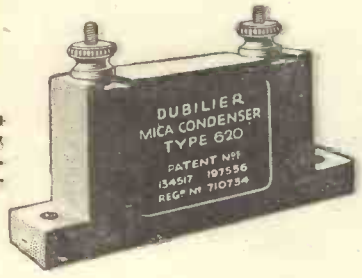
Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom double fees are charged.

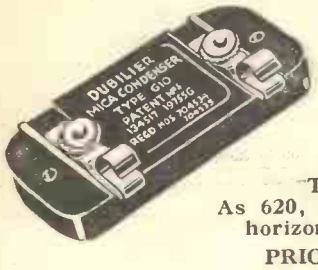
The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to

"AMATEUR WIRELESS" ADVERTISEMENT DEPARTMENT
58/61 FETTER LANE, LONDON, E.C.4

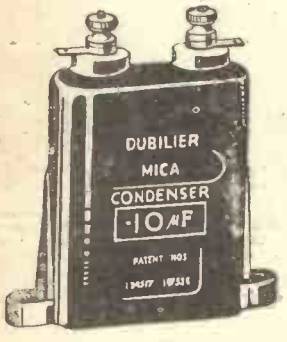
Dubiliers make a mica condenser for every job!

TYPE 620
For use in radio circuits where comparatively small capacity is required. Arranged for vertical mounting.
PRICES 1/8 to 3/-





TYPE 610
As 620, but arranged for horizontal mounting.
PRICES 1/8 to 3/-



TYPE B775
Primarily designed for resistance coupling, but suitable for use in other circuits where a comparatively large capacity, capable of withstanding several hundreds of volts, is required.
PRICES 3/- to 18/-

Use Dubilier Condensers and be certain of satisfaction.

DUBILIER
CONDENSERS

DUBILIER CONDENSER CO. (1925) Ltd.,
DUCON WORKS, VICTORIA ROAD, N. ACTON, W.3.

VOTED THE FINEST ALL-MAINS UNITS AT OLYMPIA

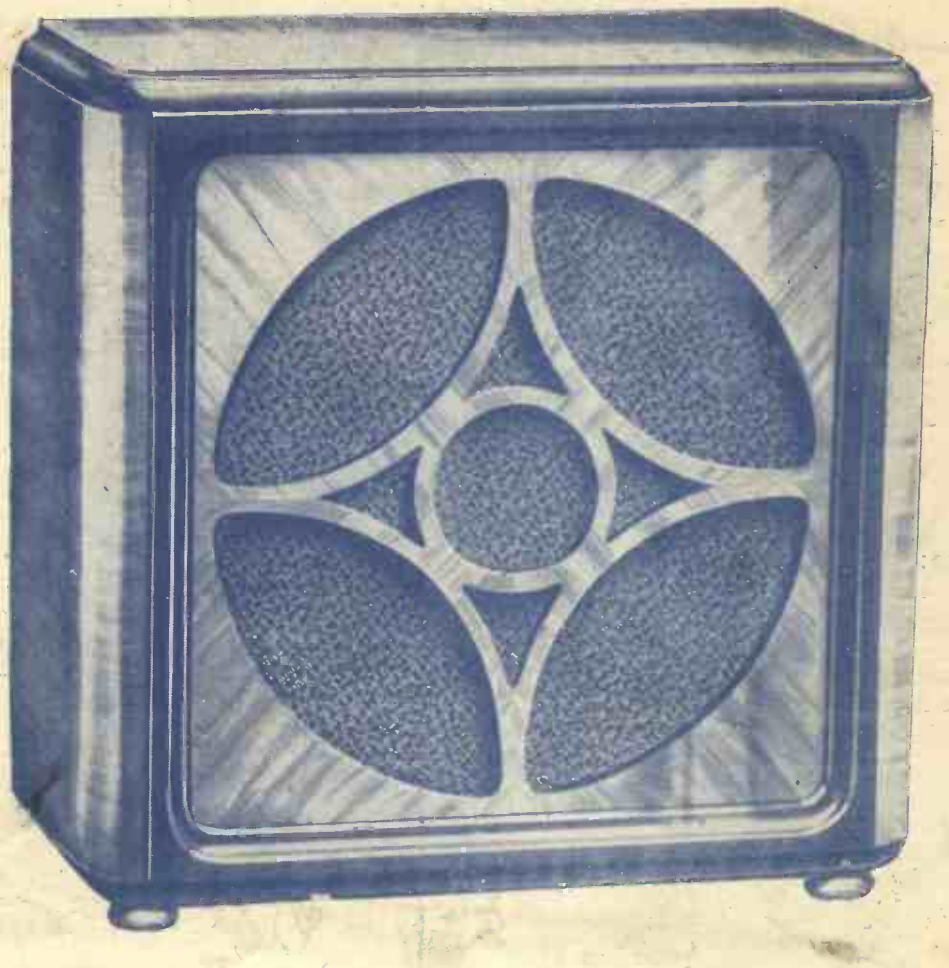
BY winning the first place in the "Wireless World" Competition, the already famous "ATLAS" ALL-MAINS Units are voted the finest value obtainable at any price. Two variable tappings, unrivalled power, small size, and the Westinghouse Metal Rectifier, are among the outstanding features that lift model A.C. 188 far above the level of all competitors.

Ask your dealer for Folder 55, or write direct to the makers.

H. CLARKE & CO. (M/CR), LTD.
Old Trafford :: Manchester

MODERNISE YOUR SET WITH

"CLARKE'S ATLAS"
MODEL A.C. 188



BLUE SPOT 29R

Blue Spot Speakers are in a class all by themselves—Blue Spot Speakers are the best in the world. 29R is the best of the Blue Spot Speakers . . . Put two and two together, what follows? . . . . Yes, quite right, 29R *is* the best in the world. - - - **£6-6-0**

This price does not apply to the Irish Free State.

Blue Spot TRADE MARK

• THE BRITISH BLUE SPOT COMPANY LTD. •

BLUE SPOT HOUSE, 94/96 ROSOMAN STREET, ROSEBERY AVENUE, LONDON, E.C.1

'Phone: CLERKENWELL 3570. *'Grams: "BLUOSPOT, SMITH, LONDON."*

Distributors for Northern England, Scotland and North Wales: H. C. RAWSON (Sheffield and London), LTD., 100 London Road, Sheffield; 22 St. Mary's Parsonage, Manchester; 183 George Street, Glasgow.

Printed in England. Published by Bernard Jones Publications, Ltd., 58/61 Fetter Lane, London, E.C.4
Sole Agents for South Africa: CENTRAL NEWS AGENCY, LIMITED. Sole Agents for Australasia: GORDON & GOTCH, LIMITED. Saturday, November 29, 1930