FULL DETAILS OF THE "NEW COIL" TWO AND THE P.W. "MONO-AMP" INSIDE

FURTHER SPECIAL FEATURES
CONCERNING VALVE AMPLIFIERS
By Capt. P. P. Eckersley, M.I.E.E.
DOWN AMONG THE TUBAS
By G. V. Dowding, Associate I.E.E.
HANDS OFF THE LICENCE MONEY
"The Most Efficient Choke We Have Tested"

The above letter is a further appreciation of the unique qualities of the Lewcos H.F. Choke. The fine materials and high-class workmanship used in its manufacture make it supreme. The terminals are arranged, one at the top and the other at the base of the Coil, to eliminate the risk of additional self-capacity in the wiring of the receiver. The H.F. Choke curves illustrated above show the astonishing performance and advantages of the Lewcos Choke over other makes.

Full particulars of the Choke Ref. R33, will be sent on request.

THE H.F. CHOKE IS SPECIFIED FOR THE "NEW COIL" TWO RECEIVER DESCRIBED IN THIS issue.

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Max. Anode Voltage - 150  Positive Screen Voltage - 75
$\text{*Anode Impedance (ohms)} 230,000  \text{*Amplification Factor } 200$
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$\text{*At anode volts 100; Screen Volts 75; Grid Volts Zero.}$

2-volt : P.M.12.  4-volt : P.M.14.  6-volt : P.M.16.

PRICE 20/- each.

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Mullard
THE MASTER VALVE

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Easy to Pack—Cheap to Post—Certain to Please

If you want a present that cannot fail to please any boy or girl, you cannot do better than to choose one of these famous Annuals. They are packed with the jolliest stories and pictures, and in addition to beautiful coloured plates most of them contain pages printed in colour. These books are strongly bound in brightly-coloured covers and are cheaper than the average toy and more durable. Books are the best gifts—easy to pack—cheap to post—and certain to please. Your news-agent or bookstall will be pleased to show you these famous Annuals.

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A big favourite with boys and girls from six to twelve years old. Full of amusing pictures, stories, and puzzles.

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incorporate components giving
100% unfailing efficiency throughout their long life

The last word in modern radio is—TELSEN! Why build your set of out-of-date components when TELSEN, up-to-the-minute in design and of superlative quality throughout, are far more efficient for every purpose?

TELSEN FIVE-PIN VALVE HOLDER.
Price 1½ each.

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Designed to cover the whole wave-band range, from 18 to 4,000 metres. Extremely low self-capacity, shrouded in Genuine Bakelite. Inductance 115,000 microhenries, resistance 400 ohms.
Price 2/6 each.

TELSEN "RADIOGRAND" TRANSFORMER.
New Model, shrouded in Genuine Bakelite, with new windings and core, fitted with earth terminal. Made in ratios 3-1 and 5-1.
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The ideal model for all Portable Sets and where space is limited. Made in ratios 3-1 and 5-1.
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Giving enormous amplification with perfect reproduction, shrouded in Genuine Bakelite with new windings and core, fitted with earth terminal.
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Shrouded in genuine Bakelite, made in capacities up to 0-003 u.F. Pro. Pat. No. 20287/30. 0-0003 supplied complete with Patent Grid Leak Clips to facilitate series or parallel connection. Can be mounted upright or flat. Tested on 500 volts.
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Don't miss your chance of getting this GREAT GIFT BOOK which every reader of the December "Wireless Constructor" receives.

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THE man who likes to "make his own" will find this book PACKED WITH FACTS!

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HOW TO BUILD:
THE "STABILISER"
THE "SIMPLICITY" CONE
A SHORT-WAVE ADAPTOR
AN OUTPUT FILTER
Etc., etc., etc.

PRESENTED WITH THE DECEMBER ISSUE OF THE WIRELESS CONSTRUCTOR OUT NOV. 15th. SIXPENCE USUAL PRICE
Take your H.T. L.T. and G.B. from the electric light with an
"EKCO" ‘BUILD-IN’ ALL-POWER UNIT

Here is the ideal All-Power Unit for set constructors. It is complete in itself and supplies H.T., L.T. and G.B. for A.C. Valves. There is no need for you to experience any difficulties in the construction or performance of an all-mains set. Having built the receiver, just connect the “EKCO” All-Power Unit and PLUG IN—THAT’S ALL. When you want to alter your receiver or build a new one there is no need to worry about the power supply portion—just transfer the “EKCO” Unit to the new set. Or, you can bring your present set right up-to-date and increase its sensitivity, volume and all-round performance by changing to A.C. Valves and using an “EKCO” Build-In All-Power Unit in place of the batteries and accumulator.

Save Time, Trouble, Worry and Money and enjoy better radio. See your dealer now or send for illustrated “EKCO” literature on Units of all types, Sets and Speakers and TERMS OF EASY PAYMENTS.

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.

THE NEW Cossor DETECTOR VALVE

DEFINITELY FREE FROM MICROPHONIC NOISES

THE PLAIN VAN.
A NEW AERIAL.
FOR THE DEAF.
MARS AGAIN!

"In a Plain Van."

Speaking as a householder I should say that the trend of radio is fast becoming Sheraton! The project of a new domestic receiver has given rise to all manner of doubtful and discussions, most of them fairly wide of the mark. "How will the shape of it fit it off with the angle which the whatnot makes with the fender?" "How will the colour of the wood harmonise with the lino and paint?" More and more ornate grow the "consoles" year by year; less and less is said about the set. The drawing-room suites will before long consist of settee, chairs and radio cabinet; the valves will be in pink or blue-frosted glass!

"E.L.; H. and C.; Screened Grids."

That is another glimpse into the future—an extract from a house-agent's advertisement. Radio may be diverted from the cabinet-maker and handed over to the builder, who will leave recesses and holes in the walls and ceilings, busy wires, sinks "earls", plates, provide aerials and poles and, if business is tight, throw in the set, the licence and a twelve months' "service" guarantee! And not long after that, the then existing generation will wonder how we managed to live without listening; as I often wonder how humanity could live without smoking tobacco.

New Type of Aerial.

From American sources I learn that a new type of aerial is being planned for the W.A.B.C. transmitter (50 kw.) which the Columbia Broadcasting System is to build at Wayne Township, N.J. There will be a 700-ft. steel tower, and the aerial wire will hang down inside its lattice-work. (Query: Won't the mast "screen" the aerial?) Of course, a vertical aerial is no novelty, but I do not recall any instance of the use of such by a broadcasting station. The novelty consists mainly of putting the aerial wire inside a steel construction.

B.B.C.'s BUILDING BEATEN BY BERLIN?

While the B.B.C. is going ahead with a big building in Portland Place, London, W., to replace the Savoy Hill headquarters, the Berlin radio authorities have finished their move to larger premises. Shaped like the bow of a ship, the building has the necessary office and studio room, a museum and extensive research laboratories. The photograph above was taken from the top of the Berlin Radio Tower.

Society Note.

The Hon. Sec. of the Golders Green and Hendon Radio Society informs me that the Society has moved its headquarters to Woodstock School, Golders Green Road, where its meetings will be held on the second and fourth Thursday of each month, at 8.15 p.m. The season's programme includes visits to Brookmans Park, the National Physical Laboratory, Croydon Air Port, and the Gramophone Co.'s factory at Hayes, and a series of dances will be held, the first of which is to take place on Nov. 21st. A few vacancies for membership exist, for which application should be made to the Hon. Sec. of the Society, 60, Pattison Road, N.W.2.

In Memoriam.

In passing I should like to record with regret the sudden and unexpected death last month of Mr. R. B. Weaver, aged 55, Manager of the G.E.C. Wireless Department. Mr. Weaver must have been known to hundreds of people connected with radio, and he was undoubtedly an outstanding figure in "the trade," for which he did much useful work.

A Tip For the Deal.

I have hit upon a story about a New Yorker who went to visit an old man whom he found to be so deaf that he could not hear his radio set unless it were worked at a deafening volume. Giving the ancient a small card made of celluloid, the visitor bade him take it between his teeth, turn the set down to a normal output, and listen again.

(Continued on next page.)
motor-equipped balloons into space? In a recent lecture to them, a Mr. Clyde Fitch, described as a wireless expert, is reported to have said that he is "theoretically possible to communicate with Mars or other planets by means of infra red light rays, which could pass through the Heaviside Layer.

Has Your-Battery Asthma?

The "Christian Science Monitor" tells of a new kind of dry battery, perfected by the National Carbon Company. This battery is provided with humps, or porous patches through which it can take oxygen from the air when its own oxygen-producing contents begin to fail. It is claimed that this type of battery has a "life" of 1,000 hours on a 7-volt set. Hurrah! Let's have a couple! It is said that the supply at 2 Volts will work only on certain 2-volt current stations. Now that my little son is learning physics, I find that my dry cells have wings.

The Dog and the Dance.

This is a true story. A friend told me that a few weeks ago he was sitting by the fire with his wife, listening-in. The dog lay between them on the hearth, fast asleep with his legs stretched stiffly out, as in his custom. Jack Payne's dance band was tuned in, and presently he noticed the dog was twitching its legs with the rhythm of the music. The symptoms intensified and so violent did the jerks of the legs become that my friend had to wake up the dog. What is the explanation?

A Short-Wave Club.

Now, listening-boys! We are informed that an International Short-Wave Radio League has been constituted, with headquarters in Boston, Mass., U.S.A. It is not a non-commercial project, formed solely for the help of radio enthusiasts. A European branch exists at Westminster Chambers, 106, Lloyd's Street, London, to whom you should address your enquiries, if any. Membership costs 4s. per annum, and entitles members to the League's official bulletin, "International Short-Wave News."

Powers Compared.

PHILIPS have been working out the total amount of electrical power used for broadcasting in various countries of Europe. I don't see that the result is much more than a curio, but here it is: Germany comes first, very near alike, with 533 kw., followed by England with 470 kw. I presume they mean all the B.B.C.'s stations including 5 S.W. Next comes Russia, with the surprisingly modest total of 225 kilowith watt'ski, followed by Sweden, 189 kw., and Czechoslovakia, 107 kw. France has only 64 kw., but I do not think she need worry too much about that.

Canadian Statistics.

The responsible department of the Canadian Government reports that the number of radio receivers licensed during the year ending March 31st, 1930, was 424,164, which compares happily with the 396,756 issued during the previous year. Moreover, the first five months of the current year they have issued 349,676, a fine increase. Other points of interest in the report arc that 12,609 transmitting stations were established, including 81 private commercial broadcasting stations and 610 amateur experimental stations.

A Drilling Tip.

"Keep your eye on the Sergeant-Major's!" No, I was forgetting. I mean drilling with a drill—not with a man-eater. Mr. S. A. W. (Manchester) kindly passes on his method of drilling a hole down a spindle for a condenser bearing, without tears, etc. His diagram shows that first of all he puts on the spindle an iron nut, which he screws down just so far as to permit a second and locking nut to come up to it and then leave the to-be-drilled surface of the spindle well in sight. This arrangement assists one to guide the drill. Do you get the idea? Very difficult to translate a drawing into prose!

More From Manchester.

Another reader from the London of the passing of Mr. J. K., first tries to amuse me with nice words about Notes and News (he wants 12 pages of "em, Heaven forbid!) and then calmly drops his blazonry in the middle of the question whether the stream of electrons from a filament could be controlled at its source. He thinks that it could be done by coupling the aerial to the filament through chokes. Well, isn't that roughly Mr. Dowding's "thing"? Well, I'm not so sure:

"Listening-in to Icebergs," says a head-line. "Many of the long-entitled 'white-browed' broadcasters"—"Pictorial Weekly."

BRITAIN CALLING.

To encourage a "Come to Britain" movement, At the request of the International powers, sixty spots are to be broadcast in U.S.A. this winter, we read in a University Chronicle. "Two hundred and fifty talks! Well, that should encourage the U.S.A." movement, anyway.

ONE VIRTUE.

It has been calculated that physical exercise should broadcast each morning. This would probably give us a little more strength to stand the evening programmes.

"... Then there was the Scoutman who asked the dealer method of removing his valve seat of the electric street lamp outside his house. ..." Daily Mail.

Halloworth Park. "Harri" adapted for the Microphones; much a headline in the Manchester Evening Chronicle.

Brown: "Scientists say that in a hundred years people will be able to pick up the wireless programme which are being broadcast now." Do you think they will?"

Smith: "They might—once." "Humorist."

A correspondent writer to say that he has received a form giving the transmitter, licence-plates, L.F., its speech on continuously, and nothing no doubt will be any effect. Having seen the P.O. direction-finding van referred to in Notes and News, he wonders if those officials would help him eliminate the trouble!

Welcome to London.

One note with satisfaction that Mr. Joseph Lewis, who held the post of Music Director at Birmingham for seven years, has been transferred to Savoy Hill where, in addition to being one of the conductors of the B.B.C. Orchestra, he will have a good deal to do with the programme building on the musical side. Ha! (said he, rubbing his hands together) this will compensate somewhat for the loss of John Ansell! As Mr. Lewis was formerly assistant conductor of the City of Birmingham Orchestra under Adrian Boult, who is now the B.B.C.'s Music Director, London is in luck's way.

The U.I. de R.

The Union Internationale de Radio-diffusion, which works at Geneva under the secretaryship of Mr. Burrows, the "Uncle Arthur" of yesterday, has recently concluded a Conference at Budapest. The two most interesting bits of news about all this is that the Union is doing its best to encourage international broadcasts during the coming winter, and is taking steps to facilitate the use abroad of tourists' receiving sets.

Appulse Wanted.

I see that Uncle Henson complains that for the artists there is no satisfaction at all attached to broadcasting." Mm! Well, I'm not so sure: £ s. 6d. is fairly satisfactory stuff! And although we know that all great artists are not alone (sob) we know also that a great many of them have to receive a lot of money to help them to live. Leslie think that a gadget blassing to broadcasters would be a "gadget which would record votes of success or failure." Also the thing is physically impossible.
THE PARTS YOU NEED
TO BUILD IT.
1 Panel, 12 in. x 7 or 8 in. (Red Seal, or Lissen, Goltone, Paxolin, etc.).
2 Cabinet, with baseboard 9 in. deep, to fit (Pickett, or Cameco, Osborn, Keystone, etc.).
3 0.00075 mfd. variable condenser (Lotus, or Lissen, J.B., Igranic, Dubilier, Ready Radio, Formo, Polar, Ormond, etc.).
4 Slow-motion dial (Igranic, or Lissen, Ready Radio, J.B., Formo, etc.).
5 Cabinet, with baseboard 9 in. (Red Seal, or Lissen, Goltone, Paxolin, etc.).
6 Sprung valve holders (Igranic, or W.B., Dubilier, or W.B., etc.).
7 2-meg leak and holder (Igranic, or Lissen, Goltone, Lotus, Dubilier, Ready Radio, Polar, Wearite, Mozart, Lumiglass, Formo, etc.).
8 Slow-motion type (Igranic, or Lissen, Ready Radio, Formo, etc.).
9 3-contact switch (Bulgin, Wearite, Ready Radio, Fowerite, Ready Radio, Red Diamond, Pioneer, etc.).
10 0.00075-mfd. "Brookman" condenser (Ready Radio).
11 0.001-0.0015-mfd. differential reaation condenser (J.B., or Lissen, Igranic, Ready Radio, Polar, Wearite, Mozart, Lumiglass, Formo, etc.).
12 0.0003-mfd. fixed condenser (Mullard, or Lissen, Igranic, etc.).
13 0.001-mfd. fixed condenser (T.C.C., or Lissen, Igranic, etc.).
14 " P.W." dual range coil unit (Wearite, or Ready Radio, Pioneer, Magnun, etc.).
15 3-contact switch (Bulgin, Wearite, Ready Radio, Pioneer, Magnun, etc.).
16 L.T. switch (Junit, or Igranic, Lissen, Goltone, Lotus, Benjamin, Mugnum, Bulgin, Wearite, Ready Radio, Red Diamond, Pioneer, etc.).
17 " P.W." dual range coil (Wearite, or Magnun, Keystone, Wearite, Ready Radio, Formo, etc.).
18 0.001-mfd. fixed condenser (T.C.C., or Dubilier, Lissen, Ediswan, Ready Radio, Formo, etc.).
19 " P.W." dual range coil unit (Wearite, or Magnun, Keystone, Wearite, Ready Radio, Polar, Formo, etc.).
20 0.00075-1.6 mfd. "Brookman" condenser (Ready Radio).
21 " P.W." dual range coil unit (Wearite, or Magnun, Keystone, Wearite, Ready Radio, Polar, Formo, etc.).
22 Terminals (Eelex, or Igranic, Formo, etc.).
23 Terminal strip, 12 in. x 2 in. (Formo, etc.).
24 Flex, wire, plugs, screws, etc.

WHEN you find a good thing, stick to it, may be a good enough motto in its way, but it doesn't appeal to the " P.W." Research Dept. Our idea is always to give away anything good as quickly as possible!

Our new high-efficiency coil, for example. As fast as we work out a fresh use for it we embody it in a set design to suit, and pass it over to our readers. Even now we have not come to the end of its possible applications, and we've been working at them for nearly six months.

"Amazing"
That is one of the most fascinating things about the " P.W." dual-range coil unit. Not merely does it set a new standard of higher efficiency, but it has been so carefully worked out in its details that it can be applied to an amazing variety of different circuits.

IT SETS A HIGH STANDARD

AS NEAT AS IT IS NEW

As a matter of fact it would be really difficult to pick out a circuit of modern type in which the coil could not be used! (What about a short-wave set, did somebody say? Have a heart! We are talking about broadcast circuits. Anyway, you wait and see what's coming out shortly in the way of a universal-wave set using the new coil!)

A Testimonial
You have already seen how nicely the coil lends itself to circuits of the "Contra-dyne" type, and that, in itself, is a fine testimonial to the unit, for the "Contra-dyne" had

(Continued on next page.)
not been thought of when the coil was designed. This week we are presenting a design which has been prepared specially to show how beautifully simple and easily built an ordinary standard set becomes when advantage is taken of the new coil.

“Most Pleading to Handle”
For the purpose we have chosen the popular two-valve combination of detector and one low-frequency stage. It doesn’t sound very exciting put like that, perhaps, but with the aid of the new coil it becomes something pretty good, all the same.

Its general efficiency naturally goes up a lot, with a really substantial increase in selectivity and range, and it makes a thoroughly attractive little outfit in every way.

It is delightfully straightforward to assemble and wire, and it is most pleasing to handle. It gives you wave-change switching without the slightest complication of wiring, and with the highest efficiency; the losses many people used to think unavoidable in wave-change circuits are cut right down to vanishing point.

Versatility
On top of all that, it is a very economical set to build and run. Comparatively few parts are needed, and they are all of types you can be certain of using over and over again in future sets.

It begins to sound attractive, doesn’t it?

A TWO-VALVER
THAT IS REALLY
SELECTIVE
It will give very fine results, too, and even put quite a few foreigners on the loud speaker after dark so long as anything like a decent aerial is available. The local programme, of course, it will reproduce on the speaker with excellent volume and quality, without using reaction at all.

On Long Waves
Although we have spoken of it as a standard and simple type of set it has got quite a few nice little special features of its own. For example, it has a very handy and effective device for adjusting the selectivity, placed conveniently to hand on the panel.

It has a special form of aerial coupling on long waves, too, which has many

(Continued on next page.)
THE "NEW COIL" TWO.

(Continued from previous page.)

advantages. For one thing, it gives particularly good volume and selectivity (the set separates Radio Paris from 5 X X quite easily), and for another it greatly reduces the risk of interference from the local station on long waves.

This last is important. You will observe that we have not included the "Contradyne" device in the "New Coil" Two, because it is only needed with a set of this type when you are really close to the local station. The form of "Brookmans" coupling we have provided for long waves will prevent the trouble in all other situations.

Of course, if you want to use the set very near to a powerful local station and expect to have trouble from the local programme "breaking through" on long waves, the remedy is simple: Just add the "Contradyne" as a separate unit. (See Popular Wireless Nos. 434 and 438.)

The "Brookmans" Effect

Now suppose we run briefly over the circuit diagram, and see how this interesting little receiver is arranged.

The general layout of the tuning and reaction circuits you will be able to follow out quite easily, for they are very simple. Note the way the windings on the dual-range coil unit which form the tuned circuit are switched in parallel for the lower wave-band, for much of the efficiency of the unit depends on this expedient.

These are the windings which are both joined at their upper ends to terminal "G," and go to S, and S, at their lower ends. The wave-change switch puts them in parallel when it is closed, and at the same time short-circuits the .001-mf condenser.

This last provides the "Brookmans" aerial coupling effect, which of course is only wanted on long waves. Accordingly, it is cut out on low waves, where the necessary aerial coupling is given by the primary winding between terminals A and S on the coil unit.

Easy Control of Selectivity

The selectivity control which we mentioned just now takes the form of a variable condenser of the inexpensive "solid dielectric" type in series in the aerial lead.

ALL ON THE PANEL

The whole of the few necessary controls, including the wave-change switch, are on the panel.

This is of .0075-mf maximum capacity, and you will see it in series in the lead between the aerial and the A terminal on the coil unit.

The idea here is to keep the condenser at maximum capacity (moving plates fully engaging with fixed), when you can, and only reduce it when you want exceptional selectivity. By setting it to a comparatively small value and applying reaction judiciously you can get quite remarkable selectivity when required.

It is generally best, however, to keep it at rather larger settings if you can do so without getting too much interference from the local. Volume is usually best this way, and there is less need of an accurate setting of reaction to get sufficient strength.

The rest of the circuit is quite plain sailing, and you will note the differential reaction (now standardized for all "P.W." sets to which it can suitably be applied), and the transformer-coupled stage of L.F. amplification.

Since this is an eminently suitable design for the beginner as well as the more experienced set-builder perhaps a few constructional notes will be welcome.

Panel Drilling

The first step is to mark out the panel for drilling, and here you should refer to the special diagram on this page. You will want a ruler and a sharp pointed instrument, such as a "scribe," for the marking out process.

Since your various lines will be in the form of scratches on the surface of the panel the marks should be made on the back thereof. The diagram shows the panel from the front, but this need not affect the marking out.

(Continued on page 409.)

AND IT IS EASY AND INEXPENSIVE TO BUILD

We feel sure that this "New Coil" Two is just the very set many constructors have been waiting for—it is full of good points, and there are no "snags." Undoubtedly it is one of the very best receivers ever designed by the "P.W." Research Dept., and that is saying something!
**HANDS OFF THE LICENCE MONEY!**

The suggestion is being made that some of the B.B.C. profits should be allotted by the Government to establish a National Theatre.

By THE EDITOR.

The huge revenue from listeners' licence fees is, in part, spent on broadcasting. The revenue from broadcasting licence fees was intended by the Post Office and the Treasury—to make a tempting bait for certain kinds of enthusiasts who want various artistic enterprises harked by plenty of cash and the adjectival qualification of "national." The other day the suggestion that a portion of the profits made by the B.B.C. should be allotted by the Government for the purpose of establishing a national theatre was made by Mr. Harley Granville-Barker at the annual conference of the British Drama League at Exeter.

Mr. Granville-Barker, who is very well known as an author of dramatic plays, said that revenue from B.B.C. funds might be allotted by the Government to be used, first, as a credit for the establishment of a national theatre, and after, as it might be needed, as a sufficient yearly endowment for its support.

Only a Million!

In other words, if the national theatre did not pay its way—and it probably wouldn't—it would be subsidised. The same idea has already occurred to promoters of "national" opera.

"I think there is much to be said in favour of such a scheme," said Mr. Barker. "A credit of about £1,000,000, would be needed to meet the cost of a national theatre, but I do not think it practicable to raise a credit of that amount by private subscription. I think that, in some form or another, we must use public money, and I want official approval for the scheme. Yet I do not see any Chancellor of the Exchequer of our time nakedly putting the profits made by the B.B.C. should be used in support of the arts. There, at any rate, is a means of finance for a national theatre. At the moment, however, that is not practicable, but I do not see why all three political parties might not be asked to agree upon that scheme in principle here and now.

Let the Theatre Do It.

"There is ample precedent for allocating money in a particular way for a particular purpose. There is, for instance, the Road Fund. As soon as a Chancellor of the Exchequer is able to turn round and take breath, I think those B.B.C. profits might be ear-marked for the support of the National Theatre. A credit of about £1,000,000, would be needed, as a sufficient yearly endowment for its support.

The argument is poor. The Road Fund was definitely "raided" and certainly not for some artistic scheme which could not pay its own way. The raid on the Road Fund, although outrageous enough, was at least for the benefit of all classes of the community. One might say with some justice that the raid was made because of a National Emergency. Whether that emergency ought to have arisen is beside the point, fine arts, and especially for those of music and the drama. The best means of assuring such a step being taken is to educate public opinion.

"Whiff of Audacity."

"The Trust Fund of £100,000, held by the National Theatre Executive, is also available. We are meeting to consider the position in the light of much public approval of the project of a national theatre. A national theatre would rally the thoughts, stimulate the will and cheer up the spirits. Any Government with a whiff of audacity would concentrate on its promotion."

For Those November Fogs!

This newly-invented "Navigational Compass" is for use by ships in fog, and is sensitive to sound waves and warning signals.

Popular Wireless, November 15th, 1930.

There is no "emergency," about a national theatre. The idea is chiefly backed by theatre people themselves. There has been no sign of a widespread desire on the part of the public to have a national theatre at all costs. If the theatre wants a national home, let it put the money itself. It can afford it.

Luckily, Mr. Barker's scheme stands no chance; licence money from listeners will not be spent that way. Mr. Barker's speech was followed by one made by another well-known personality in the theatre world—Mr. Alec L. Rea, of "Brandon's" fame. Mr. Rea has produced many fine plays, especially at the St. Martin's Theatre, London.

A Form of Robbery.

He asked why a poor person who contributed his 10s. a year for his wireless set should be robbed for a national theatre. The Road Fund was raised for the benefit of people who used the roads. The B.B.C. funds should be used for benefiting people who used the wireless.

Mr. Holford Knight, M.P., a member of the National Theatre Executive Committee, has stated that Mr. Barker's suggestion is already before the Government.

The suggestion of a grant from the B.B.C. surplus towards the maintenance of a national theatre," Mr. Holford Knight is reported to have said, "was an integral part of the official scheme placed before the Government at the request of the Prime Minister some months ago. It was thought that such allocation might be fittingly made in respect of additional services the B.B.C. licence holders would receive."

Listeners' Union Required.

Listeners really ought to have a Union, or some protective organisation which would make it its business to see that the revenue from broadcasting licence fees was spent on broadcasting.

But Mr. Barker has his own ideas about broadcasting:

"The B.B.C. money is in a slightly different category," he says. "It is in the nature of a profit made by a corporation working under Government monopoly, and it is earned partly by exploiting the arts of the drama and music. It would be appropriate, naturally, that money earned in such a way should be used in support of the arts. There, at any rate, is a means of finance for a national theatre. At the moment, however, that is not practicable, but I do not see why all three political parties might not be asked to agree upon that scheme in principle here and now."
WE think very much in frequencies these days. From the aerial, where the subject of side-band snipping is of interest, right through to the loudspeaker, it is "high-note loss," "low note cut-off," and so on and so on, all the time.

Does it show that we are becoming musically minded? I don’t think so. I feel that "frequencies" have us in their academic grip, and that there is a very real danger that we shall forget their real significance unless we start looking at the audio-frequency range in the proper way.

By this I mean that we ought to take stock of our frequencies every time we deal with them, and line them up with reality—the musical notes or partials they may stand for.

With this sort of idea vaguely floating in my mind, I recently spent an evening glancing through some modern textbooks on radio—some elementary, and some of a definitely advanced character.

"Frequencies" All were literally studded with the word "frequency," and that was only to be expected, for it stands for one of the most ubiquitous of electrical factors. But not in one instance did I see a "piano scale" or any reference to definite musical notes as produced by various instruments.

The desirability of making an amplifier that would deal with all audio frequencies from, say, 30 to 5,000 cycles, was stressed "in general" by numerous authorities, and methods of design were elaborately dealt with; but I am certain many others of their readers must also have been left with the impression that that sort of thing is a rather hazy ideal.

What Those "Cycles" Mean With a view to making the matter a little clearer for at least some of my readers, I am going to devote this article to an attempt to explain why it is desirable to aim at apparatus that will deal as well with 50, 60, or 70 cycles as with frequencies running into many thousands.

The pitch of a note is determined by its frequency, i.e. the number of vibrations per second. Thus, when you strike middle C on the piano it sends out 256 vibrations of air per second.

The next C above middle C has double the frequency (512), and at each succeeding octave the frequency is again doubled. The next C below middle C on the piano has a frequency of 128, which is exactly half. Each octave gives you double the frequency as you ascend the scale and half the frequency as you descend the scale.

From the point of view of radio reception, I am of the opinion that that area lying between the first and second C’s below middle C comprises one of the most vital bunches of frequencies in the whole gamut. And, curiously enough, the technical term for the notes found in it is the Great Octave.

64 to 128 The actual frequencies run from 64 to 128. If you know anything at all of the deficiencies of radio gear you will realise that "cut-offs" abound in this neighbourhood. It is a good L.F. transformer that doesn’t start to tail off badly before you reach 64 cycles, and it is a better loud speaker that doesn’t fade right out at about 76.

And, in any case, as has been pointed out (Continued on next page).
DOWN AMONG THE TUBAS

(Continued from previous page)

out on many previous occasions, you want considerable power to get these lower frequencies over. Tens of thousands as much electrical energy is needed to give the same proportion of loudness to a 64-cycle note as is necessary for one of two or three thousand.

A super-power valve properly used in conjunction with a first-class amplifier is essential to preserve a fairly decent balance of low notes.

But let us see what that 64-128 frequency band has to deal with, and then the figures will become more real to you, and you will see what you may miss if you don’t give them their proper treatment.

Surprising Facts.

The piano continues down below the Great Octave for over a further octave, so that it touches the agencies in the neighborhood of 27. Nevertheless, those very low notes do not figure very frequently in music. “Sonny Boy” may have struck the very lowest chords of cheap sentimentalism, but its piano score reveals that it seldom wanders below the Great Octave, and when it does, only to the extent of a cycle or two. Given gear able to render a frequency of 60 moderately good treatment, and the piano, accompaniment of “Sonny Boy” would get through admirably in regard to the bass. Most popular modern music for the piano stops short at the Great Octave.

The classics, on the other hand, delve far deeper. Chopin’s Preludes frequently hit the piano, you will realise that the player’s left hand has plenty of work to do darting about the 64-128 band, whatever kind of music he is playing, from fox trots to foundations of music. Many organs have notes going down to as low as 16 cycles, but a whole horde of instruments leave off at about 120 and even higher than that. Nevertheless, almost any type of band would lose a very great deal indeed if it were cut off at any figure like that.

IT CAN DO SIXTY!

The saxophone, or bassoon, can produce a sound having a frequency of 60 cycles.

The cello takes in the whole of the Great Octave (64 to 128 cycles) and, among the woodwind, so does the jolly old bassoon. But it is in the brass that you get the real bass stuff. For instance, the French horn, which is widely used both in orchestras and bands, rumbles happily away four or five tones below that 64 cycle C.

And what about the euphonium? That goes pretty low, but there are other tubas, as this tribe of growlers is known, that shiver the floor at even 32 cycles and lower.

MORE POWER NEEDED FOR THE BASS

Double-basses are outliers in notes. You can see two of them above at the extreme right, compare their dimensions with those of the ordinary violin. Low notes want much more power in order to retain their comparative strength.

Of course, Mendelssohn with his light and airy things, such as the “Bees’ Wedding,” wanders about rather higher up on the keyboard and in this particular case doesn’t touch upon many notes having frequencies lower than about 100. However, with his famous “Spring Song,” he flutters down to 68 and even a wee bit lower now and then. You can’t always tell, without concentration and experience, exactly where the “body” of a piano solo lies in terms of frequency. For you get composers who play on resounding chords within the Great Octave, such as Wagner with his “Pilgrims’ Chorus” (Tannhauser), and achieve what sounds like robust 40-cycle stuff without going below 64—which is higher than the lowest level of the delicate “Spring Song.”

But if you know anything at all about the piano, you will realise that the player’s left hand has plenty of work to do darting about the 64-128 band, whatever kind of music he is playing, from fox trots to foundations of music. Many organs have notes going down to as low as 16 cycles, but a whole horde of instruments leave off at about 120 and even higher than that. Nevertheless, almost any type of band would lose a very great deal indeed if it were cut off at any figure like that.

The above-mentioned double bassoon plays notes a whole octave lower than the notes written for it—the saxophone and the bassoon scoring. The saxophones are all of a transposing character, and the “bass in B flat” actually gives you two octaves and one-half. The written notes—reaching a frequency of about 48.

“Transposing” the Parts.

It is interesting to note the reason why instruments should be made to play notes of frequencies other than those written for them. An orchestration shows the saxophone parts, or even more so, the bassoon parts, that matter, written in the ordinary clef.

It is obvious that by the use of transposing instruments the scores can be greatly compacted. Thus the “Bass in B flat” saxophone often “doubled” by the “Tenor in B flat,” and the “Baritone in E flat” by the “ Alto in E flat.” Such pairs follow exactly the same written notes, but the actual notes from such are separated by exactly one octave.

In the percussion class of instruments you find the grand old bass drum, and this is the thing you see the “ecorkey merchants’!” in dance bands playing partly by means of foot pedals. But everybody does at least know that drums call for pretty low frequencies—at least, drums of the above class.

Finally, and most important of all, it must not be forgotten that the human voice is often to be found wandering in the Great Octave, especially when deep-voiced announcers are at work.

If you “cut right off” at 120 cycles, it doesn’t mean that you do not hear any of these instruments I have been talking about. Many of their notes will be higher than that, while those that are lower will get through as thin harmonic ghosts of their original selves. You see, I have been talking about the fundamental frequencies of notes. You must remember that no musical note from any instrument is composed of only the one frequency. It will be made up of the main frequency, or fundamental, and a family of higher frequencies, which are known as harmonics, and it is these that give it individual character.

“AMERE TRAVELY”.

Sometimes the harmonics, or at least some of them, are more powerful than the fundamentals in the ordinary course of events. But if you nip off the fundamental from any note you still have the harmonics to carry on with. The practical result is that you change the character of the notes.

Instead of hearing the complete full-toned structure, you get a thin, reedy, high-pitched tr west of an ordinary note, you are handed a nasty little rattle that sounds like a cocoa-tin being tapped.

But now I must stop, although I could continue this very interesting topic for a long time. Perhaps on a future occasion I shall be able to take the other end of the scale and discuss the high notes and harmonies in the same sort of way.
ONE of the most interesting jobs of work that has come my way since I resigned from the B.R.C. is the answering of technical queries in Popular Wireless. Recently I got a query which deserves an article or two to explain the full answer.

So I hope to appeal to those who design their own sets by a series of articles which attempt to outline and explain the general theory of the valve.

It's such a pity that, for want of a little guidance, so many "amateurs" make just that boss shot which ever afterwards leaves them dissatisfied and "fiddling." They get things right in the end and they may have great fun testing, and sometimes the results achieved surpass those obtained by the theoretician, who forgets that some theory fails to go deep enough.

The "Touch" of Genius.

I want to appeal to those whose theory may not be very sound but who have a great and often unsurpassed "touch." People sometimes just know that 50,000 ohms ought to go there. People sometimes go astray.

I was recently asked by one who was acting for those who wanted to commercialise my reputation to write something about valves for the general buying public.

IT JUST CHANGES!

**Our Radio Consultant-in-Chief is going to outline the general theory of the valve in an exclusive series of "P.W." articles. Read this first one, and we are sure you will make a special point of ordering "P.W." so that you do not miss the others.**

(1.) THE VALVE'S MAIN TASK.

This is about what I wrote. It was not published. I said, in effect, that when a valve manufacturer indicates by his advertisement that the replacing of an existing valve by one that he wishes to sell will immediately change everything and bring the purest quality, the knife-edge selectivity, the winning sensitivity, that all of us so much desire, he is, shall we say, guilty of the revelation of a half truth. Because something may change, something may not.

Dealers often find when replacing a "detector" valve of 1,000-ohms impedance and a mag. factor 1.01 which happened to be handy, by one meant to work as a detector, that there is a considerable improvement. But even then swapping the power output valve with the first H.F. is more or less a special point of ordering "P.W." articles.

So that one valve is better than or worse than another not on a casual comparison on any old circuit which suits one better than another, but on qualities such as straightness of characteristic, consistency to the specification, continued stability of performance, long life, reasonable first cost, and economy in consumption (for battery sets).

But I do seriously try and reinforce this point—that it's not just a valve, it's the valve for a job. And it's not only just a valve for a job, it's a valve and associated circuit for a job.

The way to look at a valve, in my opinion, is to consider it always as a generator like any A.C. generator at a power station but having the peculiarities of a high internal resistance and a relatively small power output compared with Turbo Alternators, but a flexibility which allows an output at any frequency.

This generator is not, mark you, a magnifier; really, it's a converter. Thus all the so-called magnification, voltage or power, is really only conversion of the high- and low-tension energy into another form. The valve does not magnify energy because—like taking one pill three times a day, you can't do that.

Impedance Importance.

Consider the valve of Fig. 1 (a). Suppose we change the grid potential. More or less current flows from the high tension. But in Fig. 1 (a) we can't get hold of this current change to do anything about it. The current just changes, that is all, but assuming a good high-tension supply no volts change is manifest in the anode circuit.

It's only when we include some form of impedance in the anode that changes of grid volts are appreciable as changes of anode volts.

It is not difficult, by applying Ohm's Law and the general principles of the valve, to work out what voltage change occurs at the anode, given the mag. factor of the valve, the impedance of the valve (so sometimes called), and the impedance of Za. Fig 1 (b).

Next week we go on to study the simple diagram which anyone with a little trouble can understand and which should be of immeasurable value to those who will understand it.
THE experiment, which it is hoped will strengthen the Vaudeville programmes from London, namely the inclusion of four regular artists, for whom special material will be written for each performance, is to be put into operation earlier than was originally intended.

Instead of waiting for the New Year, it will now be started for the National Vaudeville programme on Monday, November 24th, when these "repertory" artists, who are to be known as "The Players," will link up the performances of other artists (engaged in the ordinary way for single shows), by singing choruses, announcing the "turns" and will attempt in various other ways to get "pep" and continuity into the entertainment.

An Interesting Experiment.

Listeners will watch this experiment with considerable interest, especially as the "star" artists engaged for the opening "bill" include Clapham and Dwyer (after a long absence from microphone work), Teddy Brown, Ronald Frankan, and Ross and Sargent.

Relays from the stage of the Palladium, which have been somewhat few of late, will also be included more frequently in the Vaudeville programmes this winter. One is down for Thursday, November 20th.

Vaudeville entertainments from the studio are fixed for Monday, November 17th (National), and Saturday, November 22nd (London Regional), in each of which a series of "cartoons" of well-known actors and actresses will be introduced by Elizabeth Pollock, one of the microphone discoveries of the year. These "cartoons" will seek to portray the stage and private lives of their subjects.

Mayoral Ideas.

The Lord Mayor of Bristol and the Mayors of Bath, Gloucester, Wells, Taunton and Bridgewater, have been invited to select their favourite musical numbers for a programme of "Old Favourites" which Cardiff is broadcasting for West Regional listeners on Thursday, November 27th.

A similar concert was organised last year, when among those invited to select a song was the oldest inhabitant of Bristol, a lady in her 104th year. Her choice was "The Cottage by the Sea," the music for which could not, unfortunately, be obtained, so the third choice, "Sweet Belle Mahone," was broadcast.

Operatic Developments.

The present series of studio operas, which has been going since September, 1929, during which time operas have been broadcast at the rate of about one a month, concludes with a performance of "Pelléas and Molisande," on November 18th and 19th, for London Regional and National listeners respectively.

It will not be long before a very interesting announcement is made by the B.B.C. on the subject of how opera in future is to be developed. There is reason to believe that Savoy Hill is now completing a real and permanent amalgamation of all the big operatic enterprises of the country.

A "K.K.K." Club Programme.

The Cardiff "K.K.K." (Kardomah Koff Klub), the President of which is the new Lord Mayor (Aldermer R. G. H. Snook), and whose members include an M.P., several city councillors, clergymen, magistrates and journalists, are arranging a programme for West Regional listeners on Tuesday, November 25th

The "K.K.K." meets every morning at eleven o'clock for "Koffee," and every member's birthday and such events as silver weddings are celebrated by permitting him to pay for the coffee of all present. The club also entertains distinguished visitors to Cardiff and assists charitable institutions.

FOR THE LISTENER.

By "PHILEMOM.

A critical survey of some of the recent programmes, with frank comments on the fare provided and the way it is served up.

Einstein.

"HEALTH, length of days, to the greatest of our contemporaries—Einstein!"

In these words, and after a brilliantly witty speech, Bernard Shaw proposed the health of the famous German scientist. Einstein is a German. It was afterwards translated.

It didn't seem to matter much then.

As he spoke, his voice was recorded for Russia.

The gentleman from the Soviet Embassy, whose name I regret I did not hear clearly.

Popular Wireless, November 15th, 1930.
SEE the curve of this new Lissen Torex Transformer. Notice the remarkably even amplification it reveals—almost a straight line over the whole band of audible frequencies. This is the sort of curve you expect from an expensive transformer—yet Lissen have achieved it in a transformer to sell at 5/6.

This Lissen Torex Transformer is a neat, compact component, in a moulded bakelite case which is hermetically sealed and completely insulates the windings. It is proof against shorting, leakage and moisture.

The ratio is 3 to 1. So the Lissen Torex is a general-purpose Transformer which you can use in many different circuits. It is particularly suitable for use in an anode resistance feed circuit and gives splendid results. Test it out in your next "hook-up"—get a Lissen Torex Transformer from your dealer. Price 5/6.

LISSEN LIMITED, WORPLE ROAD, ISLEWORTH, Middlesex.
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 coal changes have declared it absolutely unique. Over fifty stations have been obtained on loud speaker with aerial 20 feet high, using cheap valves, including Cardito, Paris, Madrid, Manchester, Stuttgart, Toulouse, Hamburg, Glasgow, Frankfurt, Rome, Langenberg, Berlin, Brussels, Hilversum, Kalambug, Konigswauterhau, Radio Paris. These were obtained 3 miles from Daventry while 5 G B 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. Test Points, 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 wave trap and obtained under favorable conditions a large number of Continental Stations at loud speaker strength, including Toulouse, Brussels, Budapest, Konigswauterhau, and Radio Paris. At less than half the price of a high-grade portable set, it is acknowledged as superior in selectivity to any 2 valve sets on the market. In order that what marvelous results can be obtained the set was placed between two aerials at the entrance of the Buckingham Park, and the two stations were easily separated. The set was also taken on 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 Blue Print, 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.

THE NORTHAMPTON PLATING CO., SUPER A.C. ELIMINATOR.

SPECIAL OFFER. 7 days approval to test. This A.C. eliminator value 8/6 can be sent to any address on payment of 50/- 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 refunded. The 7 days is inserted in order to test the condition and undamaged. It is guaranteed to be the most silent in operation giving over 20 millionamperes. Suitable for all 3, 4 and 5 valve sets. Test it for yourself. Trade inquiries invited.

NEW CYCLE BARGAINS.

GREATERT RADIO SENSATION

NEW 3-VALVE SET OBTAINS OVER 50 STATIONS ON LOUD SPEAKER WITH DAVENTRY 5 G B 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 coal changes have declared it absolutely unique. Over fifty stations have been obtained on loud speaker with aerial 20 feet high, using cheap valves, including Cardito, Paris, Madrid, Manchester, Stuttgart, Toulouse, Hamburg, Glasgow, Frankfurt, Rome, Langenberg, Berlin, Brussels, Hilversum, Kalambug, Konigswauterhau, Radio Paris. These were obtained 3 miles from Daventry while 5 G B 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.

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TRADE SERVICE AGENTS WANTED.

THE NORTHAMPTON PLATING CO., SUPER A.C. ELIMINATOR.
In response to many requests from readers we are giving below the details of a really first-class one-valve amplifier. It can use the same batteries as your set, is easy to make, and will boost up your programme strength for real loud-speaker reception. Designed and Described by The "P.W." RESEARCH AND CONSTRUCTION DEPARTMENT.

It's not too easy nowadays to think out a design for anything so simple as a single valve low-frequency amplifier which shall be a bit novel and interesting. All the same, there is at least one neat little idea which will be new to most in the amplifier you see on this page. Besides this, you will find it is an attractive little instrument in all sorts of ways, and it is based on the very best modern practice in spite of its very simple nature.

What it will do.

Before we say any more about it let us just tell you what it is intended to do, so that you may decide whether it is the right unit for the job you have in mind. It is meant for use with sets which already have only one L.F. stage or none at all.

If you connect it up to such a receiver it will bring any signals which previously were fairly good 'phone strength right up to loud-speaker volume. Signals which before were just about good enough for the speaker will now be up to very full volume indeed, and will probably need to be toned down a bit.

The amplifier should not be used with sets which already have two L.F. valves at work; it would be better in such cases to add a stage of H.F. amplification, rather than yet another of low frequency.

The amplifier would not be of much use with a crystal set (you really want two stages for that purpose), but in all other circumstances you will find it a most valuable little adjunct to an existing set. It provides a very easy method of enlarging your present outfit in the most economical manner.

In making the enlargement, too, it adds some very useful little refinements. For example, it provides a proper volume control to adjust the amount your power valve will handle without over-loading. That is more important than many people realize, for over-loading is responsible for a great deal of the distortion for which loud speakers and sets get the blame. With reasonably powerful amplifying circuits it is perfectly easy to overload even a super-power valve on the local station, and so long as that is happening it is quite out of the question to expect good quality.

Another worth-while refinement which it gives you is an output filter for the loud speaker. This is always rather desirable when a super-power valve is used, and of course it is absolutely essential for safety reasons (among others) if you get your H.T. from the mains.

A Valuable Feature.

The special novel feature of the little instrument is the scheme with which brings the control of both set and amplifier on to a single on-off switch. As a rule, you know, when a separate amplifier is used it is necessary to operate the L.T. switches on both the receiver and the amplifier to turn the outfit on or off. With the "Mono-Amp" this is not so; you keep the receiver L.T. switch permanently at "on" and turn everything on or off with the switch on the amplifier.

(Continued on next page.)

THE PARTS YOU NEED—

1 Panel, 10 in. x 7 in. (Lissen, or Goltone, Red Seal, Paxolin, etc.).
1 Cabinet, with baseboard 7 in. deep to fit (Cameo, or Pickett, Keystone, Osborn, etc.).
1 Volume control, 1 or 1 meg. (Igranic, or Varley, Gambrell, Lissen, R.I., Wearite, Magnum, etc.).
1 L.T. switch (Bulgin, or Goltone, Igranic, Lissen, Lotus, Ready Radio, Magnum, Benjamin, Wearite, Keystone, Red Diamond, Junit, etc.).
1 L.F. transformer (Telsen, or Ferranti, Varley, Lissen, R.I., Igranic, Mullard, Lewco, Lotus, etc.).

TO MAKE THE “Mono-Amp.”

1 Sprung valve holder (Lotus, or Igranic, Lissen, W.B., Telsen, Benjamin, Bulgin, Magnum, Dario, Wearite, Formo, Junit, etc.).
1 Output choke (Lissen, or Ferranti, Igranic, Wearite, Varley, Magnum, R.I., etc.).
1 2-mfd. fixed condenser (T.C.C., or Lissen, Dubilier, Igranic, Ferranti, Hydra, Filta, Mullard, etc.).
1 Terminal strip 10" x 2".
9 Terminals (Bellin and Lee, or Eales, Igranic, etc.) Wire, Screws, etc.

A filtered output and perfect control of volume are among the "Mono-Amp's" many advantages.
It may seem a small point, but it is one of those little things which make all the difference to your convenience in using your outfit.

It is done in a very simple fashion, too. There are the usual L.T. battery terminals on the back-strip of the amplifier, and when the L.T. switch is turned on, current flows from them to the amplifier valve in the normal way. It also goes on to another pair of terminals on the strip, and these are joined to the L.T. terminals of the receiver. Thus the latter only gets its L.T. current through the circuits of the amplifier, and is controlled by the switch on the latter.

Another point occurs to us about the output filter, and we should like to clear this up before we go any farther. It is just this: sometimes we provide a filter and sometimes we leave it out of our designs.

Why It's Done.
The reason is that an output filter is one of those optional affairs which depend on individual circumstances. If you are going to use an ordinary power valve with battery H.T. the filter is not really needed, although it confers just a slight advantage even then.

If, on the other hand, you are going to use a super-

Simplicity in Wiring.
There is no need for the article to describe the wiring, for this diagram—backed up by the photographs—tells the whole simple story. There is one dotted connection, which can be made if your transformer has an earthed terminal, but may be omitted altogether if it has not.

The Alternative.
We therefore make a practice of showing both fashions of connection for the loud speaker, and often indicate to the reader how he may include or omit the filter.

In the "Mono-Amp," for example, you could omit the filter i.e. leave out choke and condenser, wire one L.S. terminal to plate of valve, wire other L.S. to H.T. +.
"Wireless World" readers place the Mazda A.C. Pen FIRST in the class for Valves in the Olympia Show Competition.

Here is striking evidence of the excellence of the Mazda A.C. Pen—and to the value it offers! "Wireless World" readers—the most critical public—placed this Valve FIRST in the class for valves (section 6) in the Olympia Show Competition. There could be no better testimony than this to our slogan “The finest range of valves the world has ever known.”
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2. Their guaranteed insulation resistances are not less than 200 megalohms for 2 mfd. This figure is twice the value usually provided in condensers of corresponding types.
3. They are hermetically sealed in their cases in addition to the usual wax sealing, thus preventing deterioration in service as commonly occurs where this provision is not made.
4. Their test voltages are three times their A.C. working voltages, and twice their D.C. working voltages.
5. They comply with the British Standard Specification for Condensers and with the latest recommendations of the Institution of Electrical Engineers.
6. They are built by engineers with unrivalled experience in the Electrical Industry in the manufacture of High Tension apparatus, including condensers for pressures up to 1,000,000 volts!

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- 2 mfd.
  - C1. 600 v. D.C. test 5 6
  - C2. 600 v. D.C. test 3 9
  - C3. 2250 v. D.C. test 9 6
  - C4. 1500 v. D.C. test 7 -

- 4 mfd.
  - C5. 1050 v. D.C. test 7.6

NO BETTER CONDENSERS ARE AVAILABLE AT ANY PRICE.


ARMISTICE DAY

On Tuesday, November 11th, the twelfth anniversary of Armistice Day was commemorated in all parts of the Empire. This week’s issue of ANSWERS is a special Armistice Number, containing many fine features, including an outspoken article—

"NEVER AGAIN"

By BARONESS ORCZY

The famous author of “The Scarlet Pimpernel” declares that the fact that war is still possible is the greatest blot on our civilisation.

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is a story of which every Briton should be proud—the story of the English flowers that bloom over the graves of our loved ones in France. You mustn’t miss this special issue of ANSWERS, which also contains a magnificent prize offer of £10 A WEEK for LIFE or £3,000 CASH which MUST BE WON, and there’s still time to win it!

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LONDON RADIO SUPPLY CO., 11, Oat Lane, Noble St., London, E.C.2.
A few seconds spent in running over the circuit diagram will tell you all you want to know about the theoretical arrangement of the "Mono-Amp." Just note the transformer which couples it to the preceding valve (in the receiver), the volume control, the output filter and the L.T. circuit arrangement, and then we can get on to more practical matters.

Now, it is really such a completely simple job to construct the "Mono-Amp" that we do not propose to insult the reader's intelligence by telling him how to make it in detail. Anyone who has any idea of how to drill a panel, lay out parts and wire them up should be able to do it with the greatest ease from the clear diagrams and photos on these pages.

The Output Filter.

We should just like to pause a moment to deal with one wiring point and a further matter concerning the output filter, however. First, the wiring matter: you will see that the particular L.F. transformer which we used has a fifth terminal in addition to the usual four, and this was not wired into circuit in the original "Mono-Amp." This extra terminal is connected to the iron core of the transformer, and provides a means of earthing it if desired for stabilising purposes. We did not find it necessary to do this with any of the sets with which we tried the amplifier, but we mention the point here in case of those who may be less lucky.

It is unlikely, but with some particular set (and perhaps a mains H.T. unit) you may get signs of L.F. instability in the form of bad quality, motor-boating, or a whistle. In this case just wire the fifth transformer terminal to the L.T. circuit, as shown on the wiring diagram by a broken line.

Now about the filter: if you are going to use the amplifier with a D.C. mains H.T. unit, you must modify the output circuit a little for safety reasons. This is how to set about it. Examine the wiring diagram and you will see that one loud-speaker terminal is wired to the L.T. negative circuit. Omit this lead for working on D.C. mains. Instead, wire this same loud-speaker terminal to one side of an extra 2-mfd. condenser. Wire the remaining side of this additional condenser to the L.T. circuit and your little modification is complete.

The Valve to Use.

Now let us tell you how to connect up and use the "Mono-Amp," and then we have finished.

First, there is the question of valves, and here you must be a little careful if you want the best results. The correct type to use in the amplifier is the power or super power. For use with a single-valve receiver we suggest the ordinary power type, and a super power if the receiver has more than one valve.

With a set which has no L.F. stage, the detector valve feeds straight into the amplifier, and no change is needed in the set proper. Where there is already a low-frequency stage in the receiver, however, a change may be required.

What was previously the output valve, i.e., the last valve in the set itself, may have been a power or super power. Transfer this to the "Mono-Amp," and put a new valve of the L.F. type in the socket thereby emptied.

The point you must remember is that the valve in the set which feeds into the "Mono-Amp" must be of the L.F. or H.F. type, not a power or super power.

Connecting Up.

Now the connections. Join the input terminals on the amplifier to the phone or loud-speaker terminals on the receiver. See that the "input" terminal goes to the 'phone or L.S. terminal of the set which is wired internally to the plate of the valve therein.

Disconnect the accumulator from the set, and put it on the amplifier terminals marked "L.T. (to battery)." Connect the other pair of amplifier L.T. terminals to the set L.T. terminals. Connect the amplifier H.T. + terminal to the maximum voltage point on your H.T. battery, hitch up the loud-speaker to the amplifier, and you are ready to switch on.

When you do switch on, don't be surprised if you hear nothing at first! The volume control may be at minimum. A simple catch, but it sometimes happens even to old hands!

DIRECTIONAL SPEAKERS

Small Points Worth Considering.

The majority of cone loud speakers are very decidedly directional, and not only do they sound loudest when you are directly facing them, but they also sound better.

This is a point to bear in mind when you invite a friend round to listen to your results.

Do not arrange the loud speaker on the table alongside the set and let your visitor stand near the receiver.

Provide him with a chair which is so placed that he will look right into the cone, and have the speaker at about the same height from the floor as his head will be. Also, do not put him too near to the loud-speaker, but let him be at least two or three yards away.

These may be small points, but you have only to try listening in different relative positions to the loud speaker, yourself, to appreciate their importance.

FROM THE INPUT END

The L.F. transformer is in the foreground, and behind it is the L.F. choke which, with the large condenser, forms the output filter circuit. The grid-bias battery stands on the baseboard beside the transformer.
NOTES FROM THE NORTH.

SIR JOHN REITH's reticence has been criticised at various times. But his speech at the opening of the Manchester Radio Exhibition was an illustration both of the virtues of reticence and of the fact that, in spite of the critics, Sir John can take the public into his confidence when he feels so disposed.

A Radio Reprieve.

When are we going to hear these reasons? Sir John said: "I think that Mr. Liveing is satisfied that, despite centralisation, he will have ample opportunity on the North Regional wave-length (for the presentation of Northern programmes). But is it fair to Mr. Liveing to give him that opportunity, to put him and his staff on trial, and at the same time to deprive them permanently of their function for another five months."

But is it fair to Mr. Liveing to give him that opportunity, to put him and his staff on trial, and at the same time to deprive them permanently of their function for another five months."

THE "LAY-OUT" AT SLAITHWAITE.

A sketch-plan (not to scale) of the North Region station at Moorside Edge.

musical comedy programme. We have also been told that there will be an octet or a nonet to replace the orchestra, but a small combination could never do justice to most of the music played by the Northern Wireless Orchestra.

And surely the B.B.C. should be as careful, if it plays a musical comedy selection at all, to play it with as much concern for its proper presentation as it displays in producing a Mahler symphony at the Queen's Hall?

I may be asked why I am anxious that Mr. Liveing's staff should be responsible for the production of the main part of the North Regional programme? Why not relay both programmes from London?

Three Good Reasons.

The first reason is that there is a great quantity of talent and musical activity of all sorts in the North of England, and the Northern staff of the B.B.C. are best able to exploit this material. The second reason is that the North is a country within a country, with its peculiar characteristics, likes, and dislikes, and the Northern staff are best able to understand the disposition of the audience.

The third reason is that if the major portion of the North Regional programme is produced at Manchester, Leeds, and elsewhere in the North, it is more likely that the programme will be a genuine alternative to the National programme.

If the London Regional programme was not produced largely at Savoy Hill, in the same atmosphere and probably by the same people as the National programme, I submit, be a better alternative than it is to the National programme. The way to get satisfactory alternative programmes is to keep the makers of the two programmes apart.

Finally, a word about Moorside Edge. Work is going on rapidly, and the B.B.C. is now carrying out tests to determine the best arrangement of the aerials.

Popular Wireless, November 15th, 1930.
H.F. AMPLIFICATION.

In his final article "Pentode" discusses H.F. amplification and illustrates his interesting notes with a further two of those unique "radiographs," which show you how to read theoretical diagrams.

(5). H.F. AMPLIFICATION.

This is the final article of my short series, and I am going to devote it mainly to high-frequency amplification. As I have already explained, H.F. amplification precedes rectification. You take the energy you have already explained, H.F. amplification.

Here you have one stage of H.F. amplification, and this is coupled to the detector valve via an H.F. transformer. An H.F. transformer consists of two windings of wire placed fairly close together.

"The Core of the Matter."

These windings are shown in the photograph as ordinary plug-in coils. And two plug-in coils in close proximity make quite an efficient H.F. transformer. They are rather farther apart in the photograph than they would be in actual practice, but I have purposely given them wide separation.

It has probably occurred to you that an H.F. transformer is, fundamentally, an L.F. transformer without the iron core. That is not so very wrong, but it would be more truthful to say that the only real difference between the average H.F. and an L.F. transformer lies in the core.

You see, there is a core in an H.F. transformer, although in this case the core is of air, but the windings of an H.F. transformer consist of a very much smaller number of turns. In the L.F. transformers you get tens of thousands of turns of wire, while in the H.F. transformer it is generally a matter of but tens.

How It Works.

By the way, in rare instances you do get H.F. transformers having iron cores, but these are very much the exception to the rule. There is little need to increase the intensity of the magnetic field developed around the windings of an H.F. transformer, owing to the fact that high-frequency current is very effective in producing magnetic influences.

However, let us see how the circuit shown in our first illustration operates. First of all you tune your aerial system to the wave-length you desire to receive by varying the capacity of the condenser C1. The oscillating high-frequency energy then developed in the tuning circuit (comprising the coil and condenser C1) is impressed across the grid and filament of the H.F. valve.

A Tuned Transformer.

The effect of this is to cause the current flowing from the H.T. battery round the anode circuit of the valve to fluctuate. These fluctuations will be magnified replicas of the H.F. impulses developed on the grid. In its travel the anode current passes through the primary winding of an H.F. transformer, and so a magnetic field is constituted that alters in intensity at the same high frequency.

As the magnetic field cuts across the secondary winding of the H.F. transformer, H.F. current is developed in this. This secondary winding forms a part of the tuned circuit that is coupled to the grid of the detector valve. You might wonder why it is necessary to have a tuned circuit here and why we cannot dispense with the variable condenser marked C2.

A tuned circuit is not essential for the operation of this "hook-up"; you could have what would be known as an untuned secondary winding to the H.F. transformer, but you get much better results when you do have a circuit that you can tune to the wave-length of the station you are receiving. This circuit will then work in sympathy with H.F. currents of a frequency corresponding with that of the required station and prove unsympathetic to other frequencies.

Another method of coupling H.F. valves is known as the tuned-anode scheme. This is illustrated in our second composite picture. If you refer to the diagram that illustrated resistance-capacity coupling last week you will see that the condenser C1 and the coil L1 in the tuned-anode H.F. circuit replace the resistance in a resistance-capacity coupling.

Like R.C. Coupling.

Resistance-capacity coupling can, indeed, be employed for H.F. stages, but it is not a particularly efficient scheme for such a purpose. The job of the variable condenser C1 and the coil L1 in a tuned-anode circuit is merely to enable a high resistance to be built up against H.F. currents. The greatest resistance is reached when the tuning circuit formed by condenser C1 and coil L1 is tuned to exactly the frequency of the station you are handling.

(Continued on next page.)
They must constitute condensers, and, as you know, if you connect a condenser between the grid and plate of the valve, you will introduce a capacity link or coupling.

In the screened-grid valve this inter-electrode capacity is almost entirely wiped out by the introduction of a fourth electrode. This is another grid which is inserted between the ordinary grid and the plate of the valve.

It is known as the screening grid, and it acts as a shield, from a capacity point of view, although it does not impede the electrons passing from the filament to the plate. Indeed, this shielding grid is connected to a positive tapping on the H.T. battery, it assists the electrons on their journey, and tends to make the valve a more efficient amplifier.

Therefore, besides getting rid of that troublesome internal capacity effect, it also enables the circuit to be operated more effectively, and an additional gain results which makes the screened-grid valve a wonderful proposition.

**Using a Coil and a Condenser for Coupling**

The preceding illustration shows an H.F. transformer coupling, but in the above the tuned anode method is depicted. This scheme is effective, but it is seldom used in the simplest sets these days.

Indeed, so superior was the S.G. found to be over the ordinary type of valve in the matter of amplification, that it was not long before the manufacturers decided to apply the same principle to L.F. valves. Thus, the pentode, which is really a screened-grid valve adapted for low-frequency purposes. The pentode has yet a further grid, and so has five electrodes.

The aerial is connected to one or other of two tapping terminals on an X type of plug-in coil. This plug-in coil is shown standing in a baseboard-mounting coil holder. Across the ends of this coil is connected a variable condenser (which is marked C1). F and M stand for “fixed” and “moving” respectively, and refer, of course, to the vanes of the variable.

You will have no difficulty in identifying the valve, while the two plug-in coils constitute an H.F. transformer. C2 is another variable condenser, and this one is used for tuning the secondary of the H.F. transformer.

C1 is the grid condenser and GL the grid leak.

Once again you will see that the wires in the practical hook-up do not follow exactly the routes indicated in the theoretical diagram. As I have already explained in a previous article, the purpose of the theoretical diagram is to show the electrical construction of the circuit as clearly as possible.

**Theory and Practice.**

There would be absolutely no point in making the lines follow the twists and turns that it is necessary sometimes for the wires in a receiver to follow. Of course, I have tried to make the practical hook-up look as much like the theoretical circuit as possible; the average receiver, on the other hand, often bears little or no resemblance at all to the pictorial aspects of its theoretical circuit. A valve may appear to the right of a variable condenser in the theoretical circuit of a set, while in the set itself it may be to the left. Also various leads will go to terminals and not direct to sockets, earth and aerial, etc., as in my pictorial hook-up.

As a matter of fact, I had at first intended to include further and more complicated circuits, but after a bit I realised that that was entirely unnecessary in view of the fact that practically every week at least one rattling good set is described in "P.W.", and that this set is almost certain to be illustrated with theoretical and practical wiring diagrams, as well as with photographs.

**What the Pictures Show.**

I will just run through the components shown in the first composite illustration this week for the benefit of new readers. The aerial is connected to one or other of two tapping terminals on an X type of plug-in coil. The plug-in coil is shown standing in a baseboard-mounting coil holder.

Across the ends of this coil is connected a variable condenser (which is marked C1). F and M stand for “fixed” and “moving” respectively, and refer, of course, to the vanes of the variable.

You will have no difficulty in identifying the valve, while the two plug-in coils constitute an H.F. transformer. C2 is another variable condenser, and this one is used for tuning the secondary of the H.F. transformer.

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AT HOME WITH RADIO STARS

IT is a shame (for radio listeners) that Mr. John Ansell has resigned from the B.B.C., but no doubt the theatrical interests with which he is associated have benefited by the change. What is their gain is the B.B.C.'s loss.

On evenings when he wielded the baton in the studio it was a well-known fact that the musical programmes of the Wireless Orchestra were judiciously compiled with a view to giving four millions of listeners light popular compositions. The programmes which John Ansell arranged for the Wireless Orchestra are the nearest approach to the ideal for pleasing every branch of listeners (without being "middle-brow") that we have heard for a long time. It makes Mr. John Ansell and his activities particularly interesting.

A short while ago, just before he resigned from the B.B.C., I listened to a delightful hour of orchestral music of that light variety which nobody can quite classify as definitely high-brow or low-brow.

"Little Greenfields." It was typical of John Ansell; and as the strings led up to a thrilling climax and then down in a full of quiet melody, my memory, swayed by the music, travelled back a short while to when I had the pleasure of visiting John Ansell's quiet country home.

Musicians are supposed to be temperamental beings; yet even temperamental beings must have bodies, and in a curious kind of way one wonders how they live, and how their home-life reflects itself in their musical work.

It is far better to know a musician as a man rather than to know him as a musician only. Bach, for instance, is beloved by the high-brows as the Father of Music; but he was also the father of more than twenty children was often in debt and was withal a family man; which fact may endear his music to some people.

Now, my curiosity about John Ansell was aroused some months back when a friend of mine, the art editor of one of the "home" magazines, said he had just come back from securing some photographs of Little Greenfields, one of the most delightful one-floor Surrey homesteads.

In conversation it came out that Little Greenfields is the home of John Ansell. My turn to see Little Greenfields came later.

The house has a history. Once upon a time it was a stockyard, and the ground surrounding it and the solid old-English brickwork of which it was built induced the owner to convert it to what it now is—a restful and altogether delightful place, a little "churchy" in parts, perhaps, but that is only because of the old-world touch about it. It is just the sort of home one would imagine to be possessed by a busy musical man.

It Was Once a Stockyard.

The broadcasting interests with which he was formerly connected took up a deal of his time. There is so much behind-the-scenes work at Savoy Hill, of which the listening public knows nothing.

I understand that the new interests with which he is associated also leave precious little spare time. The result is that to a busy musician a restful home is a "sine qua non"—and in Little Greenfields there is plenty of rest and quiet.

The place has, naturally, had considerable conversion from when it was a stockyard. The old mixed brickwork has been covered with oak beaming and plaster, but the quaint old tiled roof has wisely been retained.

An external chimney has been built on to the end of the building, and this gives an inglenook in the main room, the lounge. Out of this a tiny window above the fireplace peeps into the open.

Corridor Charms.

I gather that John Ansell loves flowers. The garden is a picture—or, at least, it was when I visited it.

Down one side of the house a terrace runs down practically the whole length of the house, and the open red-brick hearth, the rows of pewter, brass and willow-pattern, the old country furnishings of oak and elm.

John Ansell having left the B.B.C., I am assured there is no bad feeling on either side, and his resigning has been necessitated only by business reasons. I wonder if he has a wireless set, now!

Another very picturesque thing was the row upon row of pots of geraniums in the window ledges, of which there are many, for a narrow hall with long low windows runs down practically the whole length of one side of the house.

There is an indefinable charm about a long, corridor-like hall with beams on the wall and in the ceiling, with the border of bright red geraniums and with the pale walls a soft background to a black oak settle and—oh, course—a grandfather clock.

The Reason Why.

It certainly makes you forget broadcasting and the rush and hurry of a business life. It makes one want to forget everything except music—which, I suppose, is why John Ansell has it so.

I suppose nobody wants to have the private details of his home discussed, but I can't refrain from mentioning the impression of old-worldness which is left on one's mind by the large inglenook, copied from a Sussex cottage, and the open red-brick hearth, the rows of pewter, brass and willow-pattern, and the old country furnishings of oak and elm.

John Ansell having left the B.B.C., I am assured there is no bad feeling on either side, and his resigning has been necessitated only by business reasons. I wonder if he has a wireless set, now!

A POPULAR CONDUCTOR

Here we have the commencement of a brilliant new series of articles. These sketches from real life will give you exclusive and intimate sidelights on practically all the leading radio artists and personalities.

(1.) JOHN ANSELL.

A recent photo of John Ansell, whose conductorship of the Wireless Orchestra was one of the brightest features of the B.B.C. programmes.
FROM THE TECHNICAL EDITOR'S NOTE BOOK.

Tested and Found ?

"MAGNET" H.T. BATTERY.

The G.E.C. people recently sent me a couple of their new triple-capacity type H.T. batteries. These are 60-volters, and retail at 13s. 6d. each. A point in their construction which particularly appeals to me is that "super-grip" sockets are fitted for baseboard mounting and can be supplied at 9d. each.

Any type of wander-plug of more or less standard size will slip into the sockets readily and grip tightly, but they do not jam, and are easily removed. Readers who have had experience of the shallow cone-shaped sockets that grace (or disgrace!) some batteries will agree with me that this is one of those things that makes for better radio.

The construction of the new "Magnet" triple-capacity type battery is splendid throughout, the cells are large and robust in construction, and they are joined together by substantial strip connectors. Further, they are accommodated in a sort of eggbox structure that ensures both compactness and high inter-cell resistance.

This latest "Magnet" battery is undoubtedly a fine production, and I can thoroughly recommend it to the attention of readers.

"CRITIC" COIL HOLDERS.

The "Critic" coil holder, samples of which were recently to hand, is designed for baseboard mounting and can be supplied with either side or front terminals at 9d. each.

The bakelite moulding of this "Critic" holder is one of the cleanest I have seen, and its insulation resistance is high. It is, of course, a single-coil holder, and it takes any ordinary plug-in coil snugly, and efficient contact is made.

THE "BUSTO" SWITCH.

A neat panel-mounting switch having a snap action is made for retailing at 1s. 3d., by Busto & Co., Ltd., of Birmingham. This switch is of novel design, and I have not seen anything quite like it before.

Its "make" is good and its "break" is of a most definite character. And although the contacts are of a completely self-cleaning character, the construction is such that the switch spindle cannot possibly turn.

THE "PIFCO" ALL-IN-ONE RADIO METER.

The "Sherlock Holmes of Radio" is what Provincial Incandescent Fittings Co., Ltd., call their All-in-One Radiometer. And in view of the immenserous jobs that this device can do, it is by no means an exaggerated description.

You can test valves, circuits, H.T. batteries, L.T. batteries, components, and practically everything there is a need to test, with the All-in-One Radiometer, and the price of the device is but 12s. 6d.

Fundamentally, it consists of a multi-purpose meter with a small battery inside it. This last is a 1½-volt cell that lasts for months.

Manufacturers and traders are invited to submit radio apparatus of any kind for review purposes. All examinations and tests are carried out in the "P.W." Technical Department, with the strictest of impartiality, under the personal supervision of the Technical Editor.

We shall be glad to report that we prefer to receive production samples picked from stock, and that we cannot guarantee their safe return undamaged, as it is our practice thoroughly to dissect much of the gear in the course of our investigations.

And readers should note that the subsequent reports appearing on this page are intended as guides to buyers, and are therefore framed up in a readily readable manner free from technicalities unnecessary for that immediate purpose.

THE "EASY-WAY."

Messrs. Petco-Scott's new season catalogue, "The Easy-Way To Perfect Radio," contains a very comprehensive range of all the leading makes of radio apparatus, and a strong feature is made of kits of parts for home constructors. The whole of the goods listed are available through a system of deferred payments.

VOLUTE PLIERS COMPANY.

The address of this concern is 19, Victoria Square, London, S.W.1, and not Victoria Street as stated last week.

FOR LOUD-SPEAKER ENTHUSIASTS.

One of the biggest price reductions of the year is that of the 3½s. Wates Star Loud-Speaker Unit which has proved so popular that it can now be sold at 2½s. The Standard Battery Co. recently sent me one of these units fitted to one of their large chassis.

I had, of course, heard the device in operation on previous occasions, and I believe I have included a report on it in these pages.

It is a good unit, and at 2½s. it constitutes a distinctly tempting offer. It is constructed on massive lines and has a special movement adjustable by means of two fine-screw controls.

Fitted to the large Wates chassis a fine response is the result. There is clean base and a brightness indicative of a fairly even upper register. It is a loud speaker that interested "P.W." readers should make a point of hearing.

MULLARD CATALOGUES.

Three excellently produced booklets due to the Mullard people give details of Mullard Two-volt Valves, Mullard A.C. Mains Valves and Rectifiers and Mullard Accessories and Loud Speakers. A fourth publication of note is the Mullard Rapid Valve Guide Catalogue which I would certainly advise every "P.W." reader to secure.

Popular Wireless, November 15th, 1930.
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.

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
Capt. Eckersley's Query Corner

Under the above title, week by week, Capt. P. P. Eckersley, M.I.E.E., our Chief Radio Consultant, comments upon radio queries submitted by "P.W." readers. Don't address your queries to Captain Eckersley, however—a selection of those received by the Query Department in the ordinary way will be answered by him.

More Motor-Boating.

M. R. B. (Dundee).—"My present receiver, an H.F. det. and 2 L.F., I constructed in 1925, and this gave every satisfaction until quite recently, when the transformer primary winding gave up the ghost. I obtained a modern type transformer of good make, and inserted this, but the result is violent motor-boating. Why should this happen now, and not before?"

More Motor-Boating—Mounting on Metal—What is the Capacity?

A. E. (Walsham-le-Willows).—"Is there any formula or method whereby I can calculate the capacity of a fixed condenser I use for a parallel-feed system with an L.F. transformer. I wish to parallel-feed the second L.F. transformer in my 'Magic' Three (the one I am using is not the same as the one specified), so as to enable me to employ an L.F. or small power valve in the V2 position."

O. L. (Lancs).—"Please can you tell me whether my output filter is faulty? The symptoms are these: If I switch on my set, and then disconnect the loud-speaker tags touch the terminals. Is the filter condenser leaky?"

A Spark at the L.S.

A. E. (Walthamstow).—"Do you consider that capacity effects arising from mounting an S.G. valve holder direct on a metal base-board (which in conjunction with a vertical metal screen effectively shields an H.F., S.G. stage from the detector) cancel out any advantages that might accrue? Should the valve holder be raised off the metal by a piece of wood?"

THE S.G.'s CIRCUIT

A. E. (Walthamstow).—"Do you consider that capacity effects arising from mounting an S.G. valve holder direct on a metal base-board (which in conjunction with a vertical metal screen effectively shields an H.F., S.G. stage from the detector) cancel out any advantages that might accrue? Should the valve holder be raised off the metal by a piece of wood?"

The lower arrangement is recommended to A.E.
Popular Wireless, November 15th, 1930.

Save Money—
Do Your Own Woodworking

For solid satisfaction and profit there is no hobby like woodworking. You watch the result of your handicraft growing to completion, and for years you have the pleasures of achievement and use from the articles you make.

If you have never done much woodworking before, it does not matter. "THE PRACTICAL WOODWORKER" is a book that will tell you what tools to use, how to put up your work bench, what woods to use.

Then, with the aid of thousands of illustrations and working drawings it will show you how to make nearly 1,000 useful articles. Everything is so clear, it is as good as having a master craftsman standing by you, telling you what to do at every turn.

Advanced workers will find in "THE PRACTICAL WOODWORKER" many splendid and lengthy articles on period furniture, woodcarving, inlaying, upholstery, etc. Every wireless enthusiast should learn how to make beautiful Cabinets, or to do any kind of woodworking job in or outside the house.

The Practical Woodworker teaches how to make—

All kinds of Kitchen Furniture—

TOOLS for WOODWORKERS
To those requiring a full set of wood-working tools we are prepared to make an exceptional offer of a fine set on very easy terms. If interested, TICK COUPON.

All kinds of furniture and fittings can be made with the aid of this work.

SEE WHAT OTHERS SAY:—
TURNING HIS HOBBY INTO A PAYING BUSINESS.
"Woodworking at present is only a hobby of mine, but I feel sure that I shall turn it into a very remunerative business. They are the finest books I have ever seen."—Mr. Cussans, Belfast.

WORTH THEIR WEIGHT IN GOLD.
"I find the books worth their weight in gold. From being a raw amateur I now class myself as something approaching a practical man."—Mr. A. Berney, Westby, E. Yorks.

An Illustrated Booklet giving the fullest particulars of the work, together with our extremely easy terms of purchase.

FREE
To the WAVERLEY BOOK CO., LTD. (Dept. Pop.W.E.),

Please send Free Illustrated Booklet containing particulars of "THE PRACTICAL WOODWORKER," also information as to your offer to send the complete work for a small first payment.

NAME
ADDRESS

(Send this form in unsealed envelope under free postage.)

I am interested in your Tool Offer

Pop. W.E. 1930.
CORRESPONDENCE.

RADIO IN NORWAY.

To the Editor, Popular Wireless.

The Editor, Popular Wireless.

To the Editor, Popular Wireless.

The Editor, Popular Wireless.

RADIO IN NORWAY.

The Editor, Popular Wireless.

I MENTIONED last week a correspondence views on the amplification obtainable on short waves from an S.G. valve, particularly in relation to my scheme for "tying down" by coupling the aerial tightly. Now another interesting point arises with which I can find no fault.

It is this: that while an S.G. valve does get rid of "dead spots" that are due to the aerial system, they will still be present in the receiver, instead of showing up as spots in which the set will not oscillate, they will be spots in which no amplification is obtained.

An Annoying Thought.

As such they will, of course, be difficult to discover; but, nevertheless, their presence is sufficient to make me worry about the set.

I am never happy if I know that there may be anything wrong with a receiver. If something is wrong with it, I am happy, because I just have to go ahead and put it right. The lurking idea, though, that one is not getting the last ounce out of the gear is very annoying!

Now for a strange phenomenon that I am able to exhibit to all and sundry.

It is the fact that an S.G. valve, when used with an L.F receiver of either the detector or the last valve, shows up as a wonderful threshold howl.

Thinking that the solution might lie in the fact that the note-mag. had a choke-filter output and the detector had not, I arranged my choke and condenser externally, so that instead of plugging in the 'phones, I plugged the choke itself into either one jack or the other; but this has not altered things at all.

Use a Choke Output.

Of course, there are various things that stop the howl when the detector only is in use, but these do not solve the original problem. For instance, the provision of a resistance as high as 250,000 ohms across the detector and condensers, or even the headphones, cures it at once.

Incidentally, I might mention, for the benefit of those wearing Brown's "A" 'phones (and several of the really enthusiastic DX hounds do), that it is a wise precaution to use choke output. It is not the best thing in the world for head phones to have 8 or 10 milliamperes of D.C. flowing through them, first in one direction and then in the other. (I never met anyone who would take the trouble only to say that his 'phones were connected up correctly for polarity.)

Just before writing these notes, I had been listening to a speech by Mr. H. G. Wells, relayed over the transatlantic 'phone on 20.5 metres. The concluding announcements were to the effect that England was now closing down to the Columbia broadcasting Company's network. We hear very little of these relays, and yet I understand that the average transatlantic relay is a great success in the East-to-West direction.

Practice Records.

Someone, a few weeks ago, brought up the question of Morse records for practice purposes. I am indebted to a Bournemouth record for the following particulars: Suitable records are H.M.V. Marconi Official Training Signals, 9302 to 9513. Catalogue No. 625B to 630B. Also Columbia Morse Code records, 3202 to 3204.

An enthusiast from Seaton, Devon, wants to know how he should set his set in relation to others: Several sets being within about 20 metres, having been unsuccessful as yet. Well, W. B. B., that would take a large amount of space, but several of our sets of the same. One therefore how to make his set function well. Well, W. B. B., that would take a large amount of space, but several of our sets of the same. One therefore how to make his set function well. Well, W. B. B., that would take a large amount of space, but several of our sets of the same. One therefore how to make his set function well.
PRECISION INSTRUMENTS

for Accuracy

No matter what type of condenser you may require there is a J.B. Model to suit your circuit. J.B. Condensers are unequalled for workmanship and efficiency. Again and again they are specified in the latest circuits because J.B. lead the way in condenser design.

J.B. Variable Condensers are Precision Condensers in the truest sense. All superfluous metal and insulating material has been cut away, making for negligible High Frequency losses and high selectivity. At the same time they are so rigidly built that their calibration will never vary throughout years of service.

J.B. UNIVERSAL LOG CONDENSER. Centre Spindle Adjustable for Ganging.

PRICES:
- 0005 0/0
- 0003 0/0
- 00025 0/0
- 00015 0/0

Here is your chance to become a Master Man in a Spare-Time Business which is expanding enormously; one which is competing successfully against large combines.

Just sit down and think over this carefully. Our enormously successful Patents are in great demand everywhere. They have become tremendously popular, and as the Wireless and Electrical Business extends, which it will do and is doing to an unthinkable degree, this demand will increase proportionately. We will Licence you to manufacture our articles under our own Patent Rights, so that you can participate in the Big Profits.

No Plant Needed. No special knowledge or skill is needed, and you will find no difficulty about the manufacture. With our new and improved process no expensive "plant" or machinery of any kind is required, only simple hand tools and presses, and, even though you have not the slightest knowledge of Electricity or Wireless, you can commence to turn your spare hours into GOLDEN Hours! There is no drudgery. Indeed the work is so simple and easy that you require no special accommodation—you can start in the kitchen or any spare room can be your workroom—and the whole of the family, including the children, can help you. The work is of fascinating interest and your profit is only limited by the amount of time you have to spare.

Earn up to £300 a year! Anything—£300 a year—can easily be yours. New vistas will open out to you. It will smooth the way to success and enable you to be independent of employees and industrial upheavals. All those luxuries and necessities you have long desired will be yours! Let us hear from you NOW! You are not asked to attempt to revive a "dud" industry but are offered a Novel and Live Business—a growing business. Somebody is going to make a BIG PROFIT in your district, and that somebody can be YOU!

Send the coupon AT ONCE and full free particulars will be forwarded. Any questions you ask will be answered fully.

We positively Guarantee your profits. There is NOT the SLIGHTEST CHANCE OF your market being overcrowded it necessary we will purchase all your stocks, providing the same reach the required standard of efficiency which is easily attainable—a fact which ensures that you make PROFIT whatever may be the popularities of your own case!

Advertisement of Jackson Bros.
71, St. Tunnard Street, London.

To Mr. V. ENGLAND-RICHARDS,
THE ENGLAND-RICHARDS CO., LTD.,
1186, King's Lynn, Norfolk.
Sir,—Please send me at once, and FREE, full details as to how I can Make Money at Home in my spare time. I enclose 2d. stamp for postage.

Print your name and address boldly in capital letters on a plain sheet of paper and pin this coupon to it.

QUESTIONS AND ANSWERS.

THE BROKEN HEART.

D. W. (Fishponds, Bristol).—"For months reception has been really heartbreaking. In my efforts to improve it I have spent hours trying to improve it. Nothing I could see was wrong, and in the end I was simply broken-hearted. I could not afford to spend more on it, and was telling a friend about it when he offered to look over it for me. He has had a good deal of experience with sets, and after listening to it for a couple of minutes, he said: 'Um! Sounds like a broken primary to me.' "To cut a long story short, he brought round a spare transformer he had, connected it up, and lo! the set was just as good as ever. You can bet I am pleased, but I still feel sorry for myself when I think of the hours I spent trying to find that fault."

One question I am hoping you will answer is this: When a battery is broken, is it necessarily that the connections throughout are sound, but failure to get a click shows that the wire is broken somewhere and enables you to locate faults very quickly. Full details of the method have been given, and are still given in 'Radiotorial' from time to time. (Please note that all Technical Queries should be asked on the forms provided, which will be sent free of charge on application.) (Continued on page 494.)
GET
MORE OUT OF YOUR H.T.

Don’t waste your H.T. . . . The higher the voltage on your output valve the better will be its reproduction. By letting its anode current flow through the loudspeaker a big portion of it is lost in the windings—perhaps 15 or 20 volts.

Feed your output valve through a Varley L.F. Choke or a Varley Output Transformer and put an end to this waste. You will get increased power and purity from your output valve. The sensitivity of your loudspeaker will be increased and its windings safeguarded against burning out.

By choosing a suitable Choke or Transformer from the Varley range you can match the impedance of your speaker to that of your output valve, strengthening the bass and giving life to the reproduction.

Varley Impedance Matching Transformer for low resistance Speakers.

Varley Standard L.F. Choke, £1 10:0
Varley Output Transformer, £1 1:0
(Double ratio)

For RADIO MANUFACTURE

OLIVER PELL

OLIVER PELL

Varley


ANOTHER CONVERT

“It’s good now,” admitted the musical friend when the set was given a new battery. And it remained good. The battery was an Ever Ready. Not a battery that weakens soon. Not the average battery but the Ever Ready battery. A process is used for making the Ever Ready which meets a common need. It adds strength of life to length of life. Month after month the Ever Ready provides an even and generous flow of current. It doesn’t put the set on a starvation diet. It fills the set with all the strength it needs to pick up a symphony—and pass it to you without a note distorted.

Ever Ready batteries are guaranteed to give satisfactory service by a company that has been making reliable batteries for 28 years. They are made for all wireless sets. If you own a portable you can obtain an Ever Ready of the right size to fit it. Write for free list which gives all particulars, including exact dimensions in inches.

BRITISH MADE HIGH TENSION BATTERIES

The batteries that give unwavering power

The Ever Ready Co. (Gt. Britain) Ltd., Hercules Place, Holloway, London, N.7
A CIRCUIT FOR CENTRE-TAPPED COILS.

N. F. (Paddington, London, W.).—In addition to several valves of the H.F. (not screened-grid) type I have on hand quite a number of centre-tapped coils, and I am told that these can be used for neutralised H.F. stages and for Hartley circuit reversion.

I could use your point-to-point wiring of a two-valve on these lines?

You will need the usual components for such a receiver, as mentioned in the connections given below:

The aerial terminal is joined to a flexible lead that goes to the centre tap on the aerial coil. One end of this coil goes to earth, to a 0-0005 tuning condenser, to two diameters, to metal screen between H.F. and detector stages, and to L.T. negative and H.T. positive.

The L.T. + 1 terminal is connected to the centre tapping on the secondary of the H.F. choke. The final connection is from the centre tapping on the secondary to L.T. + wiring i.e any point between the on-off switch and the filament connections on the valve holders to which it is joined.

A RESISTANCE FOR REGULATING VOLTAGE ON THE PLATE.

T. A. R. (Halifaxfield).—To simplify wiring and external connections, I should like to use one H.T. + terminal instead of different ones for the various valves. I know this means using fixed resistances to drop the voltage to that required on the plates, but I do not see how the value of the resistance in circuit is calculated.

"Is this done in the same way as for filament current?"

Fundamentally the question is the same, whether the question is how many ohms to put in to reduce 200 volts to 100 volts.

For instance, if you are going to use an L.F.V. which when properly biased and with correct voltage of 120 on the anode takes a plate current of 4 milliamps, and you wish to give 120 volts to this but your supply is 200 volts, you have to give the valve resistance required to bring down the voltage to the necessary figure as follows:

Divide the volts which must be dropped—or, in other words, the difference between the two voltages, which is, in this case, 80 volts, by the 0.004 resistance for such a valve and voltages would be 20,000 ohms.

BALANCING THE COIL AND CONDENSERS.

P. H. A. N. (Wexford).—I learned from 'Pentode's articles, and I have since proved in practice, that a small coil in conjunction with a big capacity tuning condenser gives the same wave-length as a much larger coil in conjunction with a small condenser. Which of these arrangements gives the greater selectivity, or is there no difference?

On ordinary wave-lengths selectivity is usually better when a small inductance and a comparatively large condenser setting is employed, than when a larger coil tunes to the same wave-length by means of a smaller condenser.

(Continued from page 492.)
HERE IS THE
RADIO GRAMOPHONE CABINET
YOU ARE LOOKING FOR
INSTALL A
"LANGMORE"
and have your gramophone, Wireless Set, Loud-speaker and Batteries all in one cabinet.

These cabinets are very strongly constructed of selected Oak and Plywood. Size overall, 3 ft. 2 in. high by 21 in. wide by 15 in. deep.

THE TOP SECTION. Size 41 in. high by 18 in. wide by 14 in. deep, gives ample accommodation for gramophone and pick-up.

THE CENTRE SECTION. Size 10 in. high by 18 in. wide by 14 in. deep, is for the Wireless Set, to take a panel either 18 in. by 7 in. or 18 in. by 8 in.

THE BOTTOM SECTION. Size 15 in. high by 18 in. wide by 13 in. deep, gives accommodation for Loud Speaker and Batteries. The whole of the back is enclosed by double doors so that all parts are easily accessible.

Price 4 9/6 each
Packed FREE and sent Carriage Paid to any address in Gt. Britain.

A NEW CHUCK—
that will definitely
improve your loud speaker

After considerable experimenting, we have at last designed an entirely new type of chuck for all cone loud-speakers. This is the TONAX which, by means of the screwing device behind the washer, grips the driving rod of the unit so as to eliminate all the trace of chatter.

We are confident that this chuck will improve the purity of your present cone speaker by 100 per cent. It has a highly polished nickel-plated finish AND WILL FIT THE DRIVING ROD OF ALL MAKES OF UNIT, supplied with specially lined washers.

Obtainable from most dealers price 1/- each or direct from the manufacturers ½ post free.

IT IS STILL IN "FRONT"
FOR SAFETY AND APPEARANCE
IMPERVIOUS AND LASTING.

EBONITE PANELS
are still in "front" for safety and appearance imperious and lasting. Wood panels may appear satisfactory but "safety first".

The BRITISH EBONITE Co., Ltd., HANWELL, LONDON, W.

IMPORTANT
TO ADVERTISERS
OUR ISSUE FOR DECEMBER 6th will be the specially enlarged XMAS NUMBER
With Charming Cover in full colours
SECURE YOUR SPACE NOW!
Price THREEPENCE AS USUAL.
NO INCREASE IN ADVERTISEMENT RATES.

Westminster Radio
OUTSTANDING VALUE!
THE PORTLAND TABLE-MODEL SCREENED-GRID RECEIVER
is an excellent example of the value represented by "Westminster" receivers. A well-designed circuit (screened grid, detector and Pentode), a cone-speaker, and the batteries are all contained in the oak cabinet.

Price, complete - £11 19: 6
Write for illustrated catalogue, or see the actual job at any "CURRY" shop.
Branches throughout the Country.
**Radiotorial Questions and Answers**

(Continued from page 494.)

**ADVANTAGES OF OUTPUT FILTER FOR LOUD SPEAKER.**

R. M. (Limerick, Ireland).—"When first made, the set was very unstable, and in fact would not work at all except with a continuous buzz. Acting on P.W.'s suggestion I fitted an anti-motor-heating device (consisting of fixed resistance and a 1-cd. condenser) which worked wonders and made the set usable at once.

"But there is still a faint tendency to jarring on certain notes which I put down to L.F. instability. Would this be improved by using a filter output for the loud-sounder circuit?"

Probably improvement would be affected by de-coupling the output circuit by means of a filter circuit. In my case there is much to recommend this practice apart from the effect on L.F. instability, and we should certainly advise you to try the method in preference to running the plate current from your last valve through the loud-speaker winding.

"Even if the jarring to which you refer is not caused by L.F. instability (and is not therefore affected by the filter arrangement) there are other advantages of a filter, and you would then know that you must look elsewhere for the cause of the jarring, such as inefficient grid bias, loud-sounder or cabinet resonance, etc."

**MEASURING PLATE CURRENT.**

T. H. A. (St. Anne's-on-Sea, Lancs.).—"I have a milliammeter wired into my four-valve set in the negative high-tension lead between the valves."

(Continued on page 498.)
TRIPLE-TESTED

Three times tested, Belling-Lee Wander Plugs are as perfect as they can be made.

FIRST TEST. For grip, in a socket smaller than that of any known battery.

SECOND TEST. Without any adjustment to prongs it must now grip a socket larger than that of any battery made.

THIRD TEST. A piece of metal is inserted in place of the flex, and the lower portion of the Plug screwed up tightly against it. Any weakness in the thread will result in its stripping. Only Plugs which have passed all three tests are sold.

BELLING-LEE BATTERY CORD, complete with engraved plugs and spades. 9 way (for Mullard Orgola 3 circuits) Price 5/9.

Also made in 5, 6, 7, 8 and 5 way.


IGRANIC ELECTRIC Co., Ltd.,
149, Queen Victoria Street, LONDON

No Chemical Action whatever.

That is the essential difference between the Westinghouse METAL RECTIFIER, and so-called "metal" rectifiers depending upon electrolytic action which limits their life.

Full details and circuits for all units for radio mains equipment are given in our 40-page booklet, "The All Metal Way—1931." Send 3d. stamp for a copy.

A JOLLY GOOD VALVE

Plenty of Volume — Fine Selectivity and the lowest priced BRITISH Valve

Don't run away with the idea that because a valve is expensive it must be good. There is just as much scientific thought—just as much careful workmanship in the Golden P.R. Valve as there is in the highest-priced valve of any make, and it is covered with a written guarantee of life and efficiency. Until you have tried a Golden P.R. you do not know what you have missed in tone, selectivity and mighty volume; and you save a fine sum, too.

The Best, and the CHEAPEST

For selectivity and volume a better valve cannot be obtained anywhere with such a low consumption of H.T. and L.T. The glass bulbs are of a distinctive golden colour, and each valve has a golden guarantee band.

All valves despatched under guarantee of Money Back in Full if not satisfied and returned within 7 days. All valves are carefully packed and breakages replaced.

Ask your Dealer for them, or send direct to:

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(Opposite G.P.O. Tube Station.)

Have you tried one of the IGRANIC "Midget" L.F. TRANSFORMERS?
—price 10/6—

You would be surprised at the wonderful results obtained with one of these transformers in your set. Designed for those who truly appreciate quality in radio reception. LOW IN PRICE, SMALL IN SIZE, HIGH IN EFFICIENCY.

Write for Catalogue No. R165.

IGRANIC ELECTRIC Co., Ltd.,
149, Queen Victoria Street, LONDON
RA DIATOR ION QU EStIONS AND ANSWERS.
(Continued from page 466.)
the L.T. and H.T. negative terminals. This tells me the total current consumption of the plates of the valves, but I should like to know these separately.

"As the milliammeter is permanently wired into circuit I do not wish to move it if it can be avoided, so can you tell me if there is a way of telling how much current each valve separately is taking, as well as the total current taken by all the valves?"

You can tell this in a moment by pulling out of their sockets the valves it is not desired to measure, and leaving in the single valve the current of which you wish to know. If your milliammeter is sensitive you there will be a distinct decrease in the total current flowing as each valve is pulled out of circuit.

Probably you will find that when the power valve is removed there will be a very big drop in the reading such as, for instance, from 22 to about 7. The other valves will not cause such a big drop, but the L.F. valve and the screened-grid valve may cause a drop of two or three milliamperes each.

Indeed the detector valve takes very little (especially if it is resistance-capacity-coupled, or is of small capacity) but with a sensitive milliammeter its current will be indicated quite clearly.

TRoubLED WITH REACTION.
C. F. L. (Salisbury).—" For some reason the set seems less lively than it used to be, and on the whole not so satisfactory."

"I keep reaction right back to 0 except when searching for foreigners, but at one time I could get the set right up to oscillation without any whistles or chirp, and now I can hardly go near the reaction dial without signs of extreme liveliness."

"Hard capacity is noticeable on the tuning as well as on the reaction dial. No alterations whatever have been made to the set, and I am totally at a loss to see why it should have altered like this."

"Can you suggest a cure?"

All your symptoms seem to point to a fault in the earth connection, and we should certainly investigate this very carefully.

The trouble may lie inside the set itself, such as in a faulty connection to the earthed side of a coil holder, or the contact alone the wings of pieces in the case may be bad. Alternatively the actual connection to the water tap, or buried earth as the case may be, may be at fault.

If the earth wire is particularly difficult to inspect you can test it by connecting a temporary lead to a fork of the water tap, or buried earth as the case may be.
because the layout is completely symmetrical. There is thus no need to trouble about reversing right and left when working on the back.

Having pricked into the ebonite to mark the position of screws, run a small \( \frac{2}{3} \) in. drill through each, then go over them with larger drills, and enlarge them up to the correct sizes for the fixing bushes of the components.

Ready to Start

Next fix the panel to the baseboard with three screws, passing through holes in the lower edge of the panel into the front edge of the baseboard. (Panel brackets are scarcely necessary with so small a set.) Then prepare the terminal strip and fix it to the rear edge of the baseboard in a similar manner.

Now attach the appropriate components to the panel, and when you are ready to start the assembly of the parts on the baseboard.

Provide yourself with an assortment of brass screws (\( \frac{2}{3} \) in. and \( \frac{1}{8} \) in. are the most useful sizes), and proceed to fix down the components in the positions shown in the wiring diagram.

This part of the job will not take you long, but then you will be ready to start the wiring. You will discover this is very easy, too, for the layout was carefully designed to make it so.

A Time-Saving Tip

It is just a matter of following out the wiring diagram carefully and methodically, and without hurrying unduly. As you fix each wire in place cross out the corresponding line in the diagram, and you will be surprised how quickly and accurately you finish the job.

When it is done, check up each lead one more to make sure it agrees with the diagram and satisfy yourself that it is really sound: see that every lead is securely gripped by any nut or terminal which holds it, and see every soldered joint is perfect by giving any nut or terminal which holds it, and see every soldered joint is perfect by giving

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Some Final Hints

The H.T. voltages should be some 60 to 80 on H.T.+1 (adjust for the smoothest possible reaction control), and 100 or 120 volts on terminal H.T.+2. Grid bias will be about 4\( \frac{2}{3} \), 6, or \( \frac{1}{3} \) volts, according to the maker's instructions for the particular power valve you have chosen.

With these matters attended to you are ready to try out the set and discover for yourself what a fine little outfit you have built. We have already told you how to use the selectivity control, and it only remains to mention that the wave-change switch knob should be pulled outwards for the medium wave-band and pushed inwards for the long waves.

---

**Findings of 1919—Present Day**

**START RIGHT . . . with a PILOT RADIO KIT**

*It's complete .. it's better .. it's cheaper*

**THE CONTRADYNE THREE (P.W. 1/11/30)**

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<th>CASH</th>
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**EASY CHANGE THREE**

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**ALL COILS**

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**ALL APPLICATIONS for Advertising Space in "POPULAR WIRELESS" must be made to the Sales Advertising Agents, JOHN H. LILE, LTD., 4, LUDGATE CIRCUS, LONDON, E.C.4**
FOR THE LISTENER

(Continued from page 472.)

enough to attempt to spell, proved much too hard a nut for Colonel John Loder to crack!

Two things emerged from their recent conversation about Russia: first, the extraordinary gulf between Soviet ideals and our own; and second, the good progress which (according to Soviet ideas) is being made in the reorganisation of that vast country.

Colonel Loder's blunt criticisms were the criticisms of a traveller; but nothing he could say shook the confidence of the representative of the Soviet Embassy.

"Our workers," he claimed, "are living in better conditions than those in many other countries." All the same, I got the impression that no outsider knows very much of what is going on in Russia. A curtain is drawn.

"The Importance of Being Earnest." Wilde's play, "The Importance of Being Earnest," is one of those plays in which the author creates characters and situations in order to dress them with the felicities of his wit. It is brilliant in the extreme.

Epigrams are as thick as blackberries on a hedge. But the difficulty is to make it a play. It was easy enough to bring it to life thirty years ago; and almost impossible to do so nowadays.

Save for the brilliancy, it was like Ernest himself, "dead, quite dead." Peter Hamilton as Algernon, and Norah Baring in the party of Cecily, spoke clearly, and machine-gummed the epigrams and witticisms over to us very well; but Gladys Young, as Lady Bracknell, was the only one who seemed to be at all inside her part.

To cut this play is to kill it. Mr. Gielgud cut it well; and need have no qualms about it, for it was practically a corpse before he began!

Science and Sermons.

I and many others are grateful to Mr. Gerald Heard, who in "This Surprising World" keeps us up to date in scientific matters; but I cordially object when, as recently, he uses stones or ants or bacteria as texts upon which to hang homilies.

Every man to his job. Mr. Heard is a very good man at the job of popularising scientific findings. He speaks at 7 o'clock. The younger are in bed. The rest of us are perfectly capable of finding the moral for ourselves, if we want to.

If we don't want to, Mr. Heard runs a risk.

At the Piano.

Maurice Cole has recently been playing Bach. He has been very good. The steady development of this young pianist gives great pleasure to his many friends.

Arthur Rubenstein, playing with the Symphony Orchestra in the Tchaikowsky Concert in B Flat Minor, was superb. He can hit the piano even harder than Marcelle Mayer—and that is saying a lot indeed! But however hard he hits, he never loses tone, and the accumulative effect of his playing is a memorable experience.

Marcelle enjoyed herself in the Mozart Concerto, but not more than I did. She is great.
Thousands are making good battery sets All-Electric.

They want "All-Mains"—they want to use the Six-Sixty Mains Valves—they want the best in radio! So they convert their sets with the Six-Sixty. Mains Unit only (H.T., L.T., and G.B.) - £6 6s. All-Mains Conversion Equipment. Price, complete from - £8 5s.

No internal wiring alterations. The Six-Sixty 5½ pin valve holder adaptors are the links to the specially selected Six-Sixty A.C. Valves for every A.C. Supply.

We'll send you our free booklet.

THE MOST ECONOMICAL BATTERY YOU CAN BUY

COLUMBIA 4780, 60 volts. Triple Capacity 17/6

Measure Columbia 4780 by its long life as well as its cost—you will find it to be the world's most economical battery. Now costing only 17/6, Columbia 4780 (60 volts, triple capacity) gives you better radio, clear, undistorted and entirely trouble free. Buy Columbia 4780 from your dealer.
 Perhaps it is that we are apt to some extent to be hypnotized by the words themselves. The psychology of the word "super" has, indeed, been exploited for many years past by American film producers!

Questions of Amplification.

As a matter of fact, the output from a valve, in relation to the input, depends, amongst other things, upon the amplification factor, and it may be in some cases that the amplification factor of a so-called "power" valve is actually comparatively small.

In the case of a super-power valve the amplification factor is almost invariably quite on the low side. What, then, you may say, is the advantage in using the power or super-power valve if it does not mean that greater output is obtained?

Every wireless experimenter knows, in fact, that power and super-power valves are always associated with large output (in intention if not in realisation), and therefore it may come as a surprise to many to know that a power valve does not necessarily produce greater output.

Power Handling; Capacity.

The explanation of the whole thing is simply this. If you have developed in your receiving circuit, prior to the first power stage, a reasonably large signal strength, then for the next amplifying stage you must have a valve which is capable of handling the already strong signals and increasing the same by amplification and handling the new increased output.

The extent to which the input is magnified before becoming the output is not for the moment important. Now, a valve which is capable of handling a reasonably large input and converting it into a larger output is vaguely and somewhat loosely called a "power valve."

In the same way, if you desire a still further stage of amplification it is obvious that the next valve must be capable of handling greater power than the previous one, and the same argument applies again.

A Popular Mistake.

But this does not mean that the power valve or the super-power valve has necessarily produced any very great magnification in the signals. For instance, let us suppose that you have both a power stage and a super-power stage, the magnification factor of the power stage being, say, 10, and that of the super-power stage being, say, 6.

If you substitute the super-power valve in the power position you will actually obtain a smaller magnification than you obtained with the power valve.

I think you will see, without any further explanation, that the distinguishing feature of a power or a super-power valve is its capability of handling a comparatively large amount of power and that this has not necessarily any direct connection with its actual amplification factor.

Additional Running; Costs.

Naturally the impedance of the valve will as a rule be lower the greater the power which it is intended to handle, and it is (Continued on next page.)
this which enables the valve to handle a large amount of power without consequent overloading and distortion.

It goes without saying that both the filament current and the anode current will be increased, since the extra power involves an extra heavy H.T. current, and this, although driven by the H.T. voltage, consumes a fact of emission current from the filament.

A Simple Illustration

I mention this because there is often a temptation, especially on the part of beginners, to put in power valves where ordinary valves will do, in the belief that greater output will thereby be obtained.

To use a power valve in the earliest stages of the L.F. amplifier is like employing a seven-seater motor-car to carry only one person.

As the signals are amplified in, say, the second or third stages of the L.F. amplifier, so the need for a more capable valve arises. Return to the familiar, this corresponds to the party having increased to, say, 4 or 5 persons, when naturally more commodious car becomes necessary.

Pentode Points.

Whilst on the subject of power valves and super-power valves, it is perhaps advisable to mention the pentode, which also seems to have a good deal of fascination for many.

It is often thought that the pentode is a sort of power valve and super-power valve all rolled into one, and that the introduction of a pentode L.F. stage will in some magical way give the equivalent of a whole additional stage quite a large amount of amplification. This, of course, is what might be called primarily an "economical" valve; that is to say, it gives at a single stage quite a large amount of amplification and it is capable, owing to its special design, of handling a comparatively large amount of power, without its impedance, as we would expect from its high amplification factor, is also large compared to that of an ordinary power or super-power valve.

Moreover, it is not able to cope with a very large grid swing—in other words, the loudness of the input with which it can deal is comparatively limited. In the same way, however, its input is also definitely limited owing to its high impedance, and therefore it does not produce the same result as may (in proper circumstances) be obtained by the use of the pentode, i.e., an L.F. valve followed by a super-power valve.

The Proper Conditions

Perhaps I can sum all this up by saying that if you want to do the most with a particular stage of low-frequency amplification, and provided the conditions are appropriate (this is very important) the pentode may be an extremely useful valve.

But if you want to handle really large amounts of power you will, as likely as not, find that the pentode is not the valve for the purpose that you must rely upon the
TECHNICAL NOTES.
(Continued from previous page.)

more conventional arrangement of successive stages, increasing in power-handling capacity.

An Interesting Question.
In a very interesting article recently by Mr. Victor King, the question of mains hum was discussed and it was pointed out that—provided the actual background is not above a reasonable minimum—the actual distracting effect differs with different people. It is curious how one can get accustomed to a sound, especially if it is a continuous or uniform and unvarying sound. The ticking of a new clock, for instance, is at first very noticeable, but after a few days one becomes so used to it that one only notices the clock if it stops, that is, if the noise ceases.

TECHNICAL TWISTERS

No. 35.—Valve Connections.

CAN YOU FILL IN THE MISSING LETTERS?

On the ordinary valve, the pin which is "staggered" away from the others makes connection with the .

The terminal on the top of an S.G. valve is joined internally to the .

The extra terminal on the base of a Pentode is joined internally to the .

The centre-pin of a 5-pin A.C. valve holder makes contact with the .

The ordinary detector's grid leak return normally goes to the .

LOOK OUT FOR THE MISSING WORDS NEXT WEEK.

Last week's missing words (in order) were: Potential, Amperes, Resistance, Ohms, Higher.

All this is perfectly true, but it raises the very interesting question as to how much background in a mains-operated receiver can be reasonably tolerated. It is clear that the background must in any case be of very small intensity compared to the average loudness of the reproduction, and it is also clear that some people are very much more sensitive to background than others.

An Essential Feature.

At the same time, it would appear that the background, using the mains, can never be completely eliminated (in the same sense as with battery operation), and it becomes a question as to the point at which the background may for all practical purposes be said to have been extinguished.

It is obvious, at any rate, that a very close approximation to practical perfection as far as mains hum is concerned is obtainable with modern receivers and components, and there is no serious reason why any appreciable background should be tolerated.

TECHNICAL NOTES.
(Continued from previous page.)

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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 £22 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 £6 15s. This model is not supplied complete with cabinet.


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.

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