METAL DETECTORS INSTEAD OF VALVES!

NEW METHODS OF CUTTING OUT NOISES

Amateur Wireless

and Radiovision

A.B.C. of the PENTODE in BEGINNER'S SECTION

Every Wednesday 3d

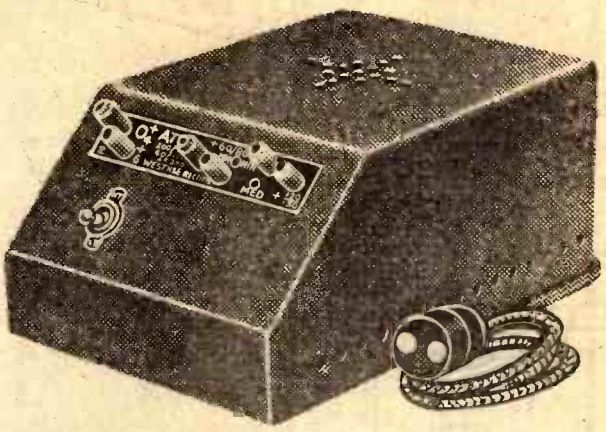
Vol. XXII. No. 560 **Saturday, March 4, 1933**

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

"ATLAS" MAKE THE *ONLY* UNITS

suitable for the

JAMES "PUSH-PUSH 3"



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PETO-SCOTT RADIO BY MAIL

MELODY RANGER

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A.C. MODEL DESCRIBED THIS WEEK

KIT "A"

CASH or C.O.D. Carriage Paid.

Author Kit of First Specified Parts for SET PORTION ONLY, including **Ready Drilled Panel, Set Baseboard and Screening Foil,** but less Valves, Cabinet, Power Pack and Speaker.
Or 12 monthly payments of 13/6.

£7-7-0

Set of 5 specified Valves £3 13 6
Peto-Scott Consolette Cabinet in oak (less shelf and Baffle) £1 5 0

● POWER PACK

Author Kit of First Specified Parts, for Power Pack only including special shelf and baffle but excluding rectifier valve and speaker.
Or 12 monthly payments of 6/1.

CASH or C.O.D. Carriage Paid.

£3-6-6

● COMPLETE KIT

Includes all First Specified Components for SET and POWER PACK, including Valves and Cabinet as above (less Speaker).
Or £2/12/0 deposit and 11 monthly payments of 26/-.

CASH or C.O.D. Carriage Paid.

£15-12-0

Specified W.B. P.M.4 Speaker £2 2 0 Cash or C.O.D., or add 3/10 to each of the 12 monthly payments.

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11/6 DOWN

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Set of of 4 Specified Valves - £1-19-3

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Convert your "Melody Ranger" into a Radiogram by building it into a 1933 ADAPTAGRAM, illustrated in "Amateur Wireless," page 285, Feb. 18th issue.

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Complete with FULL-SIZE working diagrams and copious constructional notes.

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Every purchaser of the PILOT Q.P.P. Conversion Kit is assured of our FULL TECHNICAL ASSISTANCE.

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or 8 monthly payments of 6/-

KIT "B" but with 2 Pentode Valves, Cash or C.O.D., £3/17/6, or 12 monthly payments of 7/-. Set of 2 Valves (separately), £1/15/0.

JAMES PUSH-PUSH THREE

COMPLETE WITH LISSEN COILS AND UTILITY CONDENSERS AS SPECIFIED

PILOT AUTHOR KIT

EXACT TO SPECIFICATION

KIT "A"

CASH or C.O.D., Carriage Paid

Author Kit of specified parts, including ready-drilled panel, but less valves and cabinet.

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Or 12 monthly payments of **10/-**

KIT "B"—As Kit "A" with valves, less cabinet. Cash or C.O.D., Carriage Paid, £8/7/6.
Or 12 monthly payments of ... **15/4**

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Or 12 monthly payments of **17/-**

Set of 4 Specified Valves ... £2 18 6

PILOT ECONOMY KIT

OFFICIALLY APPROVED BY THE EDITOR
See Page 327 last week's issue.

KIT "A"

Full complement of parts including ready-drilled Panel, but less Valves and Cabinet. Cash or C.O.D. Carriage Paid.

88/-

Or EASIWAY 12 monthly payments of **8/-**

Set of 4 Specified Valves .. £2 18 6

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As Kit "A" with Valves, but less Cabinet. Cash or C.O.D. Carriage Paid. ... £7/6/6
or 12 monthly payments of **13/6**

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Complete Economy Kit, with Valves and Cabinet Cash or C.O.D. Carriage Paid £8/3/6
or 12 monthly payments of **15/-**

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CELESTION Q.P.P. 19a MOVING-COIL SPEAKER with input transformer. Cash or C.O.D. Carriage Paid, £2/10/0. Send **4/7**
Balance in 11 monthly payments of 4/7. only

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ATLAS Q.P.P. (A.C.) H.T. ELIMINATOR. Specially designed for Quiescent Push-Pull Output. Cash or C.O.D. Carriage Paid. £3/12/6. Send **6/10**
Balance in 11 monthly payments of 6/10. only

GUARDIAN MILLIAMMETER

Specially designed for Q.P.P. Panel type **10/-**; Pocket type **7/6**. Dial diameter 2 in.

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Q.P.P. Intervalve Transformer 9 :1	12/6
Q.P.P. Output Choke 1 :1, 2 :1, 3 :1	9/-
R.I.	
"Q" Type Q.P.P. Multi-Ratio Choke D.Y.35	12/6
"Q" Type Q.P.P. Transformer D.Y.23 8 :1	16/6
VARLEY	
D.P.36 Q.P.P. Input Transformer 9 :1	17/6
D.P.38 Q.P.P. Output Transchoke 3 :1 and 50 1	16/6

Above Q.P.P. Transformer prices include Royalty 1/6.

LISSEN "SKYSCRAPER 3." Chassis model with (Lissen) S.G., Detector and Pentode valves. Cash Price, £4/9/6. Carriage Paid. Send **8/3**
Balance in 11 monthly payments of 8/3. only

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No. 560. Vol. XXII. MARCH 4, 1933

Amateur Wireless & Radiovision

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

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

NEWS & GOSSIP OF THE WEEK

A "MELODY RANGER" FOR THE MAINS

No Battery Bothers

OUR sensational "Melody Ranger," the first practical set to tune from 12 to 2,000 metres, has won an immense circle of friends. It truly has an amazing performance. The battery-driven version has been presented in "A.W." and has proved itself in thousands of readers' homes. *Now we describe a "Melody Ranger" for the mains!* This is an even better set than its battery brother. The mains valves give more "punch." And, of course, if you build this set you put an end to battery bothers.

TOWARDS THE "PLAN DE LUCERNE"

AT the time of going to press the B.B.C. delegates have not returned from the meeting at Brussels of the International Broadcasting Union where, it will be recalled, plans have been under discussion for an alteration to the present Prague Plan of wavelength distribution. So far the engineers have not disclosed the nature and extent of the proposed changes. What has been settled is the date for the full-dress meeting of the various administrations at Lucerne. This has now been fixed for May 18. From that meeting we may expect to emerge the new Plan de Lucerne.

B.B.C. GOING ALL HOLLYWOOD!

IF Eric Maschwitz has his way when he takes over the directorship of the new Department for Light Entertainment in April, some of the more amiable attributes of Hollywood will soon be introduced into the vaudeville programmes. For example, Mr. Maschwitz has strong views on the necessity for "putting artistes across," as they say in Hollywood. He estimates that his time will be equally divided between the three tasks of finding new stars, in "making" them, and in supervising programmes in which they appear.

MAKING THEM SNAPPY!

MR. MASCHWITZ intends to have a topical variety show at least once a fortnight, in which there will be room for any visiting artistes of interest to listeners and for anyone who is "in the news." In this enterprise he will be ably assisted by Mr. John Macdonnell, whose work in the one-time highly popular "surprise" items will be recalled with pleasure by many readers.

BOAT RACE PREPARATIONS

WHAT might turn out to be the most amusing "S O S" signal every broadcast is foreshadowed as a dark possibility owing to the fitting of larger batteries to the launch *Magician*, used for the Boat Race commentary on April 1 this year.

It seems that a larger transmitting power is desirable but the extra batteries needed to provide this increased power may make the boat rather unseaworthy. Last year, owing to the weight on board, the launch could only with difficulty keep up with the crews. Other sports broadcasts which will be worth hearing are Mr. Allison's talk on March 11, in which he will deal with the F.A. semi-finals which take place on March 18, and his talk on April 22 about the Cup Final to be played on April 29. On March 4, Mr. F. T. Bidlake, President of the Road Records Association and a Vice-President of the Cyclist's Touring Club, will talk on "Speed Cycling." Mr. Bidlake is a former holder of the fifty-mile, hundred-mile, twelve-hour and twenty-four-hour tricycle records and still retains the last-named record, which he put up in 1893. On March 18, Mr. H. M. Abrahams, the old Cambridge Blue, will give an eye-witness account of the Oxford v. Cambridge sports.

Also in this Issue—

FEATURES YOU SHOULD NOT MISS

- Metal Rectifiers Instead of Valves!
- More About the "James Push-push (Q.P.P.) Three"
- New Methods of Cutting Out Noises
- New Valves for 1933
- The "A.C. Mains Melody Ranger."

AND SPECIAL SECTION FOR BEGINNERS—"WIRELESS MADE EASY"

HUNTING for NOISE!

The Paris police have declared war on street noises, and this electrical apparatus is being used in public thoroughfares to check the average noise level

NEXT WEEK: A BATTERY-OPERATED RADIO-GRAM—By PERCY W. HARRIS

NEWS & GOSSIP OF THE WEEK—*Continued*

BETTER DERBY COMMENTARY

FOR the broadcast commentary on the Derby this year the B.B.C. has secured a place in the Grand Tier. This means that the commentators will be able to speak without interruption, from which they frequently suffered in their former position in the Press Stand.

EXTENDING THE EMPIRE SERVICE

AS mentioned last week, the B.B.C. proposes to extend the Indian zone programme one hour each side of the present schedule. This takes effect on April 2. The gap between the two African zone programmes between 8 and 8.30 is also being filled, so that there will now be a continuous programme to South and West Africa from 6 to 10.30 p.m. By the way, as British Summer Time comes into force on April 9 the Empire listeners to Daventry after that date will notice an apparent error of one hour in the chimes of Big Ben. This will, for a time, be explained by the Empire announcers.

AFRICA SPEAKS !

WE have previously mentioned in these notes the B.B.C.'s desire to exchange programmes with other parts of the Empire, as a sort of *quid pro quo* for the Daventry transmissions of the British programme to overseas listeners. The first of these new programmes will be given by the B.B.C. on March 6, when a descriptive commentary will be relayed from Table Mountain, South Africa. Lord Clarendon, who was the first chairman of the present corporation, and who is now Governor-General of South Africa, will inaugurate the broadcast.

BIG MUSIC HALL PROGRAMME COMING

ON March 11 the B.B.C. will put over another of its star music-hall programmes. Included in the cast are many famous names, such as Laddie Cliff and Phyliss Monkman, the New Trix Sisters, Marie Lloyd, jun., George Lacy, Gus Elen, Leslie Sarony and Mussi—a new "golden-voiced" tenor who is half Scotch and half Italian.

BOOKING THEM UP IN ADVANCE

TAKING a leaf from the book of the music-hall people the B.B.C. is now making long-term engagements with vaudeville artistes. The New Trix Sisters, for example, and Clapham and Dwyer now have engagements booked with the B.B.C. up to the end of the year. This is in the nature of a safeguard on the part of the B.B.C., which naturally wishes to ensure an adequate supply of artistes in the future.

MUSICAL PILGRIM'S PROGRESS

KEEN amateur students of music will be glad to hear that Mr. J. D. N. Rorke has now definitely fixed up a contract with the B.B.C. for a series of twelve talks on a "Musical Pilgrim's Progress." Mr. Rorke has the Walford Davies microphone manner, charmingly intimate and highly informative.

PLYMOUTH GOES DOWN

AS from February 25 the Plymouth relay on the 288.5-metre B.B.C. National common wavelength ceased to function and all Plymouth listeners transferred to the new and more powerful relay on 218.5 metres. Local listeners have had plenty of time to adapt their sets for the shorter wavelength, which is at present an unappropriated international channel.

A Q.P.P. FOUR-VALVER

THOSE who are interested in the construction of a powerful yet inexpensive battery-operated four-valve radio gramophone with a Q.P.P. output stage should make a point of looking at the "Words and Music" Radiogram de Luxe, of which the construction is fully described in the March issue of *Wireless Magazine* (1s.). On test the set has picked up more than seventy-five stations—all at "mains" volume !

AN ORGAN "O.B."

THE B.B.C. "O.B." engineers are continuing to take outside organ broadcasts from various London centres, and the popular St. Stephen's relays are continuing. Many men who may give recitals on the B.B.C.'s new organ have been heard in this way, including (last week) Francis W. Sutton, the well-known organist.

HOW RADIO PETS HELP

MOST radio stations have their pet animals, though few can be put to such good use as the animals at a certain South African broadcasting station. There they have two cats, one named Blackie and the other Amy Johnson, and a fox terrier dog. These animals are said to chase the rats from the studio when these massive rodents appear and frighten the artistes !

MORE FLESH AND BLOOD

FOLLOWING complaints about the programmes sent out on the Canadian zone wavelengths of the Empire service, the B.B.C. has decided to introduce more "flesh and blood" in place of the canned music and Blattnerphone tapes that have so far served as the main fare of this zone's transmissions. The reason for so much second-hand stuff in the Canadian programmes is, of course, that they are broadcast in the middle of our night, when most self-respecting artistes are in bed. Still, the B.B.C. Orchestra is to forego its beauty sleep on the night of March 22-23, when it will broadcast to Canada from 1 to 2 a.m. Quintets and other musical combinations are also being fixed for this period.

RUGGER INTERNATIONAL BROADCASTS

THAT highly popular commentator Mr. H. B. Wakelam will be heard during the running commentaries on the Rugger internationals between England and Scotland at Murrayfield, Edinburgh, on March 18, and between England and Wales from Ravenhill Park, Belfast, on March 11.

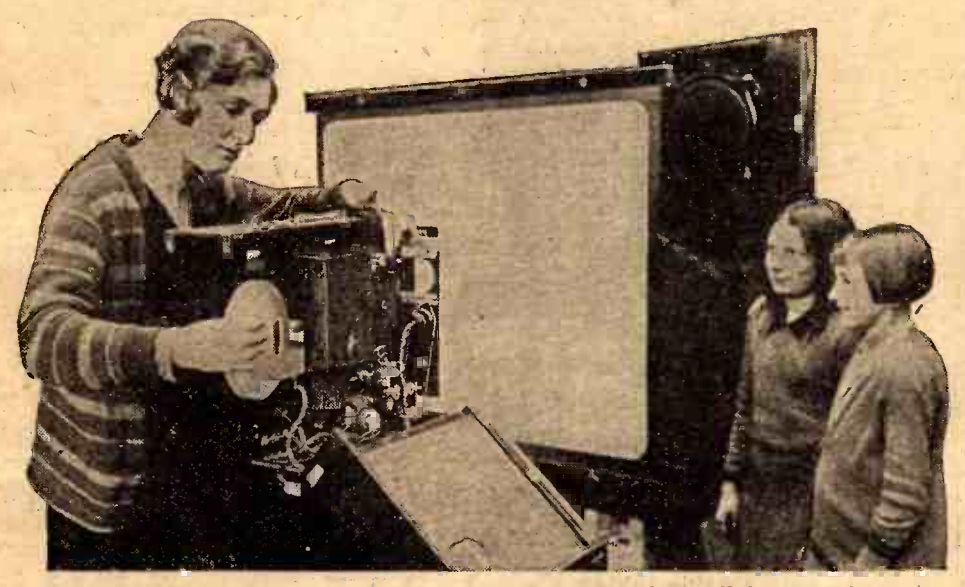
THE B.B.C. FILMED

MICROPHONE personalities play their part in a film entitled *King's English*, which goes on tour shortly. The film was made by British Instructional Films, Ltd., and the B.B.C. co-operated. The theme is the adventures of a news item which starts its history in the office of a news agency and travels to a newspaper office and to Broadcasting House. The news is read by people in various parts of the country in their own particular dialects, and finally we see the Chief Announcer at the microphone, reading the same item. Mr. A. Lloyd James and M. Stephan also appear in the film. If cinema audiences find no moral in *King's English* it should, at any rate, entertain them !

NO ADVERTISING !

FOURTEEN DAYS' SUNSHINE is a new musical play now being completed by Henrik Ege and Norman Hackforth for broadcasting on March 20 (National) and March 21 (Regional)—a John Watt production. The play revolves around the people who meet on board a liner for one of those much-heralded pleasure cruises, but the critics may spare themselves their usual delightful pursuit of looking for a subtle advertisement of some renowned shipping line which will betray the B.B.C. moral turpitude. There will be no advertising. Which is a reminder that one of the best-known vaudeville artistes in the B.B.C.'s "bills" recently broadcast a skit telling of his projected attempt to swim the Channel at the widest point, and in the course of the skit he was asked how he expected to get across. "At the end of a tow line hitched on to the ——," he said, naming a transatlantic liner. Within a few hours the B.B.C. received a request from a competing shipping company for a similar advertisement of one of their boats.

HOME MOVIES BECOME TALKIES !

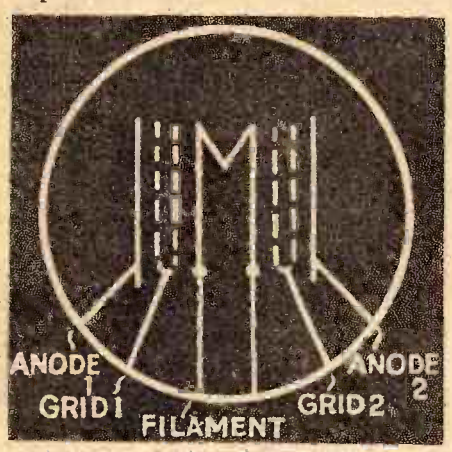


Thanks to radio-type L.F. amplification in conjunction with a photo-cell, home movies now need be no longer silent. This complete home-talkie outfit was a feature at the British Industries Fair. The sound-on-film system is used

NEW VALVES FOR 1933

During the ensuing year there is likely to be a considerable amount of valve development and the probable trend of this is briefly reviewed below

BEHIND the doors of their laboratories designers are hard at work on the production of new sets for next August. Their ideas revolve round automatic volume control, quiescent push-pull, Class B, tone compensation and other innovations which will take receivers for 1933-4 a step nearer perfection.



The Class B output battery valve, with two sets of electrodes in one bulb. This is designed to work with positive voltage on the grids

Improvements in coils, condensers, transformers, volume controls, switches and each and every component are carefully tested and approved as contributions towards a better product.

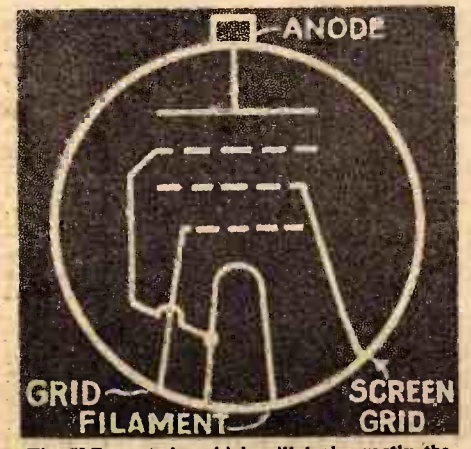
And dominating the scene is the valve manufacturer with the new valves.

What are they going to give us? Shall we see anything revolutionary, such as the screen-grid, pentode, or indirectly-heated valves were in their day?

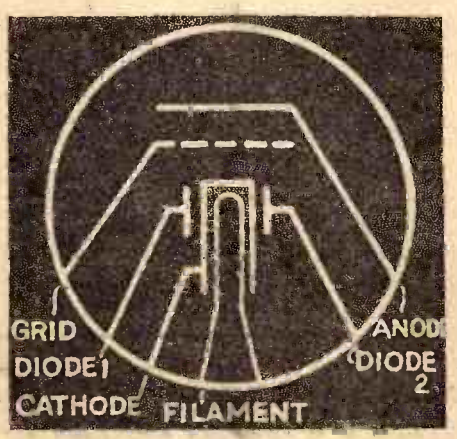
So far as can be ascertained up to the moment, nothing like this is likely to appear, but there are a number of new types which may be described as developments of existing standard valves, introduced to perform functions which experience has found to be useful.

The user of battery sets will find the most interesting steps forward in the output stage. A very old friend, the original push-pull circuit, in fact, has been revived under the title of "quiescent push-pull," sometimes called "push-push." For this no new valves are necessary, an advantage lying in the use of the existing small, high-efficiency pentodes, which have the essential virtue of giving a large output —about 1 watt maximum—for a moderate input grid swing, and can thus be loaded directly from the detector though a suitable inter-valve transformer.

The second development is known as "Class B," and again, although not new, it is rendered possible by improved valve and transformer technique. Here the distinguishing feature is that the grid voltage is swung past zero into positive, and there are two variations. In the first, one may use a pair of small power valves biased to the bottom bend; in the second, valve



The H.F. pentode, which will look exactly the same as a screen-grid valve so far as outside appearance and connections are concerned, but has an extra internal grid



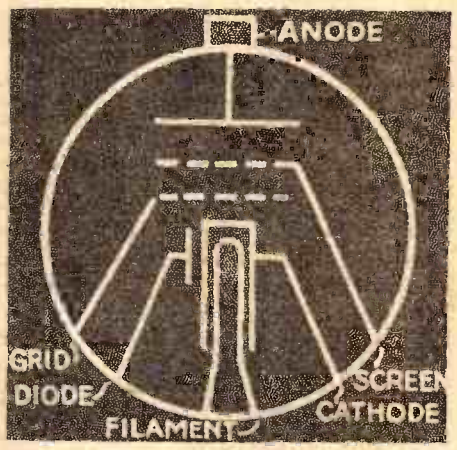
The double-diode triode, consisting of an ordinary triode with two small extra anodes placed close to the cathode and brought out to additional pins. This valve will need a new seven-pin base

makers are introducing a special double valve having two sets of electrodes in one bulb. This valve will have two grids in each anode, connected to act as one, so that with a small grid bias the anode current will be only a milliampere or two.

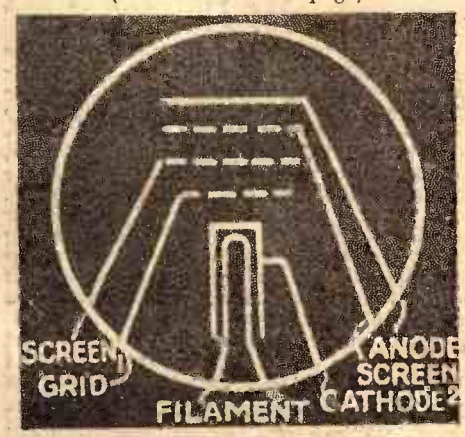
So far, there are no indications of other battery valve novelties, although one or two makers are effecting improvements in non-microphonicity and other important general properties.

In the mains classes there are many changes. We shall see a number of high-frequency pentodes with variable-mu characteristics, which bid fair to replace screen-grid valves in a year or two, if we can take American progress as an example. Then the double-diode-triode makes its bow, with a rival in the single diode-tetrode. These are both primarily for use in the second detector position of superhets, although they can, of course, be applied to "straight" sets as well. Which of the two will emerge triumphant, or whether yet another novelty will displace

(*Continued on next page*)



The single-diode tetrode, which is a low-magnification screen-grid valve with an additional small anode close to the cathode



The type 59 pentode, popular in America, which can be used in three quite different ways according to the manner in which the grids are connected

A NEW RADIO-GRAM BY PERCY W. HARRIS

First details of a new receiver to be described next week

SIMPLICITY, sensitivity, selectivity and quality—you can talk as much as you like about a receiver and cover up the real facts about it in a maze of words, but these four qualities, these "Big Four" are the requirements of to-day. The simplicity, too, must be genuine. It must come from real design and not merely from the omission of controls which ought to be there if the set is to be made to work properly.

Now sets, and indeed circuits, vary considerably in selectivity, and it is just as well to face facts at once. Broadly speaking and other things being equal, the selectivity of a receiver varies with the number of tuned circuits employed. Observe my remark, "other things being equal." I mention this because there are many two-circuit receivers more selective than those using three tuned circuits, and we may get trouble if we do not provide proper screening from direct pick-up coming on to the detector coil without troubling to go through the previous tuned circuit.

Yet very sharp tuning with comparatively few tuned circuits can be obtained if we combine good coil design with a very loose coupling. Loose coupling involves a certain loss of signal strength, but with the modern screen-grid valve and particularly with proper and scientifically applied reaction, this loss can be made up in a satisfactory manner.

Sharp Tuning and Quality

In the past the trouble with very sharp tuning in simple circuits has been the loss of quality, and up to a very few years ago this loss of quality was accepted as an inevitable accompaniment to very sharp tuning. With the introduction of band-pass tuning, however, high selectivity without loss of quality—or rather with a retention of quality sufficient for good reception—was obtained, but this led to further complications with tuning, and in the case of a simple screen-grid set it involved three tuning condensers which must either be separately tuned (which is a great nuisance) or ganged very accurately (which is expensive).

Thanks to the discoveries of Dr. James Robinson, with whom I worked on this problem extensively for some time, it has now been shown (and *after* demonstrations, theoretical proof given!) that the loss of high notes which was associated with very sharp tuning, can not only be remedied by suitable design of the low-frequency end of the receiver, but also that the additional selectivity brought about by the so-called sideband cutting is *not* lost again when the tone is corrected.

Before Dr. Robinson announced his discoveries in this regard, it was universally held that it was useless to take a very sharply tuned circuit so as to obtain the necessary selectivity regardless of quality and then correct the quality in the audio end, because, it was said (all kinds of proofs being as usual given) that the interference which had been reduced or cut out by the high selectivity would be brought back again if the audio quality were properly corrected. You have no idea how many important people in the radio world went on record with this opinion and wish now that they had never said it!

A "Quality" Radio-Gram

In my new radio-gramophone, which I shall describe next week in these pages, **I can give you the "big four" referred to at the beginning**, and by using the tone correction method in place of band-passing, I have been able to dispense with a complete tuned circuit and its associated expense. The tone correction method adopted is such that **you can adjust the quality to suit your own ear or your loud-speaker**; the selectivity is adjustable over a wide range, tuning has all the advantages of a one-knob control, with the precision and accuracy of separate tuning, while **the overall cost is such that you will be surprised** such a "quality" radio-gramophone can be produced for so low a figure. It is, of course, a radio-gramophone, and it is arranged for battery operation—the method which, at the present time at least, meets with the requirements of the great majority of listeners. That is all I can tell you at the moment. **I assure you that you will not be disappointed!**

"NEW VALVES FOR 1933"

(*Continued from preceding page*)

both, will probably be seen in the future.

Limitations in the range of grid bias obtainable from the diode of these valves in automatic-volume-control circuits is leading to a reduction of the grid bias in variable-mu screen grids and pentodes. Now they operate at —1 to —40 volts, but we shall see a change, in some cases to —30, and to —15 in others. Thus, a far more effective control of fading is achieved.

It is possible that we shall see rises in conductance in certain cases, but nothing very much; in fact, the trend of the last few months has been to introduce lower conductances than the peak values reached a year ago.

Output mains valves are not likely to alter to any extent. The popular indirectly-heated pentode will be modified and rated up to 250 volts screen instead of the present 200, with a consequent theoretical increase in output.

In the D.C. classes we can expect very much the same introductions, as for A.C. operation, with the possible addition of new pentodes and Class B valves designed for maximum output at 180 volts. This will enable the D.C. set to compete effectively with the larger A.C. models, in spite of the limited voltage available from D.C. mains. It is conceivable that we may get a valve like the American 59, which is in essence a pentode with the "earthed" grid brought out to an additional terminal. This valve can be used in three ways: firstly, with the earthed and screen grids connected to anode, as a simple triode power valve; secondly, as a pentode; and thirdly, with the three grids connected together to form one control grid, Class B becomes possible, giving an astonishing increase in output.

Here, for the moment, we must end our prophecies of what the valve makers have in store, and you will agree that even if there is nothing more to come there is enough to promise some very interesting new circuits for 1933.

SHORT-WAVE NOTES

By "SHORT-WAVER"

A VERY important point, which is very rarely given any consideration in a short-wave receiver, is having the correct L/C ratio to obtain maximum efficiency.

It is usual to use a coil of approximately the correct inductance to cover as wide a wave-range as possible, and if the results are reasonably satisfactory and the stations picked up without very much difficulty, it is assumed the coil is correct. When down below 50 metres, the lower the capacity that is used—that is, the smaller the condenser—and the larger the coil, the better should be the amplification. For example, using a .00025-microfarad tuning condenser with a 180-degree dial and a six-turn plug-in coil, a 50-metre station would come in at approximately 120 degrees, with perhaps fair strength.

If the inductance of the coil was increased and a 9-turn coil used, the condenser would have to be of lower capacity, and the dial reading would most probably be in the region of 30 or 40 degrees. You would find that this arrangement where C (that is, the capacity) is fairly low and L (that is, the inductance) is as high as possible, the ratio of L/C is more correct and the efficiency is greatly increased. So remember, in future, to use the largest coil you possibly can and always try to tune your station in at the bottom end of the tuning scale.

Some very interesting experiments have been carried out on the common or garden "earth" and some surprising results were obtained. When an earth consisting of a copper plate was buried in normal dry soil, the efficiency increased over 1,000 per cent. when the ground was liberally watered. With a short-wave set the question of the earth connection is of vital importance, and it certainly pays to make quite sure that *your* earth is of as low resistance as possible.

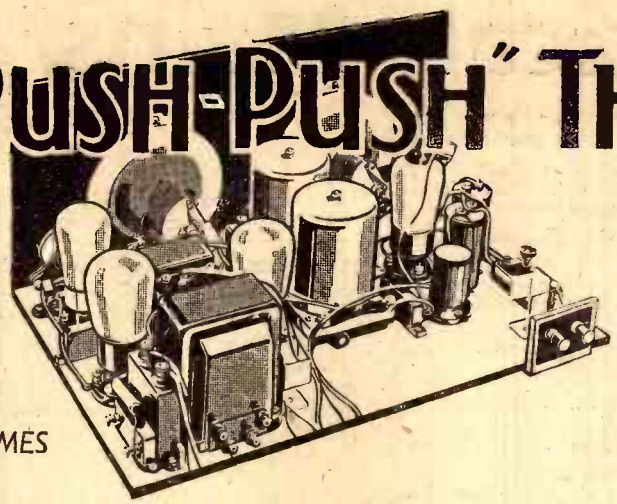
During the past week the English amateurs have been very lively, and during Sunday morning twenty or thirty of them were "on the air," coming in on the loud-speaker. Heterodyning was very bad, but, even so, it was very amusing listening to some of these enthusiasts putting over a really powerful signal when using only a few watts. I strongly advise you to tune in next Sunday morning about 11 or 12, on the 40-metre band and hear a few for yourself; but, please, don't oscillate—there is enough interference already.

I cannot possibly provide a wiring plan for the simple single valve circuits which I give, but I would be only too glad to give any help, should it be required, or should there be any queries regarding values, or components, etc.

The conditions during the last week have not been at all good. W3XAL is definitely deteriorating; but, what is worse, the schedule is not at all reliable. On one or two afternoons, instead of beginning at 1 o'clock, it has been a little after 3 p.m. before the first programme was sent out.

I understand that experimental broadcasts on Sundays have now been stopped, so if you wish to hear any Americans on Sunday afternoons you must rely on the 13.92-metre W8XK until about 3 o'clock and the 19-metre relay from 3 p.m. onwards. As the days are getting very much longer, the low wavelength stations come in much later in the day and stations under 20 metres can be picked up as late as 7 o'clock in the evening.

USING The JAMES "PUSH-PUSH" THREE



Here are the operating instructions for the Quiescent Push-pull Set of which constructional details were given in last week's issue

BY W. JAMES

EXPERIENCE shows that the most satisfactory and economical set for all-round use is one having a high-frequency stage, a detector and a power stage.

With this type of set the selectivity is usually good enough to allow the worth-while stations to be received with the minimum of interference. But those who must use batteries have always, until now, had to put up with rather poor volume.

With a Q.P.P. output stage the performance is entirely changed. Much more volume is obtained and this seems to add life to the set.

Good Quality

The quality, too, seems to be much better than from standard sets, chiefly because a more satisfying output is obtained. Added to these advantages of the Q.P.P. system is the further one that the standing (no signal) current is very small and the average current during an evening's work is less than the average current of a single valve used in the ordinary way.

You do not get everything for nothing, however, as more volts must be applied to the power stage. There is no difficulty about this, however, as with a sensitive detector and coupling transformer combination the necessary magnification is easily obtained.

This receiver may, therefore, be said to put up the same performance as other sets having a single high-frequency stage as regards both selectivity and sensitivity. It surpasses other sets in the volume and the quality of the output.

In this respect it can be said to give practically as much sound output as the usual mains set having a pentode output stage. There is, in fact, a remarkable difference in the results between a set as described and another having just the ordinary power stage.

The difference really is much greater than you might think possible and when it is remembered that the average current from the high-tension battery is less than the normal for one power valve you will realise how worth while the Q.P.P. system is.

A variable-mu screen-grid valve must be fitted in the first stage of the set. The bias for this valve is obtained through the volume-control potentiometer connected to the grid-bias battery and the wander plug joined to the flex from the potentiometer should be plugged into the negative end of the grid battery. There is a switch in the circuit and when the control is turned off the potentiometer circuit is broken.

Proper Adjustment

I like a high-frequency stage with a variable-mu screen-grid valve as the amount of the amplification can be controlled so easily. A further point is that the anode current is reduced as the magnification is brought down, with the result that the minimum of high-tension current is taken when listening to strong stations.

Associated with this part of the circuit is a pre-set condenser and reaction. There is great scope here for those little adjustments which enable one to obtain exceptional results. The effective selectivity can be improved, for example, by reducing the capacity of the pre-set condenser, by lowering the amplification provided by the valve by turning back the volume control and by using reaction.

Good separation of stations can easily be obtained by careful tuning and I always think that this part of a circuit is very interesting because of the fine adjustments that are possible.

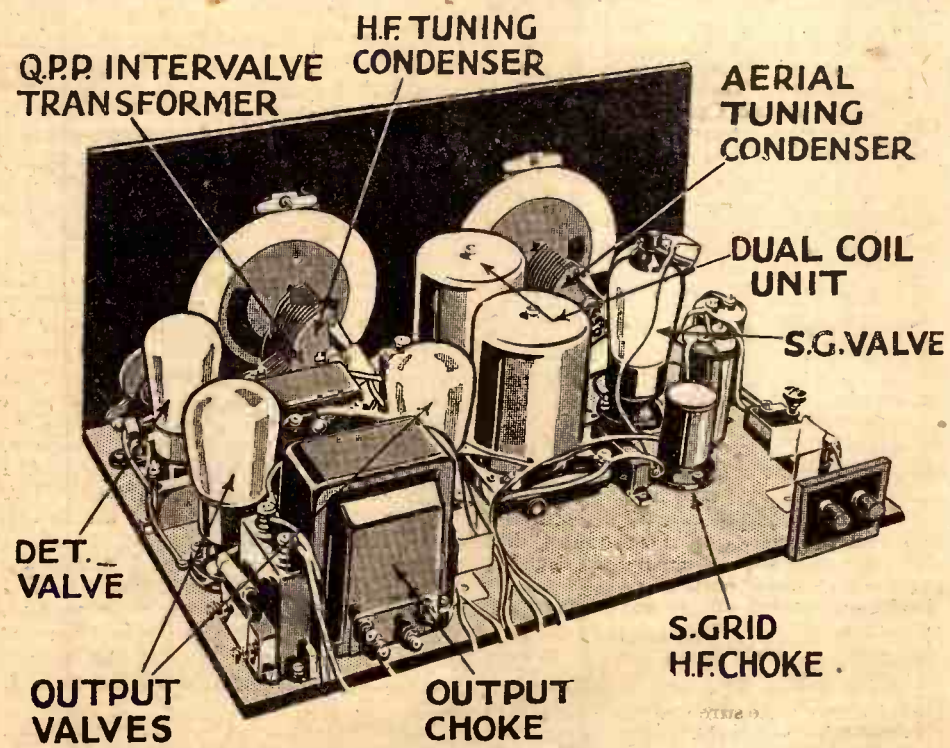
It should be remembered that if the reaction is adjusted to the point where the tuned-grid circuit is practically oscillating, increasing the volume control will have the effect of taking the circuit a little further away from the oscillating point.

Suitable Valves

If, on the other hand, the volume control is turned back a little, the tendency will be for the tuned-grid circuit to go nearer the oscillating point. This is because the impedance of the screen-grid valve increases when the volume control is turned back and is reduced when the control is turned up.

A good valve for the detector stage is one of the HL series, having an impedance of the order of 20,000 ohms. It is advisable to give the anode of this valve all the volts available and it was partly for this reason that the anode de-coupling resistance was

(*Continued on page 401*)



This lettered pictorial diagram of the "James Push-push (Q.P.P.) Three" will make the explanation given in the text easily understandable

NEXT WEEK: A BATTERY-OPERATED RADIO-GRAM BY PERCY W. HARRIS

Practical Mains Working—

for Beginners (Part 2)

LAST week we saw why you cannot use "raw" alternating current to operate the electric supplies in your set and how, simply by changing the valve holders and making one or two connections in the set, we can take our supply of low-tension current from the mains, provided, of course, we use a special form of valve.

I have already mentioned that these indirectly-heated valves are much more efficient and the question, therefore, arises as to which types we should use in a simple set consisting of a detector and two low-frequency stages.

We cannot do better than to use the mains equivalent of the "H.L." type of valve for the first two valves. For the output a great deal will depend upon our high-tension supply, for output valves can be exceedingly "greedy."

No particular pains are taken to make mains output valves especially economical, because these valves are invariably operated from mains high-tension units. We must, however, take into account the maximum efficient output from our mains high-tension unit when choosing our output valve.

While it is extremely unusual, there is no theoretical reason why the high-tension supply of a mains valve should not be provided by dry batteries, but of course this is a very extravagant way of doing it, in view of the high consumption of mains valves.

Choosing Your Valves

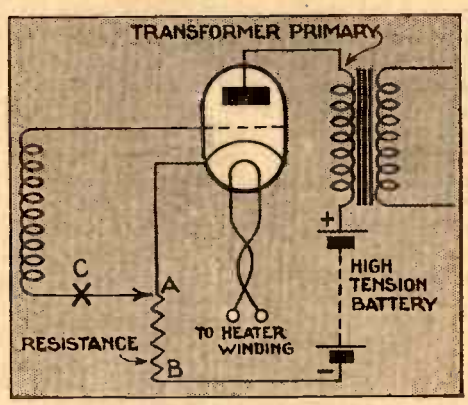
Let us look over the valve makers' lists and see what we can find. The detector valve and the first low-frequency valve together will take about five milliamperes, provided the low-frequency valve is properly biased (I am assuming for this the maximum plate voltage is about 150). For the output valve you can choose one of the mains power or mains super-power types. The high-tension consumption of these valves varies considerably among different makes, but a typical mains power valve I have in mind, correctly biased, takes about 15 or 16 milliamperes, and in the same make the super-power valve for mains working at the same voltage takes about twice that.

We come now to a very interesting point. Designers of A.C. mains sets for home construction invariably make them complete with mains-driven supply for both low tension and high tension. Many people who have been running battery sets and desire to go in for mains operation scrap their existing battery set and with it a perfectly efficient high-tension mains unit, so as to build the new receiver complete from tip to toe. I want to emphasise here there is no need whatever, when you want to go in for mains operation *in the most economical way*, for you to scrap a good high-tension mains unit.

There are many small high-tension units in use designed to give 20 to 30 milliamperes at 120 volts. If you choose for your receiver two "H.L." mains-type indirectly heated valves for detector and first low-frequency stage and an economical mains power valve (*not* mains super-power valve) for your output, the total consumption at 120 volts will not exceed that which your mains unit will give.

It is unusual in these days to design a mains set with a detector and two low-frequency valves, the most frequently adopted plan being to use a high-frequency stage, a detector, and one low-frequency stage. When you use a high-frequency stage you get an additional tuned circuit, which adds to the selectivity.

If, however, you use two tuned circuits prior to the detector and follow this by two low-frequency stages, a very high selectivity is obtainable, as I have shown in the "Mascot" receiver, which is quite capable of being turned into a mains-driven receiver along the lines we are now discussing. Indeed, I have worked one so converted for a long time in my laboratory.



Grid bias is applied to a mains valve by inserting a resistance between the cathode and high-tension negative, part of the high-tension voltage being used for the grid-bias voltage in this way

I also published in *Wireless Magazine* last year a mains-driven radio gramophone using a detector and two low-frequency stages, the detector being preceded by a band-pass arrangement and two tuned circuits.

Good De-coupling Needed

There is another very important point in all such conversion schemes as that we are discussing. Owing to the very much higher efficiency of the mains valves, there is a great tendency for unwanted feed-back to occur and it is absolutely essential in such conversions not only to use adequate detector decoupling (that already described for the "Build As You Learn" detector and two low-frequency set is adequate), but also a choke and condenser output, which I did not include in the battery set.

You will now be asking about grid bias. Mains sets do not include grid-bias batteries, because everyone wants to get *everything* from the mains. There is, however, no reason why one should not operate a mains set with a grid-bias battery, and actually it is the cheapest and most efficient way to do it.

This statement may come as a surprise to many, but you will see my point if you consider the facts for a moment. A 9-volt grid-bias battery, which is adequate for such a conversion set as we have described, costs but a few pence, and as the current drained from it is infinitesimally small, it will last for the best part of a year.

"Automatic" grid bias, which I shall describe in detail next week, requires a wire-wound resistance for each valve to which grid bias must be applied, together with at least a 1-microfarad condenser.

To give the very best results and avoid distortion grid-circuit decoupling must be used, and this calls for one more resistance and one more condenser in each stage. This grid decoupling is often omitted, but without it, theoretically at least, results as good as that obtainable with an 8-volt or 9-volt grid-bias battery are unobtainable. It will thus be seen that the total cost of fitting automatic grid bias is bound to be appreciably higher than that of a grid-bias battery.

Remember Ohm's Law!

Before we come to next week's lesson I want you to think over the fundamental principle upon which automatic grid bias is based. You know that according to Ohm's Law voltage, current, and resistance are related to one another. To send a certain current through a resistance requires a certain voltage. If we insert a resistance in the plate circuit of a valve, there is what we call a "voltage drop" through it.

Take for example a valve circuit consisting of the valve itself, the primary of a transformer, a high-tension battery, and a resistance, this last being connected to the cathode or emitting surface of an indirectly-heated mains valve.

So far as the grid circuit is concerned, we will assume that there are voltages being applied to the grid, and changes of voltage, therefore, occur across the transformer and are passed on to the next valve. Notice that every bit of plate current of this valve passes through not only the transformer, but also this special resistance joined to the cathode. I want you to note particularly the two points marked A and B.

Now if the bottom end of the grid circuit is joined to A or directly to the cathode, the grid bias will be just *nil*. If we insert a grid-bias battery at the point marked C we can, of course, make any grid bias we like.

As the whole of the plate current of the valve is passing through the resistance R, there must be a voltage drop across this resistance.

The path of the current through the valve with this resistance is such that A is the positive end and B the negative end, therefore B will be more negative than A. This being so, let us transfer the bottom end of the grid circuit from A or the cathode to B.

What will be the result? Think it out and you will see that the grid now becomes negatively biased, the amount of negative bias being dependent upon the strength of the plate current.

PERCY W. HARRIS.

On Your Wavelength!

SIGHT AND SOUND

I SUPPOSE nine people out of ten would say, off hand, that the eye is more sensitive in action than the ear, though in point of fact, the truth lies the other way round. It is not easy to make a direct comparison, because the two organs react to very different impulses, but it has been calculated that the average ear will respond to an energy-impact equal to that of the light from a candle eight miles away—which is more than twice the distance at which the same candle could be seen by the naked eye through perfectly transparent air. Yet, in spite of having so sensitive a "threshold," the ear is noticeably tolerant of certain forms of distortion, which is a lucky dispensation of providence for set-designers, who have quite enough problems to contend with as things are.

FILLING IN THE GAPS

FOR instance, the ear will often fill in notes that do not really exist, particularly at the upper and lower ends of the scale—whereby some loud-speakers get credited with more good marks than they actually deserve. On the other hand, the range of human hearing is known to be definitely inferior to that of certain animals who can hear sounds both above and below our own limits of audibility. This is probably part of the price we have to pay for the privilege of speech, which makes so keen a demand upon the ear for interpretations that it completely monopolises some of the aural nerves, and so in course of time has put them out of action for any wider purpose.

THE FACTOR OF SAFETY

IN photography the lens of a camera has a diaphragm which is adjusted according to the value of the light, and the control knobs at the broadcasting studio are handled with the same object applied to sound. In both cases the pick-up range is adjusted to cope with the largest sound or light, and the weak tones have to take care of themselves. The incorrect rendering of extreme volumes is not really a distortion, however, so long as the different values are reproduced in correct relation to one another. A good factor of safety in the receiver, in the shape of plenty of H.T., correct grid bias, good transformers and power valves, will take care of this.

REFLEX SETS

IN the early days of broadcasting the horrible sounds that emanated from some loud-speakers gave the whole game a bad name, and the cause of the distortions was invariably a reflex circuit. Reflex sets have been (rightly) out of popularity for some years and are probably unknown to *very* young wireless constructors. The most popular form of reflex circuit was the H.F.-detector-1L.F. type, in which the first valve was used for both H.F. and L.F. amplification. In the light of present practice, the use of such circuits for loud-speaker reproduction seems absurd. But, on the other hand, the small loud-speakers available then would probably not have done justice to anything better.

LIKE THE POOR—

THERE is one type of distortion that will always be with us, and, indeed, is highly desirable. However good loud-speakers and amplifiers become we shall always have amplitude distortion. Consider the terrific differences in the volumes of steam syrens, gun fire, and whispers; these differences might be expressed in values of hundreds of decibels. But in gramophone disc recording the volume range is about 25 decibels from the weakest to the loudest recorded sounds. Loud sounds are limited by the permissible width of the cut on the record and weak sounds are masked by needle scratch. Volume range is similarly reduced in broadcasting, but not quite to such a small range. In the reproduction of sounds in small rooms the reduction of volume range is essential, but in public address and cinema reproduction the extension of the present range is being sought.

DIRECTIONAL AERIALS

THE Empire broadcast transmitter uses different aerials for sending to various zones, and this recalls the fact that directional aerials were used by the B.B.C. in early days—for reception. The first American broadcast relay was accomplished with the aid of Beveridge aerials, 500 yards or so long, pointing *away* from the direction of the American station, KDKA. The first successful broadcast was made with the receiver installed at Biggin Hill aerodrome, Kent, and the aerial stretched from a hut across a main road to a field, where it was continued in a straight line at a height of only about ten feet from the ground. One stormy night the aerial fell down across wires supplying lighting to the aerodrome, making physical and verbal sparks fly.

Years before this, however, the Beveridge aerial had been used by an amateur in this country for the first reception of messages from American amateur transmitting stations. An American amateur came over specially to do the job, the "hams" over there believing that our men hadn't the receivers or necessary knowledge. Nevertheless, many messages were picked up by British amateurs with much less elaborate receiving sets or aerials. This happened only about twelve years ago! And now almost everyone has tuned in to telephony from America, while the morse messages of American amateur transmitters can be picked up by anyone with a short-wave receiver and a knowledge of the code.

NO TROUBLE REALLY

SOME readers tell me that they find H.T. accumulators rather a nuisance but I am inclined to think that those who do so have themselves to blame, as a rule. If you want to avoid trouble with an accumulator H.T.B., make a contract with a reliable charging station to call for it, say, once every six weeks, and stipulate that their attentions shall include topping up the cells with distilled water and greasing the connections. If you make such an arrangement, your battery never becomes more than half run down and it is always kept in excellent order. It is no more trouble than a dry battery, you don't suffer from falling voltage, and you are never troubled by noisiness. Don't forget too, that when your positives begin to show signs of wearing out you can have the battery replated usually for less than half the cost of a new one. Treat your accumulator H.T.B. well and it won't give you any bother.

PERSONALITIES IN THE WEEK'S PROGRAMMES

On Your Wavelength! (continued)

SHATTERING GLASSES

A GOOD many correspondents, I see, have been rather puzzled over the breaking of ornaments, glass lampshades, and so on when their loud-speakers were in action. The reason why this happens is simply that the fundamental frequency of the object in question is emitted strongly by the loud-speaker. The ornament, or whatever it may be, responds, and if this particular note is a long one the vibrations build up to such magnitude that it flies to pieces. Caruso was very fond of giving one demonstration of the power and the exact pitch of his voice. He would pick up a wineglass and flip it with his finger nail to ascertain its resonant frequency. Then he would sing the note into the glass, beginning very softly and letting the sound grow louder and louder. Presently the glass flew into fragments.

A PUZZLING CASE

THOUGH the actual shattering of treasured possessions by the loud-speaker is rare, one often does come across something in a room with a strong tendency to vibrate whenever its resonant frequency occurs. Some people hardly notice the effect of the "zizz" so produced, but to most of us it is quite distressing. I remember, some years ago, suffering from a resonance of this kind which took days to track down. I had installed the instrument with great pride, but its performances were ruined by a horrible response which seemed to come from one corner of the room. Everything that could possibly be responsible in or near that corner was removed at one time or another, but still the nuisance continued. Eventually I did track down the cause. It was a loose glass in a picture frame, and the noise was not coming from that corner at all in reality; it seemed to do so because of an echo effect.

ORDERS ARE ORDERS

THE Japanese, I observe with some interest, have been ordered by their Government to refrain from listening to any broadcast transmissions save those which emanate from their home stations. One of these, by the way, has the call-sign JOAK. And did you know that there was a Russian station RED? The purpose of this amazing decree is apparently to protect the Japanese from being contaminated by propaganda from outside, but I am rather wondering how the Government proposes to enforce it. Japanese wireless men are probably just as enthusiastic DX-ers on both the waves and the wavelets as we are, and I fear that it may be a case of that is an order—that was. Doubtless, though, there are conscientious citizens who will obey it to the full. I only hope that they will not mark their disapproval of the goings on of those who do listen to foreign station in the traditional Japanese manner. Over there, I understand, the strongest hint you can give a fellow that his conduct is not pleasing to you is to go and commit harakiri on his doorstep!

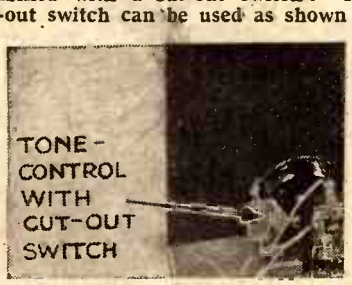
USING VARIABLE-MU'S

A GOOD many people, I find, don't know how to get the best out of the wonderful variable-mu valves responsible for the high-frequency amplification in their receiving sets. One of this valve's queer little ways is that the more you increase the negative grid bias, the smaller is its response to an unwanted signal upon a wavelength close to that of the wanted station. Suppose, now, that you are trying to separate the giant Breslau from its equally powerful next-door neighbour the Poste Parisien. Here is the proper way to set about the business. With the volume control at about the midway position and reaction almost, if not quite, at zero, tune in Breslau as nearly as you can. There is almost certain to be distinct interference from the French station. Now turn back the volume control (which has the effect of increasing the negative grid bias) until the Post Parisien disappears. By this time, Breslau will have become in all probability nothing better than a small faint bleat. This is where reaction comes in. Work up Breslau's strength by careful use of the reaction knob, turn the volume control if necessary still further towards the minimum position, and you will be able to bring him in without any interference at all from Paris. The degree of selectivity obtainable by working the volume control against the reaction control is astonishing with variable-mu's.

"JUMPERSPHERICS"

I HAVE made in my time most of my own wireless bits and pieces, not even excluding low-frequency transformers and a loud-speaker. But until the other day I don't think that I had ever manufactured my own atmospherics. Now I can claim to have done that; and quite a useful crop of tearings and crashings, too. I had been at work for some time in the lab., and after a very chilly start the day warmed up considerably—so considerably that the pullover I was wearing was clearly no longer required. I peeled it off, standing, as I did so, quite close to the down lead of an indoor aerial whilst a biggish set was at work. You just ought to have heard the atmospherics that resulted! You know how a woolly crackles when you pull it off over your head; if you do so in the dark you can often see quite a display of sparks. Each of these little discharges produced its own "jumperspheric," and the response from the loud-speaker was truly magnificent.

Have you tried fitting one of the new variable resistances or potentiometers combined with a cut-out switch? The cut-out switch can be used as shown to



disconnect a tone control from the circuit. Or, in the case of variable-mu valves, it is handy to disconnect the potentiometer which supplies the variable-mu bias

THE PENDULUM SWINGS

THE coming of both simple Q.P.P. and Class B looks like bringing about a very peculiar position in the world of wireless. For the past year or two mains sets have had it all their own way in the matters of quality and volume, and the battery set has had to follow a good long way behind. The ambition of every battery-set user has been to possess a mains receiver. But it now seems to me that the battery set may actually be a better performer than the mains set, chiefly on account of the dead silent background. Running costs will, of course, remain higher for battery sets than for mains sets; but, owing to the small amount of H.T current consumed by the former under the new conditions, they will not be very serious. A strong point about the battery set is that you can use it anywhere. Further, there is always the problem of the freak voltages and the freak frequencies in A.C. that are still found in so many parts of this country of ours. And as for D.C.—well, this is sometimes so rough that it is an exceedingly difficult matter to obtain even respectable reproduction. I foresee a huge business this year in both constructors' and ready-made battery sets.

TREATING 'EM ROUGH

IT is amazing to find what the modern set will stand in the way of rough treatment. It doesn't receive it purposely, but accidents will happen even in the best regulated families. The other day my plan for returning a set that had been lent to me for test purposes came sadly unstuck. I rather pride myself on the care that I take about returning such apparatus. Having packed it up snugly, I drove it down to the station, selected the trustiest of porters, and saw it safely installed in the carriage. Arrived in London, I hailed a porter, asking him to put the set into a taxi and telling him to handle it with the utmost care. He picked it up as if it had been made of the finest glass and walked delicately towards the waiting taxi. Then his feet, somehow, got tangled up, and next instant the set had dropped flat on its face with the most resounding of crashes on the cold, hard platform. Almost in tears, I conveyed it to its makers and watched its unpacking. Except for one small scratch on the cabinet, it was in perfect order!

THERMION.

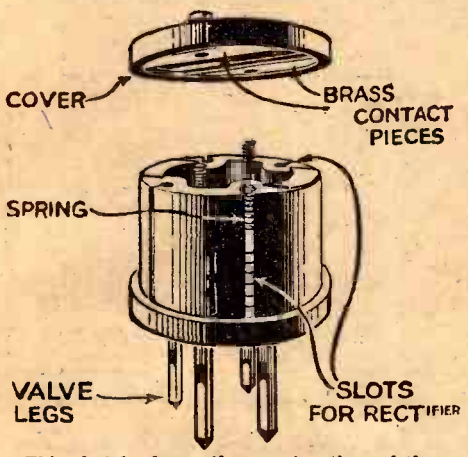
METAL RECTIFIERS INSTEAD OF VALVES

A new type of detector based upon the principles of the metal rectifier is now available which under certain conditions, can replace the valve. In this article J. H. Reyner describes the device and explains its uses.

A COMPONENT which may have a considerable influence on the design of wireless sets next season is just making its appearance and will shortly be available to the public. This is the metal detector which, as its name implies, is a metal rectifier specially suitable for high-frequency currents.

The ordinary metal rectifier is now a very familiar product in A C. sets. It consists, as most readers know, of a series of discs made of copper. One side of the disc is treated in a furnace so that it becomes coated with a film of oxide, and it is then found that if two such discs are placed in contact the arrangement will only conduct current in one direction. If the voltage is reversed the amount of current which flows is less than one-thousandth of the original current.

The ordinary rectifier is built up by using



This sketch shows the construction of the new rectifier. The rectifying units are contained in slotted holes and are held in contact by means of a light spring

a series of discs of this sort mounted up in a pile. In order to preserve an intimate contact between one disc and the next, small washers of lead are included between the individual discs and the whole is clamped up under pressure, forming a very solid and robust unit.

Apart from the mains use of this type of rectifier small units have been used for some time for instruments. These rectifiers enable an ordinary D C. moving-coil meter to be used on alternating current measurements and tests have shown that the rectification is satisfactory up to frequencies of 5,000 and 6,000 cycles per second. Beyond this point, however, the efficiency begins to fall off somewhat rapidly and any attempt to use the ordinary rectifier at radio frequencies is unsuccessful.

The reason for this is that the capacity of the rectifier, as a whole, is too large, and we have in effect a small capacity shunted across the terminals. Now the rectifier has a certain resistance, several hundred ohms in actual fact, and at high frequencies the impedance of the self-capacity is considerably less than the actual resistance of the rectifier

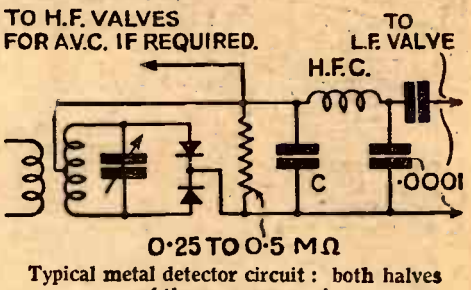
The result is that the currents prefer to go through the self-capacity and therefore do not pass through the rectifier at all. Consequently there is no D.C. voltage produced and the rectifier simply does not function.

The New Rectifier

Following this line of research the Westinghouse Laboratories evolved a form of metal rectifier in which the discs were considerably reduced in size. Instead of a diameter of ¾ inch or more, these discs are now made only ⅛ inch diameter. The thickness of the lead spacers between the discs is also increased which again reduces the capacity between the discs and by mounting the discs in this way it is possible to obtain a rectifier which operates satisfactorily on frequencies of a million a second and more. This, of course, is not the whole story, but it indicates the two principal points of difference between the "Westector," as it is called, and the ordinary metal rectifier.

This form of rectifier can be made up either as an ordinary single-wave rectifier or as a double-wave or bridge rectifier. In the former case the rectifier is very similar to the ordinary crystal detector. Its use is the same in that it is connected in series with the telephones or a suitable resistance or transformer, across the tuned circuit. It then operates in much the same way, but it has the important advantage over the crystal that it is constant in its operation and is not thrown out of adjustment by vibration or similar happenings. There is, in fact, no adjustment for the best point. It is always working at full efficiency

It is just as easy, however, to arrange double-wave rectification with this device. A suitable circuit is shown by the diagram in which a centre-tapped circuit is used. Alternate half-waves are rectified by the top and bottom rectifiers in turn, and this system has important advantages. One of the big difficulties with the ordinary detector, whether it be metal or valve, is that of disposing of the radio-frequency currents after they have been rectified. At the rectifier the process of detection separates out the low-frequency modulation from the high-frequency carrier, and the radio-frequency currents are no longer required. We must provide an easy path for these currents, as otherwise they will



Typical metal detector circuit: both halves of the wave are used

leak through into the low-frequency stages and cause distortion or tendency to self-oscillation.

Unwanted H.F.

Now this unwanted high-frequency current is rather similar to the ripple which is obtained in a mains eliminator. Following the rectifier we place a reservoir condenser, and the pulses of rectified alternating current which come through the rectifier charge up this condenser, which thus acquires a more or less steady voltage with only a small ripple on the top. Without the reservoir condenser the ripple would be much larger.

We can use exactly the same procedure here at radio frequencies. We use a small reservoir condenser following the rectifier, as shown at c in the diagram. This absorbs the high-frequency ripple to a very large extent and in many cases no further filtering is necessary. Even if a little high-frequency is still left it is only necessary to use a small and inexpensive high-frequency choke with a .0001 by-pass condenser to eliminate the high-frequency current almost entirely.

There are numerous other applications of this detector. One of the most important is that it may be used to provide voltage for automatic volume control quite easily, its connection in this case being somewhat similar to that of the ordinary diode valve, but it is, of course, considerably cheaper, not only in first cost, but also in running.

The damping introduced into the circuit by the use of this detector is, of course, appreciably greater than that of the ordinary detector, due to its comparatively low resistance. This same objection, however, applies to the diode detector which is becoming so popular.

CUTTING OUT NOISES

This helpful article gives some new methods of eliminating noises which are heard in a set as a result of stray H.F. and mains interference

Flashing Signs—a bug-bear of reception.

STRAY noises come into a set, no matter whether it is mains or battery driven, as the result of external high-frequency interference.

Battery sets can be affected by H.F. or

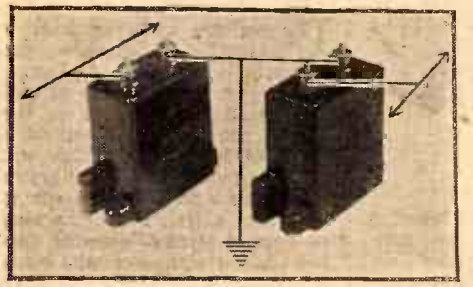


Fig. 1.—A simple split condenser arrangement which can be inserted in a mains supply to filter out stray H.F. A centre-tapped condenser can be used in the same way

even L.F. disturbances on adjacent power cable wiring running close to the set or aerial. Mains sets, of course, are much more liable to pick up this interference.

When a set starts humming or crackling—and the fault is found to be due not to any bad connection in the set itself—external sources of interference (neon signs, motors and so on) mustn't be blamed until you have made sure that you have done everything to cut out interference at the set end.

A mains supply to a set forms a workable aerial and it is often on this section of the wiring, rather than on the aerial itself, that stray H.F. is induced into the set. This applies to H.F. or L.F. strays in the wiring as a result of power cable deficiencies, and to neon sign, clicking contact and motor interference which is induced on the lines.

The first step is to filter out the H.F. at the mains end of the wiring. First you can try putting large fixed condensers across the mains leads to the set as shown in Fig. 1. The centre point of the condensers is taken to earth.

This is quite a good hint as, in many cases, you will find it an advantage to disconnect the earth wire from the set itself (using a counterpoise or a shielded aerial arrangement, as will be described later) and the earth wire can then be connected to the join point of the condensers. 2-microfarad condensers capable of standing to voltage surges on the mains should be used **and the condenser arrangement must be connected on the set side of the fuses** so that if there is a breakdown the mains side of the wiring won't be affected.

An arrangement which is particularly effective on direct current supplies is shown by Fig. 2, where an additional smoothing choke is placed in one side of the mains wiring (the earth side if one side of the mains is earthed) and a 2-microfarad condenser is connected between the other mains lead and earth. Or you can use the choke in conjunction with the split condenser arrangement shown by Fig. 1.

This often makes a great difference to mains ripple which is so troublesome on D.C. supplies. Post Office engineers who have tested D C. supplies, find the following is the maximum allowable ripple in a 200-volt D C. supply at various frequencies under various reception conditions.

Reception Conditions	*Frequency of Ripple in Supply*		
	50	300	600
Silent periods	96	62	150
Normal speech	96	138	150
Soft music passages	107	150	150
Loud passages	128	150	150

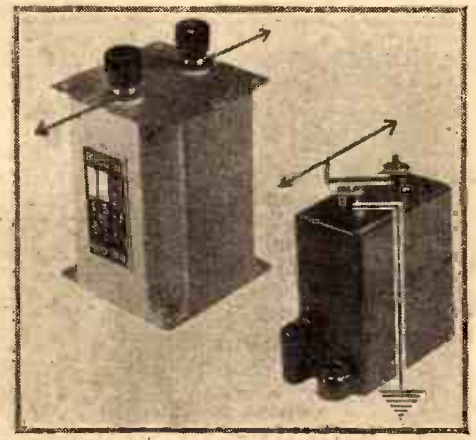


Fig. 2.—A choke and condenser filter circuit which is of especial value in D.C. supplies. A choke can be used in both mains leads if necessary, and the split condenser arrangement of Fig. 1 added

Voltage surges cause trouble in mains-driven sets and on a bad supply may even cause the breakdown of condensers in the smoothing circuits. A series resistance can be used to reduce the overall mains voltage but a simpler plan is to run a lamp in parallel with the wiring to the actual plug point of the set. In

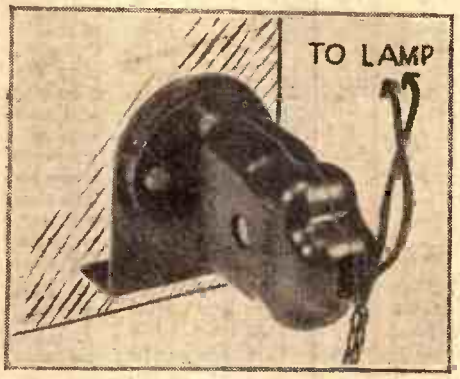


Fig. 3.—With certain badly-regulated supplies it is an advantage to run a lamp in parallel with the set to minimise voltage surges. A reading lamp may be used, or a small bulb can be wired as a pilot light

certain cases the easier path provided by the lamp filament has the effect of absorbing surges. The scheme need not be wasteful as a small high-voltage lamp can

Fig. 4.—These are the connections for a shielded aerial arrangement to cut down interference at the H.F. end of the set. The outer casing of the shielded wire is connected to the earth terminal. No actual earth wire is used. This special wire is now obtainable in this country

be used as a pilot light, or an ordinary bulb used in a reading lamp. (Fig. 3).

Shielded aerials are used by Post Office engineers in extreme cases of interference, where the induction is caused by the aerial. Until recently, the special shielded wire needed for an effective arrangement like this has only been available on the Continent. Now, shielded lead-in wire, suitable for the job, is made by one British firm.

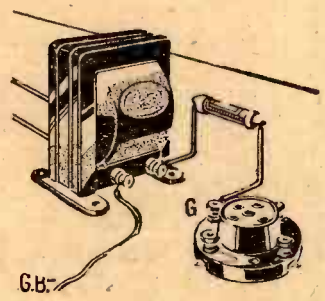
The aerial wire passes down a core of insulators over which a flexible metal covering is woven. A length of this wire should be used as an aerial. The centre wire is connected through a preset condenser to the aerial terminal on the set as shown in Fig. 4.

(*Continued at foot of next page*)

That Radio Dodge

PREVENTING H.F. STRAYS

IF you put a grid leak of about ¼ megohm between the grid terminal of a low-frequency transformer and the grid of the L.F. or power valve following the detector (in place of the direct wire connection) you can often cut out instability. This is almost as effective in some cases as putting an H.F. choke in the primary winding of the transformer. The self-capacity of the transformer disperses the stray H.F. currents and they are prevented from entering the low-frequency stage by the resistance in the grid circuit. The tone is not affected by putting the leak in this position, though it is, of course, if the leak is placed across the secondary winding.



MOUNTING A CONDENSER

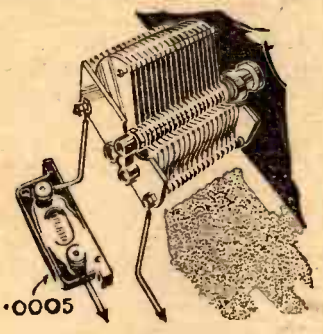
IF you have a three-hole fixing condenser, but have lost the template, here is a method for finding the position for the fixing holes. First drill the spindle hole and one fixing hole. The position of this can generally be estimated fairly accurately. Then fill the other two mounting stubs with vaseline. Mount the condenser with one screw and screw it tightly. This will pull the other two stubs tight to the panel. When the condenser is removed, two grease rings will indicate the position of the other two holes.

TERMINAL BUSHES

NOW that chassis-type sets are popular, terminal bushes are in great demand. A good way of making your own is as follows. Cut a piece of ebonite tube to fit over the terminal shank, having a bore just larger than the shank, and about ¼ in. long. Plunge this in boiling water for a few moments, fit over the shank and screw home as quickly as possible. The ebonite will be rendered quite soft by the heat and the ends will splay out, effectively insulating the terminal.

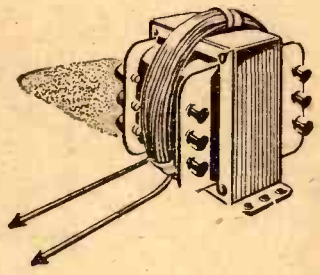
FOR SHORT WAVES

IF you have a broadcast-band set which you want to convert for short-wave operation, it is generally advisable to have short-wave condensers for the tuning controls. These have a lower maximum capacity, but owing to the characteristics of the short-wave circuit they cover the full tuning range and are much easier to operate than the ordinary .0005-microfarad tuning condensers. If your set conversion is only a temporary one, though, you needn't scrap the .0005's. Just put a fixed condenser of .0005 microfarad in series with each tuning condenser. This will cut down the maximum capacity and make it much easier to tune the outfit on the short waves.



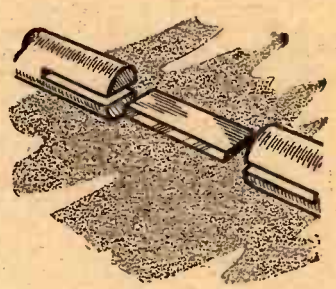
LIGHTING A PILOT BULB

IN a mains set you can often get a suitable low-tension supply for a dial lamp even if there is no low-tension winding on the mains transformer. An external low-tension winding can be fitted by just winding a hank of wire outside the transformer. If the transformer is not shielded there will be an external field which will create a sufficient voltage for the dial lamp. Fairly stout wire of about 24 gauge should be used and the number of turns depends on the primary winding of the transformer and the distance between the primary and this additional secondary winding. Start off with a dozen turns bunched closely together and wind on more if necessary until the pilot lamp (3.5-volt screw-in type) gives a sufficient light.



SLIPPING COIL SWITCHES

GANGED coil switches sometimes slip if not coupled firmly together. Then one set of coil contacts remains open while the others are closed. If the coupling link between rotary switches consists only of a tubular piece with grub screws, a slip may occur unless the screws are tight. A good plan is to fit a positive link as shown in the accompanying sketch. File slots in the ends of both coil-switch rods and cut a flat piece of sheet brass to fit in the slots as a link piece.



MICROPHONIC VALVES

IF you are suffering from a "pongy" detector valve, the following is a simple but effective cure. Just stick a piece of well masticated chewing-gum on the top of the valve and embed a piece of lead in it. This will damp out vibration almost before it has time to start, except in very bad cases. Plasticine may be used in place of chewing gum but Chatterton's compound is not recommended. It has to be applied hot and the heat of the iron is liable to break the bulb.

"CUTTING OUT NOISES"

(*Continued from preceding page*)

The outer covering of the shielded wire is taken to the earth terminal of the set and the normal earth is disconnected. **No actual earth should be used, but if the set is mains driven, an additional precaution can be effected by taking the earth wire to the split condenser arrangement of Fig. 1.**

It is worth while taking a little trouble to filter out stray H.F. in the mains supply. Post Office experts state that the high-frequency potential imposed on house wiring in this way may be only a few microvolts, **but the interference experienced can be as strong as the signal received from a 50-kilowatt transmitter, 30 miles away!**

Other means of inducing interference aren't so direct. For instance, experience shows that motor interference rarely extends to a greater distance than 200 yards. This has the advantage that if you suspect a noisy motor of causing interference with your reception you can generally trace the motor and the owner. A split condenser arrangement across the input to the motor terminals, as shown by Fig. 5, is generally successful.

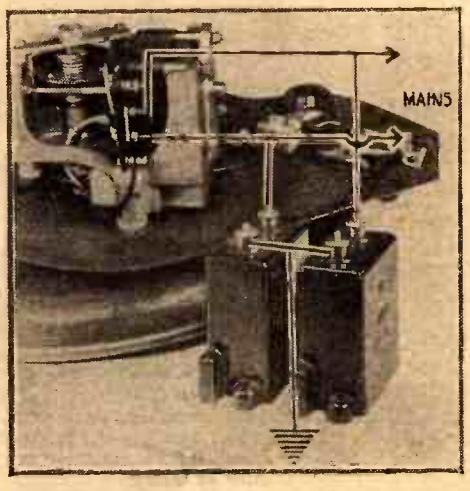


Fig. 5.—A split condenser arrangement can be connected across the terminals of a "noisy" motor to reduce the H.F. interference.

The City of Birmingham Orchestra will be heard twice on March 25, relayed from the Town Hall. In the afternoon their Children's Concert includes Elgar's Second "Wand of Youth" series and in the evening there is a plebiscite concert under the direction of Leslie Heward.

In the Peto-Scott announcement in last week's issue, the price of the Pilot Structakit for the "James Push-Push Three" was incorrectly given as 10s. 6d. This should have read 6s. 6d.

OUR BROADCAST CRITIC ON AN EVENING RECITAL

LAURI KENNEDY

I APPRECIATE the value of hearing something beautiful last thing at night. I have always imagined I understood what made Chopin write nocturnes, and have always enjoyed going to Queen's Hall for an evening symphony concert, even though the train journey home has often spoilt the effect. When I hear something really artistic last thing at night *in my own home* the effect has always been the same; a contemplation of wireless as a great psychological power.

One night (during the present week of writing) Evelyn Scotney and Lauri Kennedy gave a joint recital. I do not remember having enjoyed anything more for a considerable time. Miss Scotney's voice possesses all the qualities requisite for perfect radio transmission. I would rather hear her than anyone who I can call to mind at the moment. It is a big thing to say, because there are so many that are good, but I say it because I honestly think it.

Miss Scotney was wise to choose good but lightish songs. Her voice was so clear, and tonally beautiful, that I found myself wishing I could write down a list of all the songs and arias which appeal to me—the list would be rather lengthy, I fear—and "make" her sing them all. That thought came to me as she sang *Solveig's Song*, which I never heard sung as she sang it. Having thus extolled her undoubted great qualities (those of a perfect soprano voice coupled to considerable power of interpretation) I am going to say one other thing—and quite frankly. *Her diction is not good enough.* Only one word in four came through the other night. Now, in case she (or anyone else) might be inclined to suggest that the fault lay in my set, or the transmission, or both, I point out that less than an hour previously, I heard a vaudeville artiste, who would not pretend to have a tenth of Miss Scotney's tone, sing three songs of the vaudeville type. Her words were absolutely distinct. If I need to add anything further on this subject, so far as Miss Scotney is concerned, it would be to tell her that, although I *knew* the words of *Solveig's Song* I could not hear them. I want her to remedy this one fault. When she does so, she will be the perfect wireless soprano.

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Lauri Kennedy's playing always appeals to me. He has often given me pleasure at Queen's Hall when he has had some fragmentary melody as a solo in a symphony. His tone in Kreisler's arrangement of Dvorak's *Indian Lament* seemed to suit my loud-speaker extraordinarily well. I should like to hear him play a 'cello concerto in one of the Sunday night symphony concerts. Will somebody ask him to do so?

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Variety, I have come to the conclusion, must be divided into three distinct classes. They are Vaudeville, Boredeville, and Funeraudeville. We had a Boredeville on Thursday night. It would have been a Funeraudeville had not Alec Shaw and Gillie Potter saved it between them. Alec Shaw imitated the songs of the birds in such a way as to beat the birds at their own game. The nightingale at the end of this amazing recital was absolutely to life. The good Gillie gave us a splendid satire as a judge trying a case of an offender against the Shops Closing Act. Some of it was very smart.

As I have said, they saved the show which, otherwise, was more than a little boring. The Hulbert Bros. not appearing, Harry Tate came instead. All I will do is to quote his funniest lines. Mr. Tate told somebody to go to the post office with a label and tell them to tie a parcel to it. That made me laugh so much that I nearly missed the other. A man was described as coming up the stairs two at a time. Mr. Tate asked why. What *do* you think the reason was? (I can scarcely write the words for laughing, even now). *It was because it was quicker than coming one at a time.* There now. Isn't that a scream?

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Huntley Wright's songs were what one would expect from him. Quite enjoyable, but the first one had ten verses too many.

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The Eden Phillpotts play *The Point of View* had good points about it, certainly, but the dialogue was rather heavy-going and I regret to say I found my attention wandering. For some reason "entirely out of our control" (I quote the Announcer) the second play *The Carrier Pigeon*, by the same author, was not performed. The revival of the play about salesmanship, which took its place, is one I should not criticise, I think. It was obviously rushed on at the last moment. I imagine without rehearsal.

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Schnabel's playing of the *Emperor* Concerto of Beethoven created the usual deep impression. Those who have followed him know what to expect. Another point about that concert was Adrian Boult's handling of Mozart's *Jupiter* Symphony. One or two musicians have told me how much they enjoyed it. I agree.

A Popular Series

The series of historical entertainments called "As It Might Have Been" ought to be popular—at least, to those who are remotely interested in history. I did not hear the first of them, but I enjoyed the second. The year 1783 was a good one to choose because so many interesting people were living in London about that time, such as Dr. Burney, Sir Joshua Reynolds, Dr. Johnson, Horace Walpole and Nathaniel Wraxhall. Incidentally, I recognised the voice of Ronald Simpson in the last-named part. It was amusing and also not a little instructive, to be reminded that an overture of "Mr." Haydn was being performed for the first time in England, and that the new "forte-piano" had recently taken the place of the usual harpsichord. To hear Mozart regarded as a very modern type of composer was another good point. I have always held the opinion that real characters are far more interesting in plays or shows of this sort than fictitious characters. Within reason, we cannot have too many historical subjects treated, so long as they are accurately treated. There was not much wrong with the facts in this show. I look forward to the next.

WHITAKER-WILSON.

PROGRAMME POINTERS

More than one concert has been spoilt recently by its programme containing both classical music and ultra-modern music. It seems to me that, as ultra-modern music has broken away so definitely from music written in the classic and romantic periods, the change of thought is too virile to be artistic. Programme-making is a psychological activity at the best of times; it is not merely "contrast at all costs." This refers as much to chamber-music concerts as it does to symphony concerts. To listen to music of the dissonant type requires an effort not everyone is inclined to make, especially those who are devotees of the classical Masters. As broadcasting is so universal it should express its catholicity of taste by giving everything, but only in a suitable position. It is one thing to give everything over a period; it is another to mix everything up together.

The A.C. Mains MELODY RAN

HERE IS THE MAINS MODEL OF THE FAMOUS "MELODY RANGER"—THE SET WHICH COVERS FOUR WAVEBANDS AT THE TOUCH OF A SWITCH AND MARKS SUCH AN ADVANCE IN DESIGN

DESIGNED BY S. RUTHERFORD WILKINS

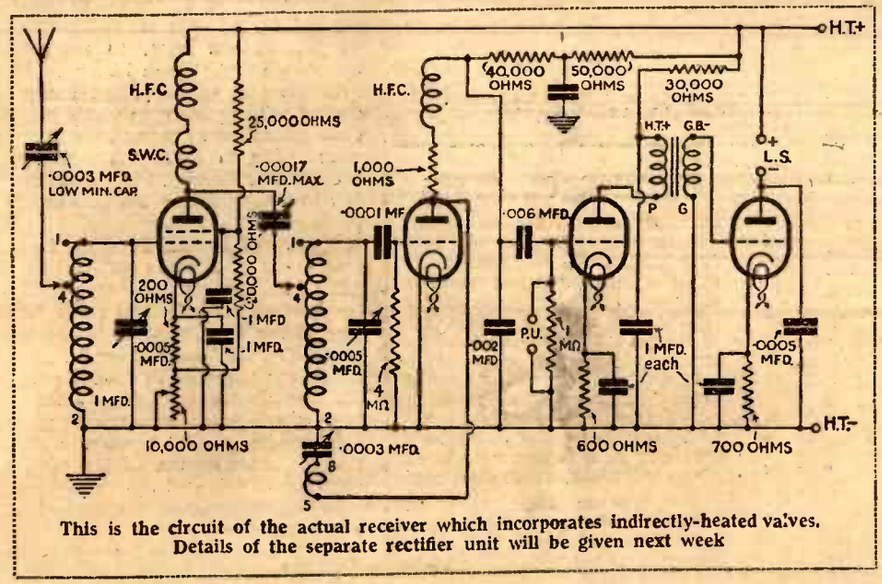
NOW you can build a "Melody Ranger" that not only has all the wonderful attributes of the all-wave set first described in AMATEUR WIRELESS dated January 28, 1933, but that can be worked entirely from the A.C. mains. This latest version of our wonder set is bound to be very popular with all those who are on an A.C. supply, for the all-electric model illustrated in these pages does away with the high-tension, the low-tension and even the grid-bias batteries.

SIMPLE ALTERATIONS

In effect, the alterations to the original set as first described are simple enough, if you understand the essential differences between a battery-operated set and one that derives its power from the electric-light supply.

As Mr. Percy W. Harris is explaining in his new series of articles on Practical Mains Working, the really big difference is in the arrangement of the filament circuits. Instead of the negative side of the filaments forming the earth connection of the grid circuits, we make use of the cathodes of indirectly-heated valves. These cathodes in mains valves do, in fact, correspond in connection to the negative side of the ordinary battery filaments.

The first alteration is therefore to use valve holders that will take the five-pin mains valves in place of the holders originally used for the four-pin battery valves. The work of altering the original "Melody Ranger" is mostly in the re-wiring of the valve holders, as shown by the blueprint and other illustrations.



This is the circuit of the actual receiver which incorporates indirectly-heated valves. Details of the separate rectifier unit will be given next week

GRID BIAS

One point of special importance is that in a mains set grid bias is obtained in an indirect way from the high-tension supply and not from an entirely separate source of voltage as in a battery set.

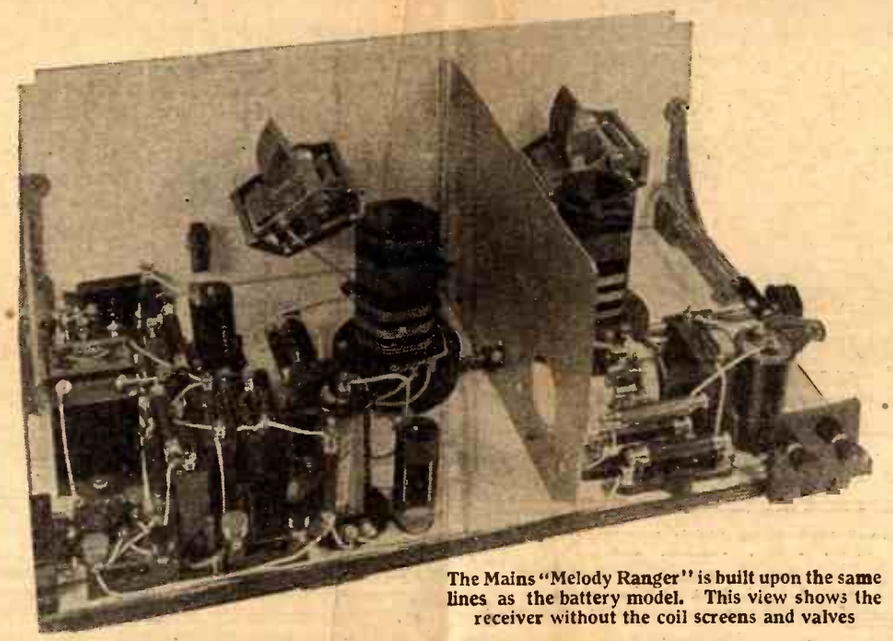
To obtain this grid-bias voltage we insert bias resistors between the cathodes and the high-tension negative side of the anode supply.

Across the bias resistors it is necessary to shunt—that is to connect in parallel—fixed condensers of suitable values.

While on this subject of bias resistors it will be as well to draw attention to certain exceptions. Take the detector valve, for example. This works on a zero grid voltage and does not therefore requireany negative bias resistor as with the low-frequency-amplifying valves.

The detector grid leak is connected to the cathode and this in turn is connected to earth. An A.C.-mains detector works at zero grid volts for efficient detection, and in this differs from the battery valve that needs a slight positive bias.

In the electrified version of the "Melody Ranger" only the last two valves have the bias resistors, as the detector does not need one and the variable-mu high-frequency valve has a variable negative bias applied by means of a potentiometer network across the high-tension supply.



The Mains "Melody Ranger" is built upon the same lines as the battery model. This view shows the receiver without the coil screens and valves

WITH THE "MELODY RANGER" YOU CAN LISTEN TO THE WO

NGER

12 TO 2,000 METRES AT THE TOUCH OF A SWITCH

We should explain that this negative bias on the variable-mu is actually obtained by producing a progressive change in the positive bias on the cathode of this valve. This comes to the same thing as providing a negative bias on the control grid.

The values are so chosen that although a variable negative bias is, in effect, obtained from the control grid, the voltage on the screening grid of this valve is constant.

CIRCUIT MODIFICATIONS

Apart from the changeover from battery to mains valve holders, there are one or two other necessary circuit alterations in the original "Melody Ranger." There is, for example, a .0005-microfarad fixed condenser connected between the anode of the output valve and earth. This improves the smoothness of the reaction.

Adequate de-coupling is probably the most important circuit feature of any mains set and in the revised "Melody Ranger" this important business has received very careful attention. You will note that the detector anode circuit is now de-coupled with a 50,000-ohm resistance and a 2-microfarad fixed condenser.

So much for the chief alterations to the original set as first described for battery operation. In addition to these alterations, which are, of course, designed to eliminate the grid-bias battery and the accumulator, we must consider the high-tension supply.

So far as the external accessories are concerned we have to provide the apparatus for the elimination of the high-tension battery. The high-tension voltage, most of which is for the anode supplies, but part of which, by means of the bias resistors, is for the grid bias of the valves, is obtained from the A.C. mains by a valve rectifier.

We shall describe this unit in detail next week. For the present all we need explain is that between the mains supply and the rectifier is a mains transformer. The primary of this is connected to the mains and there are three secondaries.

One is for the filament supply of the rectifying valve and the second is for the filament heating of the indirectly-heated valves in the set. The third is for the high-tension voltage.

Between the rectifier and the output terminals of the unit there is a smoothing circuit, which consists of a choke with electrolytic condensers. There is another condenser to eliminate what is known as modulation hum.

THE UNIT'S OUTPUT

This unit supplies the set with a maximum output of about 250 volts at 40 milliamperes, which means there is ample power in hand required for the valves actually in the all-electric version of the "Melody Ranger."

Taking a general view of the new "Melody Ranger," it is, of course, clear that with the indirectly-heated mains

The "Melody Ranger" is a handsome instrument, designed to give the greatest efficiency. The lower part of the cabinet contains the actual receiver, and the loud speaker and mains unit are in a separate compartment above

A 12-2,000 METRE SET—MAINS OPERATED (Continued from preceding page)

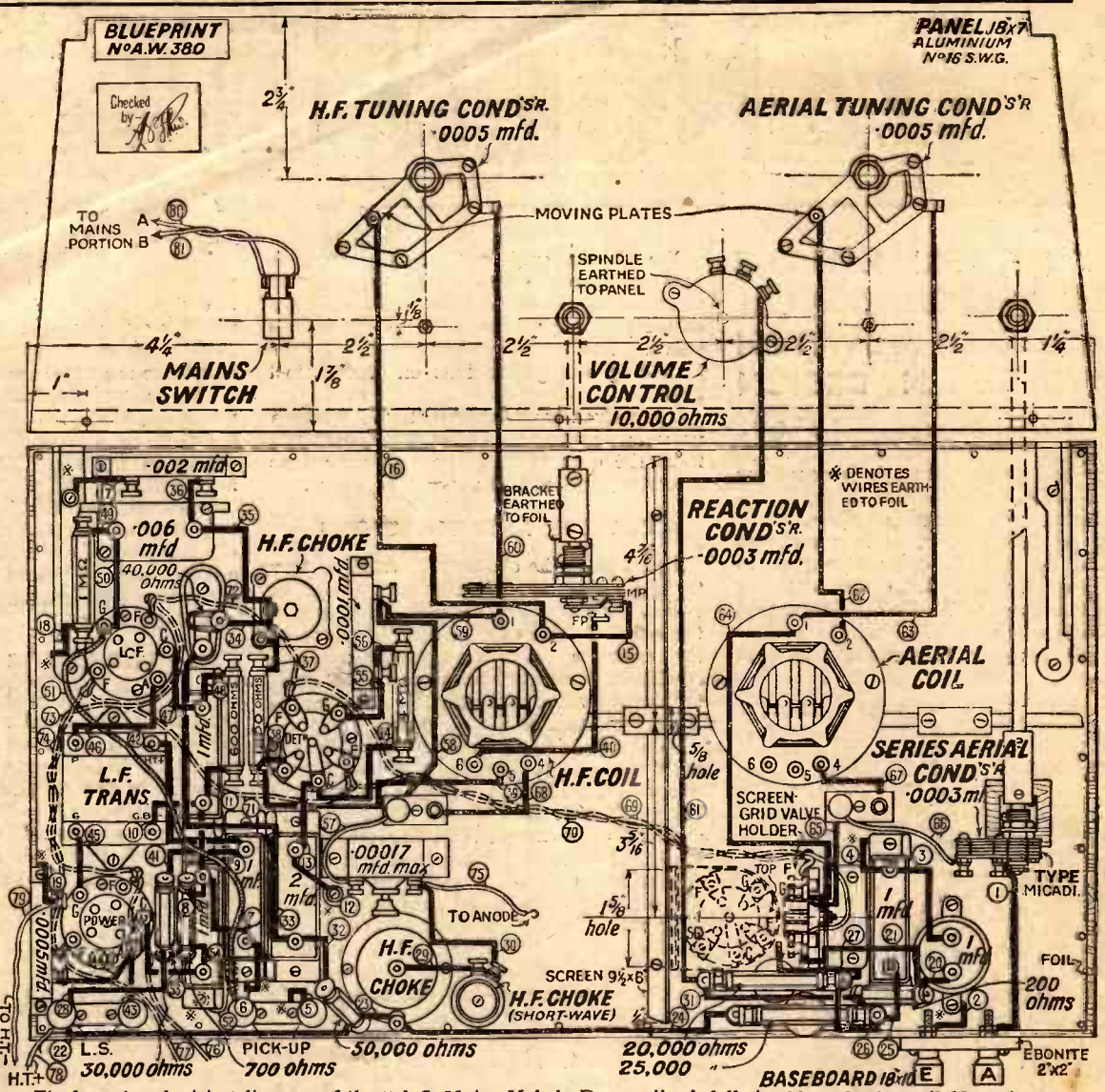
valves the overall performance is superior to the battery version. In what exact manner this superiority is shown in practice may not be clear to all readers.

For one thing, the sensitivity to weak signals is greater. Stations that are almost inaudible on the battery version may come in at good strength on this all-electric version. This applies especially on the short waves, where the extra amplification of the mains valves is heard to very great advantage.

Another way in which this mains-operated "Melody Ranger" scores is in the greater power output. There is about 750 milliwatts undistorted power handed on by the fully loaded power valve to the moving-coil loudspeaker. This, with the specified speaker, corresponds to very considerable volume.

As a fairly economical power valve has been fitted the overall running cost of the "Melody Ranger" when worked from the mains is very low indeed. The total power taken from the mains is between 20 and 25 watts, which is less than a single electric-light bulb.

DETAILS OF THE MAINS UNIT NEXT WEEK



The layout and wiring diagram of the "A.C. Mains Melody Ranger." A full-size blueprint is available, price 1/6

COMPONENTS REQUIRED FOR THE "A.C. MAINS MELODY RANGER"

CHOKES, HIGH-FREQUENCY
1—H.F. choke (Wearite, type H.F.O., Lewcos, or Ready Radio).
1—H.F. choke (Slektun standard, Graham Farish, type LMS, Lissen astatic, Lewcos, Ready Radio, Goltone, Varley, Tunewell, Climax, R.I., Wearite).
1—Short-wave H.F. choke (Igranic type CHORT, Wearite, Goltone, Slektun).

COILS
Two special coils complete with two couplers and extension rods (Lissen).

CONDENSERS, FIXED
1—.0001-mfd. fixed condenser (Lissen, Dubilier, T.C.C., Telsen, Graham Farish, Goltone).
1—.002-mfd. fixed condenser (Lissen, Dubilier, T.C.C., Telsen, Graham Farish, Goltone).
1—.0005-mfd. fixed condenser (Lissen, Dubilier, T.C.C., Telsen, Graham Farish, Goltone).
1—.006-mfd. fixed condenser (Lissen, Dubilier, T.C.C., Telsen, Graham Farish, Goltone).
4—1-mfd. fixed condensers (Telsen, Dubilier, Lissen, T.C.C., Goltone, Igranic).
1—1-mfd. fixed condenser (Dubilier, type 9200, T.C.C., Telsen, Igranic).
1—2-mfd. fixed condenser (Telsen, Lissen, Dubilier, T.C.C., Igranic, Ready Radio, Goltone).

CONDENSERS, VARIABLE
2—.0005 tuning condensers (J.B. type JL6, Polar No. 3 with phosphor bronze balls, Utility).
1—.0003-mfd. series aerial condenser (Ready Radio special low minimum type Micadi).
1—.0003-mfd. reaction condenser (Ready Radio, type Micalog).
1—.00017-mfd. pre-set condenser (Lissen, Ready Radio, Sovereign, Goltone).

DIALS
2—Slow-motion (Igranic, Indigraph type YINIL, Utility type W181).

HOLDERS, RESISTANCE
1—Vertical mounting holder (Graham Farish).
2—Horizontal mounting holders (Graham Farish).

HOLDERS, VALVE
1—Low-loss screen-grid 5-pin valve holder (Ready Radio, type SG short-wave, or Eddystone).
1—Low-loss 5-pin valve holder (Ready Radio, type short-wave baseboard, or Eddystone).
2—5-pin valve holders (Ready Radio standard, Lissen, Tunewell, Telsen, Igranic, W.B., Graham Farish, Lotus, Goltone).

PANEL AND BASEBOARD
Aluminium panel, drilled and cut to specification, 18 in. by 7 in. (Peto-Scott or Ready Radio).
Baseboard covered with foil, 18 in. by 10 in. (Peto-Scott or Ready Radio).
Aluminium screen, drilled to specification, 9½ in. by 6 in. (Peto-Scott or Ready Radio).

RESISTANCES, FIXED
One 200, one 600, one 700, one 1,000, one 20,000, one 25,000, one 30,000, one 40,000, one 50,000, one 1-megohm, one 4-megohm fixed resistances (Graham Farish type Ohmite, Erie, Dubilier, Goltone, Claude Lyons).

SUNDRIES
Pair of panel brackets (Peto-Scott, Bulgin, Burton).
Complete extension equipment and mounting brackets (Ready Radio).
Four yards thin flex (Lewcoflex, Goltone).
Connecting wire and sleeving (Lewcos).
Piece of ebonite 2 in. by 2 in. (Becol).
Two coil tap mounts complete (Peto-Scott, Bulgin), or four ¼-in. sockets (Belling-Lee); piece of ebonite 2 in. by ½ in. (Becol).
Knob for volume control (Bulgin, type K6).
Two terminal blocks (Telsen, Lissen).
1 foot single screened cable (Lewcos).

SWITCH
1—Mains on-off toggle switch (Bulgin type S80, Claude Lyons, Igranic, Tunewell, Utility, Ormond).

TERMINALS
2—Terminals, marked Aerial, Earth (Belling-Lee, type R, Eelex, Bulgin).

TRANSFORMER
1—Low-frequency (Varley Nichoke II, Lissen, R.I. Di-Feed, Telsen, Multitone, Bulgin, Slektun, Ferranti, Tunewell, Wearite, Lewcos).

VOLUME CONTROL
10,000-ohm variable resistance (Bulgin type VC32, Watmel type T1, Varley, Lewcos, Tunewell, Ready Radio, Sovereign).

MAINS PORTION
1—Mains transformer (Heayberd, type MR).
1—Smoothing choke (Tunewell type S70/50, Wearite, Igranic, R.I., Ferranti).
1—4-pin valve holder (Ready Radio, Lissen, Telsen, Igranic, W.B., Graham Farish, Lotus, Goltone).
2—4-mfd. electrolytic condensers (Dubilier, T.C.C.).
1—.1-0-.1-mfd. fixed condenser (Dubilier, type BE.31.I., T.C.C.).
1—Twin fuse holder and fuses (Bulgin, type F9).
Length of mains flex (Lewcos).

ACCESSORIES

Cabinet (Peto-Scott) with loud-speaker chassis (Myers-Hunt, Camco).
Loud-speaker (W.B., type PM4 chassis model, Rola, type F5PM1, Atlas, R. & A., Celestion Epoch).
Earth (Graham Farish "Filt").
Aerial (Electron).

"The LISSEN COILS ARE THE HEART OF THE MELODY RANGER"

Says Amateur Wireless

EXTRACT FROM AMATEUR WIRELESS 4TH FEBRUARY 1933

The following is an extract from "Amateur Wireless," 4th February, 1933:—"In the 'Melody Ranger' . . . there is the outstanding feature of a four-range coil. This coil is indeed the heart of the 'Melody Ranger' circuit, and accounts for the wonderful range of stations that has been logged during our tests all round the country. . . . The very wide wavelength range enables many stations normally outside the range of sets to be tuned in at full strength . . . the coil is a great engineering triumph."

The first successful all-wave receiver—the "Amateur Wireless" MELODY RANGER. The first time it has been found possible to combine all-wave ranges from 12 to 2,000 metres in a single coil—and Lissen have done it! Short-wave work is tricky work—minute stray capacities, relatively small masses of material such as knobs of solder, have an altogether disproportionate effect upon the tuning efficiency of the coil. Switching is extremely difficult to arrange—the medium- and long-wave windings have unexpected effects upon the short-wave coil. You would be surprised if you knew how many times this Lissen "Melody Ranger" Coil has been backward and forward between the "Amateur Wireless" laboratory and the Lissen physicist. It definitely could not have been produced at all except for this close co-operation between the "Amateur Wireless" designers and the unrivalled facilities of the Lissen organisation.

No matter how you intend to buy the parts for your "Melody Ranger"—as a complete kit or part by part, for cash or by easy payments—YOU MUST, FOR YOUR OWN SAKE AND IN FAIRNESS TO A FINE SET, INSIST UPON THE GENUINE LISSEN "MELODY RANGER" COILS. Look for the name Lissen on every coil if you want satisfaction from the set.

PRICE 15/- EACH

THERE IS AND CAN BE NO SUBSTITUTE FOR THIS COIL

LISSEN UNIVERSAL 4-WAVE-RANGE COIL

LISSEN LTD., WORPLE ROAD, ISLEWORTH, MIDDLESEX

To Ensure Speedy Delivery, Mention "A.W." to Advertisers

What Our Readers Think

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

A Switch Point

SIR,—With reference to L. N. R.'s letter in the issue of AMATEUR WIRELESS dated February 4 under "Watch that Switch," an experience of mine may be of interest to your readers.

Switching my set on a short time ago I failed to get any signals from it; as the set had worked the previous day I was rather at a loss to know what had happened. To cut a long story short, everything was tested and proved O.K. and a test proved that the valves were receiving the necessary current. What, then, was wrong?

When switched over to the long waves a thin, distorted signal could be heard, but on the medium waves, nothing.

The coils used have push-pull switches for the wavechange. I took the coils out and adjusted the nuts, which act as stops on the push-pull switch and, replacing the coils, switched on and found that results had improved, but were still far from satisfactory. It took some time to adjust the nuts so that results were satisfactory and even now, if the switches are touched while the set is working a crackling noise can be heard in the loud-speaker.

C. A. B. (Reading).

Balanced-armature v Moving-coil

SIR,—You publish in your issue dated February 4 a letter from "G. E. F." (Sheffield) headed "Balanced-armature *v* Moving-coil," which we have read with considerable amazement and not a little amusement.

Would this gentleman be so good as to enlighten us on the points enumerated below:—

(*a*) How does he know when his balanced-armature speakers are reproducing frequencies of 50 and 5,000 cycles?

(*b*) Has the output from these speakers been plotted on a decibel scale? If so, its publication would be interesting.

(*c*) What type of amplifier does G. E. F. use? Has it a linear output from 0 to 5,000 cycles, and if so what proof is there of this?

(*d*) Does your correspondent suggest that the same type of amplifier is equally suitable for the operation of both balanced-armature and moving-coil speakers?

It is, of course, quite unnecessary at this stage to go very deeply into the construction and characteristics of both types of loud-speakers or into the fundamentals of design which render it a mechanical impossibility for a balanced-armature speaker to reproduce frequencies which are quite within the normal range of a *properly designed moving-coil*.

We should be very grateful if your correspondent could find time to reply to the queries set out herewith as it appears that he is at present suffering from some form of aural delusion.

RADIO SERVICE LABORATORIES (London, N.W.).

B.B.C. Response Tests

SIR,—With your correspondent "J. E.", I hope the recent response tests of the B.B.C. will be repeated.

I, unfortunately, missed them, but think they were most welcome and much overdue.

A query to the B.B.C. brought a reply to the effect that they were unable to say "whether the transmission would be repeated but the matter would receive careful consideration."

I could have wished the B.B.C. had chosen a happier phrase knowing that in business, at any rate, it means the end of the deal. Still, we will live in hope that it *may* be considered important that we should receive the quality the B.B.C. are at great pains and expense to turn out. I wonder what percentage of listeners have any notion of their reproduction below 150 cycles?

A. W. F. (Newcastle-on-Tyne).

Appreciation

SIR,—I have now been a reader of AMATEUR WIRELESS for seven months and, believe me, sir, I have certainly improved my radio knowledge from it.

I honestly say there is not another wireless book like it on the market for the price. It certainly is worth its "3d. double."

S. A. C. (Ramsgate).

B.B.C. Pronounciation

SIR,—May I add a word of correction and advice to our friend W. T. (Godrer Craig)? He accuses the B.B.C. announcers of incorrect pronunciation, whereas their's is absolutely correct. W. T. is apparently Welsh. He pronounces Welsh place-names *in Welsh*. English announcers pronounce them *in English*.

How does W. T. pronounce "Paris"—Par-iss or Par-ee? The former is correct in English, whilst the latter is correct in French.

H. R. (Manchester).

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

The "Melody Ranger"

SIR,—I was one of the fortunate winners of a kit of components for the "Melody Ranger" in your recent competition and have now built it and given it a good test.

First, I think Messrs. Peto-Scott deserve a word of praise for the kit I received, complete in every respect down to the smallest screw and exact to your specification and beautifully packed.

Now about the set. I think the easiest way to express my opinion is to say that it is all that you claim it to be and does all that you say it will do.

I live in a badly shielded district and have only a poor indoor aerial, but it gets the stations, and on all wavelengths—Americans on the short waves, with Lisbon, Moscow, Zeesen, amateurs and others, and all worthwhile ones on the medium and long waves.

I think great praise is due both to the designers of the circuit and the coils. I have built all sorts of sets in my time, from crystal up to the "Century Super," and am really surprised at the strength and selectivity of this straight four-valver.

G. L. C. (London, W.).

IF YOU ARE A NEW READER

EVERY issue of AMATEUR WIRELESS contains a wealth of information and new readers will be interested to have details of helpful practical and constructional articles which have appeared in the past few issues.

They cover a wide range of helpful information, from hints on speakers to the construction of an amplifier on the new "Q.P.P." principle! For instance, a simple L.F. amplifier incorporating the quiescent push-pull system was described in "A.W." No. 557, and in the previous week's issue, No. 556, the theoretical side of Q.P.P. was dealt with in an authoritative article. Short-wave working is even yet a closed book to many listeners who do not realise what they are missing by not taking advantage of below 100-metre reception. There is a special short-wave supplement in "A.W." No. 556, and in this Mr. Percy W. Harris describes practical short-wave working for beginners. You will find this a really helpful guide to short-wave reception.

Of more general interest are the novel power supply ideas given in "A.W." No. 554. These apply to batteries and mains, and will interest you no matter what kind of set you have.

All the issues of "A.W." referred to can be obtained, price 4d. post free, from the Publishing Department, AMATEUR WIRELESS, *58-61 Fetter Lane, London, E.C.4.*

BUILD WITH YOUR OWN HANDS

THIS BETTER SET SAVE POUNDS

SUCCESS A CERTAINTY

NEVER before was there such a set within the reach of the home constructor. Never before such power from a battery set. Never before so many enthusiastic letters from constructors or so much talk about any radio set as this Lissen "Skyscraper" Kit has elicited. 50—60—70 loud-speaker stations—everybody who builds a "Skyscraper" gets results like that! Lissen have published a 1/- Constructional Chart, giving the most detailed instructions ever printed for the building of a wireless set. You can't go wrong—every part, every wire, every terminal is identified by photographs. Everybody, without any technical knowledge or skill, can safely and with COMPLETE CERTAINTY OF SUCCESS undertake to build this most modern of radio receivers from the instructions given and the parts Lissen have supplied.

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

YOURS FOR ONLY 8/6 DOWN

To-day you can buy the LISSEN "SKYSCRAPER" KIT on Gradual Payment Terms.

"Skyscraper" Chassis Kit, complete with Valves, CASH PRICE, 89/6. Or 8/6 down and twelve monthly payments of 7/6.

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

You can get the Lissen "Skyscraper" Chart FREE from any radio dealer, or by posting the COUPON below direct to factory.

COUPON

To Lissen, Ltd., Publicity Dept. A.W.33, Worple Road, Isleworth, Middlesex.

Please send me FREE copy of your 1/- Skyscraper Chart.

Name .....

Address .....

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LISSEN "SKYSCRAPER" KIT 3

Mention of "Amateur Wireless" to Advertisers will Ensure Prompt Attention

SETS of the SEASON

EKCO RG23 RADIO-GRAMOPHONE

IT would be difficult at the present time to point out a better value-for-money proposition in radio-gramophones than the Ekco RG23, which I have just had the great pleasure of testing.

Some instruments, from the word go, as you might say, impress one with their essentially sound performance. Such an instrument is this Ekco RG23, a three-valve radio-gramophone with so many excellent features, I hardly know where to begin in recounting them.

Perhaps you, as a potential radio-gramophone buyer, would prefer to know something of the general specification. If you have come across the admirable M23 table consolette set you will have a very fair idea of what the RG23 can do, because this radio-gramophone is designed around the chassis of the M23 radio set.

Effective Three-valves

The chassis in question is a fine nucleus for a radio-gramophone, since it has one of the most effective three-valve combinations available. There is a screen-grid high-frequency valve, a detector, and a pentode power output valve, all obtaining their high-tension supply from the A.C. mains via a Westinghouse metal rectifier.

From this back view of the Ekco Radio-gramophone it will be seen that the interior arrangements are upon original lines. Note the accessibility of the actual receiver

In addition to all the controls found on the M23 set, the RG23 radio-gramophone has a separate volume control for the gramophone side, and a radio-gramophone switch fitted concentrically around the volume control.

The same permanent-magnet moving-coil loud-speaker is used in the radio-gramophone as in the radio set. I mention this because you may have heard the M23 in action and from that you can judge the quality from the radio-gramophone. As a matter of fact the quality is better with the radio-gramophone, for the rather obvious reason that the bass-note response has a better chance to show itself behind the ample baffle of the walnut cabinet.

I think most readers would like the style of the cabinet, which, for so inexpensive an instrument, has a quiet dignity of line and finish that agreeably surprised me. The cabinet wood is polished, I understand, by a new process. Certainly the satin-like finish is well done.

When you lift the lid of the cabinet you find the turntable of the electric gramophone motor and to one side the gramophone pick-up.

The front of the cabinet is taken up with the main controls mounted above the grille or fret for the moving-coil loud-speaker. There is the usual tuning escutcheon, well lighted when the set is switched on, with a scale clearly marked in medium and long wavelengths.

The tuning is done with a neat concentric arrangement of two knobs, a main tuning knob working a two-gang condenser and a centre trimmer knob putting the finishing touch on the accuracy of the tuning when the wavelength is radically changed from one part of the scale to another. What I mean is that you do not necessarily have to touch the trimmer every time you alter the main tuning. When you do, the operation is definitely in the nature of a refinement to the tuning and, as such is, of course, very valuable under present ether conditions.

What I particularly like about the controls is the provision of an input volume control on the left and a reaction control on the right. With these two controls worked in harmony the selectivity is definitely above the average, because you can reduce the overall input and magnify with the reaction the station you want to the exclusion of those you do not want.

Just below the tuning knob is a lever for changing over from medium to long waves, and that completes the layout of the controls on the front of the cabinet. On the right-hand side, looking from the front is the combined gramo-radio switch and pick-up volume control. On the left is the mains on-off switch.

At the back we find a variety of connections, for such accessories as an additional speaker and for the connection of the aerial and the earth. You do not have to use an aerial for the reception of the powerful locals or for the majority of the more powerful foreigners as there is an internal earth wire and as a further alternative the mains aerial can be used.

BRIEF SPECIFICATION

Makers: E. K. Cole, Ltd.
Price: 28 guineas.
Power Supply: A.C. mains (D.C. model available at 2 guineas extra).
Power Consumption: 60 watts with gramophone motor in action.
Type: Pedestal radio-gramophone.
Remarks: A really good radio-gramophone, giving pleasing quality of reproduction and a wide selection of programmes with quite straightforward operation.

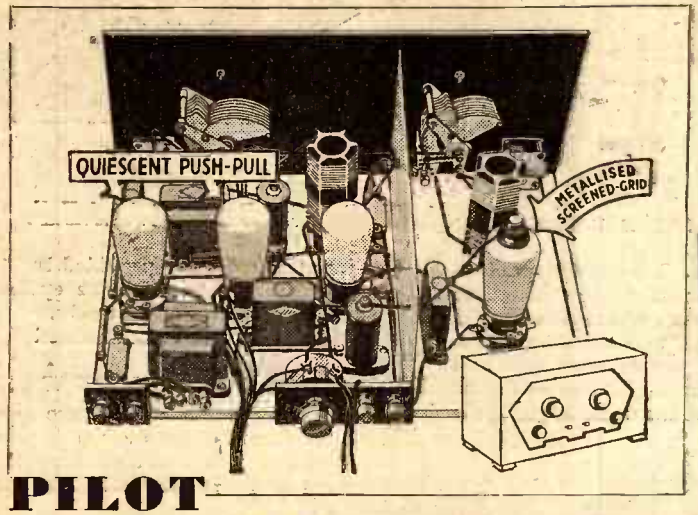
My first test was with the gramophone. I may say at once that I was more than satisfied with the overall tone obtained, at both loud and soft volumes. The bass has a pleasing depth and there is ample top-note response to retain the definition without introducing objectionable needle scratch.

At about the half-way position of the gramophone switch you can get enough volume for dancing in the average-sized room. At maximum setting of the volume there is slight overload.

Selectivity, if the input volume and reaction controls are properly used, is amazingly good for two tuned circuits. I was able to hear Mühlacker practically clear of London by reducing the input almost to zero and increasing reaction up to maximum. On long waves our old favourite, Radio Paris, is decisively clear of Daventry.

SET TESTER.

QUIESCENT PUSH PULL KIT



Mains Results from Battery Sets

DOUBLE OUTPUT

ALL-ELECTRIC VOLUME
MOVING-COIL QUALITY
50% H.T. SAVED

Save Pounds—Build it Yourself

PILOT GUARDIAN Q.P.P. 4-VALVE KIT

FREE CONSTRUCTIONAL CHART SHOWS YOU HOW

STEP by step and wire for wire—you simply cannot go wrong. Success comes right from the start. FULL-SIZE DIAGRAM accompanied by the most detailed instructions. Every component, wire and terminal clearly identified. Without any technical knowledge you can build this amazing Kit Set with this straightforward Chart. *Remember the Guardian Q.P.P. Set is the only one on the market that you can build yourself employing Screened-Grid and Quiescent Push-pull* — the greatest advance in Battery Receiver design for years. This wonderful 1/- Chart is yours FREE. Fill in the Coupon NOW.

BUILD this latest Kit Set yourself and Save Pounds. Q.P.P. is the last word in Radio — first to be commercialised for the Home Constructor by Peto-Scott — Pioneers in Kits of Parts since 1919. Never before has such all-electric volume and moving-coil quality with screened-grid selectivity and range been possible with low priced small capacity H.T. Batteries.

KIT 'A'
Complete Kit of Parts including *ready-drilled panel* but less valves, cabinet and meter. CASH or C.O.D. Carriage Paid.
£3.19.6 *or* 7/6 *Deposit and* 11 *monthly payments of* 7/3

KIT 'B'
As KIT 'A', but with Valves, *less* cabinet and meter. CASH or C.O.D. Carriage Paid.
£6.18.0 *or* 12 *monthly payments of* 12/6

KIT "A" SEND ONLY 7/6
Balance in 11 monthly payments of 7/3

For GUARDIAN Meter, add 10/- *to cash prices, or* 11d. *to each monthly payment.*

Free CONSTRUCTIONAL CHART
PILOT GUARDIAN Q.P.P. KIT
SCREENED-GRID DETECTOR AND Q.P.P. PUSH-PULL OUTPUT
KIT "A" 7/6 (4 VALVES)

POST COUPON TO-DAY

PETO-SCOTT Oak Table Cabinet - 15/- PETO-SCOTT Oak Consolette Cabinet 25/-

We originated KITS OF PARTS in 1919

PETO-SCOTT CO. LTD. 77 CITY ROAD, LONDON, E.C.1.
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Dear Sirs,
Please send me C.O.D./CASH/H.P. Guardian Q.P.P. { Kit A with/without Guardian Meter. / Kit B with/without Guardian Meter.
for which I enclose £.....s.....d. CASH/H.P./DEPOSIT.
FREE CONSTRUCTIONAL CHART.
**Strike out what does not apply.*

NAME.....
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A.W. 4/3/33

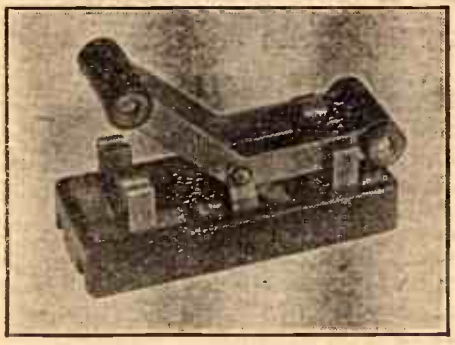
OBTAINABLE ONLY DIRECT FROM PETO-SCOTT—CASH—C.O.D.—H.P.

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

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

W.B. SAFETY SWITCH

WE have received for test a new type of double-pole double-throw switch which is intended for use as an aerial earthing switch. It is generally similar to the normal type of double-throw double-pole switch, but has two pairs of contacting arms instead of the usual one pair. These arms are arranged in the form of a wide V and thus the change over from one position to the other is accomplished by a movement of about 30 degrees only instead of the more usual 180 degrees. In this way a rapid



A handy double-pole double-throw switch made by W.B.

change in position is possible. The switch is built up on a small bakelite base measuring some 3 in. by 1½ in., the whole making a neat assembly. This switch is made by Messrs. Whiteley Boneham & Co., and retails at 1s.

HANDY SOLDER

AN interesting type of solder which we have tested recently is that made by Messrs. Andrew Findley of Glasgow, under the name of "Sme." This solder is in paste form and in order to use it, it is only necessary to coat the two surfaces to be joined with the paste and then to apply heat in any convenient way We have found the material quite effective, several joints being made by means of it, and in every case the result was entirely satisfactory. This solder should prove a boon to those who are not experts with the soldering iron and even in certain circumstances to those who are.

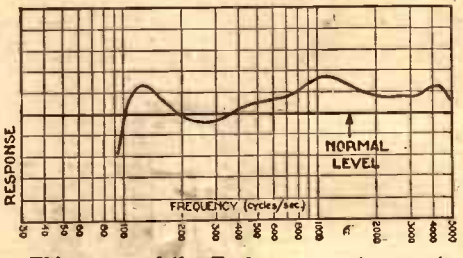
The solder is retailed in small collapsible tubes costing 7½d. each, but it can also be obtained in 1-lb. tins, if desired.

EARL SPEAKERS

A NEW permanent-magnet loud-speaker which we have tested recently is that known as the "Earl" and made by Electriclocks & Radio, Ltd. The speaker employs an E-shaped permanent magnet bolted to the back of the chassis which also carries the input transformer and the diaphragm. The diaphragm is of the moulded type and is mounted in an original fashion in that it is not rigidly fixed at the outer edge, but is

The Earl permanent-magnet moving-coil speaker, a performance curve of which is shown below

held lightly between the chassis and some thick felt pads which are also used to prevent rattling against the baffle. It is claimed that this method of arranging the diaphragm causes an increase in the response at the upper frequencies and as can be seen from the response curve reproduced herewith, the results obtained at around 5,000 cycles are appreciably above normal. The bass response also is good,



This curve of the Earl permanent-magnet speaker shows that there is a good overall response

there being actually a slight peak in the neighbourhood of 120 cycles. On actual signals the reproduction was good, the overall tone being very pleasant.

The input transformer provided has two ratios giving impedances at 512 cycles of 5,700 and 10,400 ohms respectively.

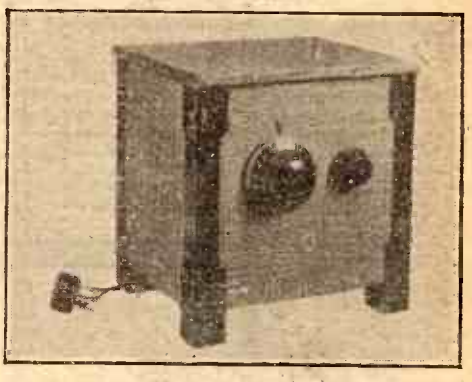
This speaker can be recommended.

YOUR SET ON THE SHORT WAVES

A BIG thing about short-wave reception, which many enthusiasts overlook is the fact that you don't need a special receiver to pick up the stations below 100 metres.

Useful short-wave converters and modulated oscillators are made by J. J. Eastick & Sons, and with an Eelex converter it is possible to use practically any broadcast band set on the short waves.

One of the standard Eelex converters is shown by the accompanying photograph. It does not matter whether you have a mains or battery-driven set. There is a suitable converter available. The Duplex types can, in fact, be used either with a



An Eelex short-wave converter

mains or battery outfit. One- and two-valve models are made, and the chassis of the Duplex battery and mains types are available separately for building into an existing receiver.

Connecting one of these Eelex converters to an existing broadcast receiver takes only a few minutes. The aerial is disconnected from the set and joined to the aerial socket on the converter. From another socket which is marked "Output," a short lead is taken to the aerial terminal on a broadcast set.

The Duplex coils used have a two-range position covering 15-30 and 30-60 metres.

A handy booklet describing the whole range of Eelex converts can be obtained free on mention of "A.W." from Messrs. J. J. Eastick & Sons, Eelex House, 118 Bunhill Row, E.C. This book also gives an abridged list of short-wave stations, with their wavelengths and working times.

LET "A.W." SOLVE YOUR WIRELESS PROBLEMS

WIRELESS MADE EASY SECTION

Why Metal is Used for Modern Sets

ONE of the most obvious tendencies in set design, whether in the amateur field or in the factory, is the use of metal instead of wood and ebonite for the baseboard and panel respectively.

A natural question arises: *Why should we use metal?* The answer forms the subject of this little article.

If you, as a beginner, care to look back two or three years, you will find that *nearly all the older designs of sets made use almost exclusively of an ebonite panel and a wooden baseboard.*

The Modern Set's Layout

On comparing the sets of yesterday with those of the present time, you will notice that the outstanding feature of the modern set is the apparent simplicity of the baseboard layout.

In fact, except for a very few wires, you might think the modern set was almost devoid of inter-component connections! Actually it is not. Indeed, there are far more circuit complications in present-day sets than in sets of even two years ago.

Metal Acts as a Shield

The bulk of the connections are carried out below the *chassis*, as the main framework of the modern set is called. In effect, the low-frequency components are *shielded* from the super-structure components carrying the high-frequency current, such as the tuning coils and tuning condensers.

It is this necessity for shielding that really accounts for the lavish use of metal in the modern set.

Whereas sets of the early days had little if any real high-frequency amplification, the modern set depends for its success on a large measure of real high-frequency signal gain before the detector stage is reached.

How the Screen-grid Valve Altered Design

As soon as it was found possible to obtain really effective high-frequency amplification—namely, at the inception of the screen-grid valve—*the whole technique of radio set design had to be altered.*

To-day nearly every set has its high-frequency amplifying valve, and in some way or other the grid circuit of the screen-grid valve is shielded from the anode circuit. The maximum amplification is now obtained without instability due to inter-action between these two circuits.

"Canned" Coils

Shielding can be done in many ways. In most home constructor sets, for example, where the practical limitations of blueprint presentation to some extent dictate design policy, you will usually find the shielding done by means of metal "cans" round each of the tuning coils, with a gang condenser consisting of separate tuning condenser units shielded one from the other by a metal casing.

In simpler sets, where the coils are not screened, it is usual to line the baseboard with metal foil and to use a panel backed with some metal shielding material, often with a metal partition erected on the baseboard to afford further screening between one circuit and another.

The Metal Chassis

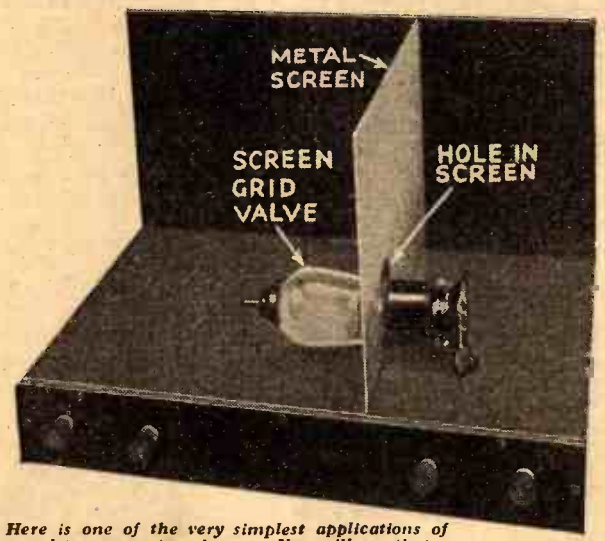
In factory-built sets the *metal chassis* is now practically standard. This consists of a metal deck on the top of which are fitted the usual tuning components and perhaps one or two others.

Below the deck are mounted the smaller parts, mostly of the low-frequency amplifier. It is underneath the chassis that most oft he wiring is done.

The variable controls are easily mounted on brackets fitted to the metal chassis, so that their spindles can project through the cabinet into which the chassis is placed.

In some sets the tuning spindle is connected by a cord-drive to the tuning knob on the front or top of the cabinet.

THE SIMPLEST METAL SCREENING



Here is one of the very simplest applications of metal to an amateur layout. You will see that a metal partition is erected between one end of the screen-grid valve and the other, the idea being to shield the grid tuning circuit of this valve from the anode circuit and thus prevent inter-action. Usually with this type of metal shielding there would also be a metal lining for the baseboard and possibly the panel would be not of ebonite but of metal

THIS WEEK:
THE ABC OF THE PENTODE
By J. H. Reyner
TWO KINDS OF AMPLIFICATION
Specially for Beginners

Avoiding "Hand-capacity" Effects

Apart from this all-important business of shielding the tuning circuits one from another, the use of metal is now very frequently decided upon for other reasons.

For example, in the now famous "Melody Ranger" four-valve set described in AMATEUR WIRELESS recently, *a metal panel is used to reduce what is known as "hand-capacity" effects.*

By earthing the panel, the approach of your hand, which is also partially earthed through your body, does not upset the tuning, and you are thus able to make critical adjustments.

This is of great value on the short-wave ranges of the set, where the slightest change in the condenser's capacity means a big change in the wavelength of the tuning circuit.

Another very practical advantage of metal for the set is *the elimination of many of the connecting wires that would normally have to be taken over fairly devious routes.*

As the metal is earthed, all component terminals that are connected to earth can be connected to the nearest point on the metal chassis—panel or baseboard—instead of being inter-connected by leads.

This saving of connections is of special value in the high-frequency side of the set. The elimination of earthed wires running parallel or near to high-frequency leads brings about a great increase in the overall stability.

Although the panel and baseboard layout is by no means finished, especially in amateur designs, it certainly looks as though metal will play an increasingly important part in the designs of the future.

ELEMENTARY WIRELESS COURSE

THE A.B.C. OF THE PENTODE

What is a pentode?

It is a special form of output valve having a much higher sensitivity than the ordinary valve.

What do you mean by sensitivity?

Our object in the output valve is to obtain a large change in the anode current, to obtain which we apply a voltage between the grid and filament. A sensitive valve is one that gives us the anode current change we want with a very small applied voltage.

What sort of voltages do we want?

An ordinary triode output valve will give an output of approximately half a watt with a voltage change on the grid of about 36 volts. We should put 18 volts grid bias on the valve and then apply a signal which changes the voltages periodically from 0 to —36.

What is a triode?

An ordinary valve having three electrodes, the filament, the grid and the anode or plate.

I remember now. Then a triode wants about 36 volts on the grid?

Not necessarily. Sometimes we are content with a smaller power output than this which we can obtain with a grid change of only 9 or 10. I chose the output of half a watt for purposes of comparison, and as I said, the ordinary battery triode will require a total grid change of about 36 volts to give this output.

Will a pentode need less?

Distinctly so. With a pentode we can obtain an output of half a watt, under the same conditions of high-tension voltage, with a total grid swing of only 9 volts. That is, we should put 4½ volts bias on and cause the grid voltage to vary between 0 and —9.

Then the pentode is four times as sensitive?

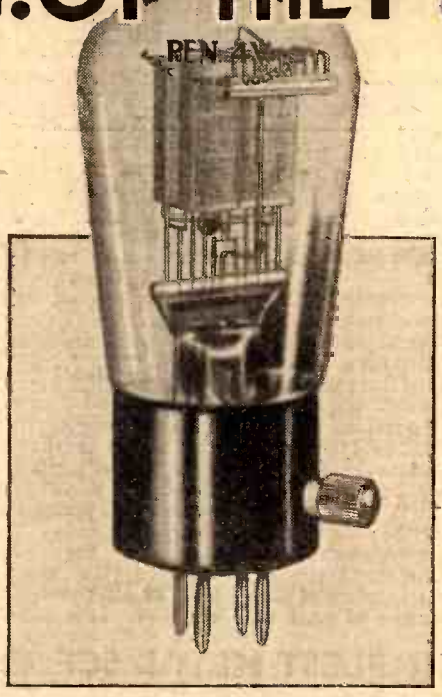
In this particular case, yes. Generally speaking, a pentode is several times as sensitive as a triode in that it will give the same watts output for a much smaller voltage applied to the grid.

What do you mean by "watts output"?

I told you last week that the object of our output valve was to produce power. The unit of power is the *watt*, and it is customary to rate the power valves in terms of the watts output which they will give.

Can you give me some example?

I told you last week that with a loud-speaker of 2,000 ohms resistance, a current change of 10 milliamps would produce quite a good signal. This will



This week J. H. REYNER and the "Amateur Wireless" Staff help beginners to understand the pentode valve, which is a specialised type of power valve having five electrodes

actually correspond to a power of 0.2 watts, that is, one-fifth of a watt. We arrive at this in the following way:

The voltage developed across the loud-speaker is given by the product of the current and the resistance. We have 2,000 ohms and 10 milliamps, which gives us $2000 \times 10/1000 = 20$ volts.

The power is the product of the voltage and the current, so that we multiply this voltage of 20 by the current, which gives us $20 \times 10/1000 = 0.2$.

But if one-fifth of a watt is a good signal why do we want half a watt?

To deal with the loud passages. On strong signals the power goes up very rapidly, and on some of the mains sets to-day a power output of 2 watts on the strong signals is nothing unusual. On ordinary normal volume, however, the power is only about one-fifth or one-quarter of a watt.

You still have not told me what a pentode is.

You have hardly given me a chance! However, you remember I told you that for high-frequency amplification we could obtain a greater magnification by using a screen-grid valve. The pentode is a form of screen-grid valve specially suitable for low-frequency amplification.

I am afraid that does not convey much to me.

Let us hark back to the screen-grid valve a moment. When we were discussing that valve, I told you that we could not increase the amplification from an ordinary valve beyond a certain limit.

The sensitivity is increased by placing the grid wires closer together, but after a time this acts like a barrier between the filament and the anode, and prevents any anode current from flowing.

To overcome this difficulty we place another grid just outside the ordinary grid and place a fairly high positive voltage on this outer grid. The result is that the screening effect of the ordinary grid is neutralised and the electrons are pulled out of the filament as they should be and flow across the gap through the anode unhindered.

I remember now. You can get amplification factors of several hundred?

That is so. The amplification factor of the valve can be increased much beyond the point at which an ordinary triode would become useless, and we use this fact to make valves specially suitable for giving large amplification.

Then is this a pentode?

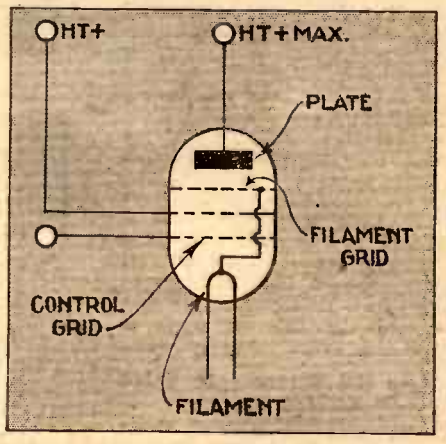
Not yet; actually it is a *tetrode*, because we have now four electrodes inside the bulb instead of the usual three.

How many has a pentode?

Five. Hence the name. It sounds very complicated, perhaps, but with modern valve construction it is quite easy to make robust valves having five or even more electrodes inside.

Why do we require so many electrodes?

The story is rather interesting. With the screen-grid valve, the anode current variations are quite small, because we are dealing with only small signals. If



Here is the circuit symbol for a pentode power valve. Note that there are three grids and that one of them is connected to the filament. The remaining two have external connections, one being the usual grid and the other a screening grid connected to a point on the high-tension battery

the anode current changes by a large amount, however, as it will do in an output valve, we find that under certain conditions the electrons from the filament refuse to stay at the anode, but bounce off again and return to the screen grid.

To prevent this we insert still another grid just inside the anode. This is connected inside the valve to the filament, and its effect is to keep the electrons on the anode, once they have got there.

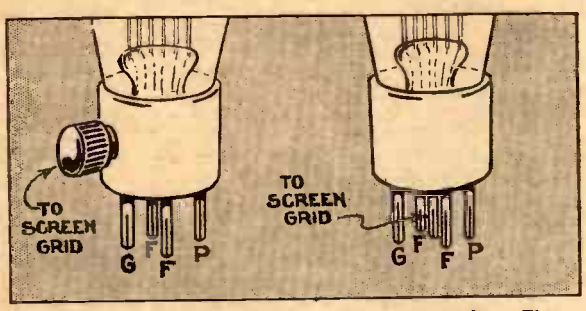
It sounds very complicated to me.

It is not simple, but in ordinary practice the why and wherefore does not arise. A pentode behaves in much the same way as an ordinary valve, but it has a *much increased sensitivity*.

To obtain this increased performance we have to insert a screen grid in between the normal grid and the anode, and this has to be connected to a suitable point on the high-tension battery. Actually there is still another "suppressor" grid inside the valve, but as far as the actual user is concerned it can be forgotten.

Is a pentode used like an ordinary valve?

Yes. The connections to the pins on the cap are the same as usual. There are the two filament pins, the grid pin and the anode pin in the customary positions, while the extra grid is connected to a side terminal on the side of the cap.



Two types of valve base used for pentode power valves. That on the left has a terminal on the side for the screening grid connection to the high-tension battery. On the right is a five-pin valve base, which does away with the terminal on the side and fits into a five-pin valve holder

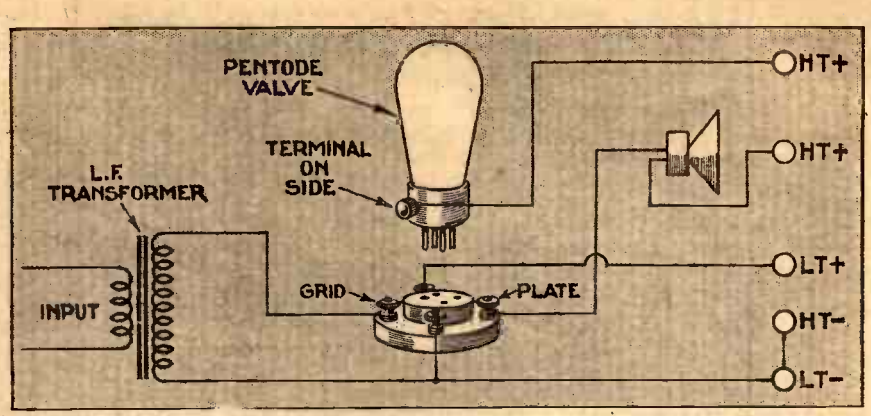
Sometimes, in order to do away with any loose leads, use is made of a fifth pin situated in the centre of the base. This particular form of base is used for certain types of valve specially designed to operate from the electric-light mains instead of batteries, and it can be conveniently applied to the pentode. In this case the centre pin is connected to the screen or priming grid.

Where did you say this extra grid is connected?

Simply to the high-tension battery. With a screen-grid valve we connect it to a point about 60 or 80 volts positive, but with the pentode we connect it to the full voltage, that is, 120 to 150 volts with the ordinary battery set.

Do we still need an output transformer?

It is still necessary to use a loud-speaker having the correct impedance for the particular valve if the reproduction is to be satisfactory, and although a speaker can be included directly in the anode circuit it is preferable as a general rule to use an output transformer as mentioned last week.



Skeleton circuit layout for a pentode power valve. Note that the terminal on the side of the base is taken to a tapping on the high-tension battery. Apart from this the circuit is quite normal, though in most well-designed sets there are tone-compensating components

As with ordinary valves, the manufacturers quote the optimum loud-speaker impedance for the particular pentode, and by choosing a suitable ratio on the output transformer, the loud-speaker may be matched up correctly.

Apart from its greater sensitivity, is the pentode just as good as an ordinary valve?

If it is properly used, it is superior in every way. One important advantage is that it has a greater efficiency. Remember that our valve is taking a steady anode current of, say, 10 milliamps. If the H.T. battery is 150 volts, this is equal to a power of 1.½ watts.

With a triode the maximum undistorted output of speech or music which we could obtain would be about 300 milliwatts, that is, 0.3 watts, which gives an efficiency of only 20 per cent. With a pentode operating under the same conditions we could obtain about 500 milliwatts corresponding to an efficiency of 33 per cent. Thus we make much more effective use of our batteries.

Why should that be so?

It is a matter of the valve characteristics. If we wish the anode current to be a faithful copy of the grid voltage the characteristics must be "straight." In practice it never is so and distortion is introduced.

With the ordinary valve the characteristic curves in the same direction all the time so that after the grid swing increases our distortion gets worse and worse. With a pentode, on the other hand, the characteristic turns first one way and then the other, so that although some distortion is present, it is appreciably less and we are able to obtain more power from the valve.

Is a pentode always used nowadays?

No. For one thing it is more expensive while there are certain difficulties in getting it properly matched to the loud-speaker.

The impedance of the average loud-speaker is not constant but increases with frequency. With a triode this does not matter, because after a certain point the power output is constant, however large the impedance in the anode circuit.

With a pentode, however, there is no such limit, and the power output continues to increase as long as we make the impedance larger.

What effect does this have?

The upper frequencies are accentuated and the reproduction sounds shrill and harsh unless we take special steps to overcome the trouble.

Can you get over the difficulty then?

Yes. We place a condenser across the loud-speaker. At low frequencies (deep notes) this has no effect, but in the treble registers it has a two-fold effect.

First of all it reduces the effective impedance of the loud-speaker so that the power obtained from the valve is not so much. Secondly it shunts some of the current so that it does not all go through the loud-speaker, some of the current flowing through the condenser instead.

The net result is that the accentuation of the upper frequencies is checked and the reproduction once more sounds balanced and normal.

Then is this scheme quite successful?

Quite, and by the aid of a simple corrector of this sort we are able to obtain as good quality as with the triode, with the added advantages of extra sensitivity and better efficiency.

NEXT WEEK : The Super-het

Two Kinds of Amplification!

Many beginners will welcome this simple explanation given in question-and-answer form of the real difference between high- and low-frequency amplification

Tell me something about the difference between high- and low-frequency amplification.

For a start, do you know what we mean by *high*-frequency amplification and *low*-frequency amplification?

Well, I know that high-frequency amplification comes before the detector and low-frequency after it. Exactly what "high" and "low" mean, though, I do not know.

Many listeners use these two words without really knowing what the difference between them is. Actually the broad division between high-frequency amplification before detection and low-frequency amplification after detection, though easy to understand, is not exactly accurate.

Before the Detector

For, as a matter of fact, the signal you amplify before detection *contains not only the high-frequency but also the low frequency current.*

After the detector, when the high-frequency current is by-passed to earth because it is no longer wanted to "carry" the low-frequency current, this low-frequency current is alone amplified.

What beats me is why you have to amplify both before and after the detector. Wouldn't it be just as well to amplify at one end of the set—the high or the low?

That is a commonly-asked question. There are many good reasons why we cannot do all the amplification either before or after the detector.

Limitations of the Detector

Let us try to show you the most important reasons. Firstly, there is the detector, which suffers from two limitations.

For one thing it cannot work efficiently *unless a certain minimum voltage is applied* to the grid circuit. This means that unless you can amplify the signal before detection only the powerful locals will be properly detected and the signals from foreign countries, which should be treated even better than the robust locals to make up for the long distance they have come, would be very poorly handled by the detector.

Secondly, the detector valve normally used does not give much power output. It is true that the power-grid detector with its high anode voltage and low impedance gives more power output than in say the average three-valver, but even so this power output is small compared with the output obtained from a valve specially designed for giving power.

Why must the detector give a large power output?

In practice it does not have to do so, though the final process before the loud-speaker must be a *power change.* That is to say the loud-speaker works on a power change, and this is provided by varying the power supply.

Couldn't the detector be used to vary that?

No, because the impedance of the power valve is too high to provide sufficient current changes to work the loud-speaker efficiently.

Separate Valve for Power

It is, in fact, essential to separate the functions of detection and power handling. We have to use two valves, one for the detection and the other, called the power valve, to translate voltage changes into power changes to work the loud-speaker.

So that disposes of my simple little plan to do all the amplification before detection! Well, here's another point. Why not do all the amplification after the detector?

We have already explained that this is not possible because the detector cannot work efficiently unless a certain minimum voltage is applied to the grid circuit.

Sorry! I had forgotten that very important point. Tell me, though, is this the only reason for using amplification before detection?

No, as a matter of fact it is not. We certainly need amplification before detection when tuning in fairly weak signals, but there are to-day so many strong signals, even from abroad, that on that score alone we might even dispense with high-frequency amplification.

Don't Forget Selectivity

There is a much more important reason now for having high-frequency amplification, and that is for *selectivity.*

How can high-frequency amplification possibly be connected with selectivity?

Very intimately! Selectivity consists in passing the signal through a series of tuned circuits, each of which tends to differentiate more markedly between the wanted signal and all other signals that are not wanted.

In going through these tuning circuits the signal loses some of its original energy. It is necessary to "boost up" the signal between each of the tuning circuits, otherwise the signal arriving at the detector, even if it were moderately powerful when it first impinged on the aerial, would be too weak to operate the detector efficiently.

Easy Sets to Operate

That explains why, in a set that is at once easy to operate and selective in its tuning, you usually find at least two stages of high-frequency amplification.

In simpler sets the selectivity is obtained partly by tuned circuits and partly by means of reaction.

It is quite easy to make a three-valver selective if you know how to operate reaction properly, but for non-technical listeners there is much to be said for a set that gets all its amplification by means of valves and all its selectivity by means of tuned circuits.

So that you have really advanced good reasons why both high- and low-frequency amplification are necessary in a good set?

We think so. Let us briefly summarise these reasons. Firstly, low-frequency amplification is needed because we have eventually to work the loud-speaker with a varying low-frequency current, which we cannot obtain at sufficient amplitude from the anode circuit of a detector valve.

Secondly, we need high-frequency amplification because the detector will not work properly with a very weak input, and because even strong signals lose energy in passing through the several tuned circuits now needed to give adequate selectivity for modern conditions. A. H.

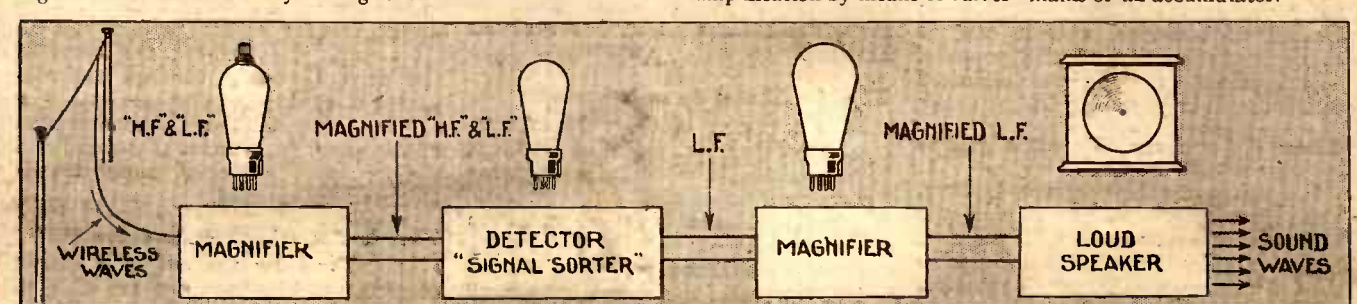
YOUR LOUD-SPEAKER

WHAT type of loud-speaker do you use? There are many types but probably there are only two in common use to-day. One is the moving-iron, also called the balanced-armature, and the other is the moving-coil.

Cheap speakers usually employ the moving-iron principle, which enables a good response of the middle and top frequencies to be obtained and provides a good volume output from a fairly small input.

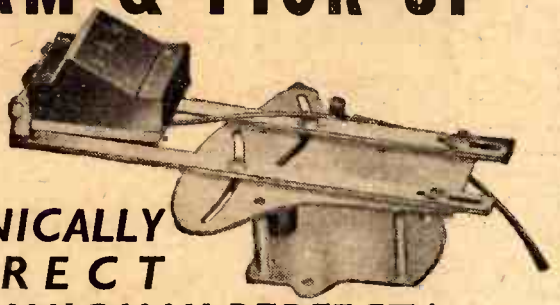
The only real deficiency of the moving-iron is its lack of bass-note reproduction. With small sets this is not really a great drawback, because at the volume output of such sets the intensity of the low-note output would be small anyway.

The moving-coil loud-speaker is now available in cheap chassis form, with a permanent-magnet instead of a field magnet that in the old days always had to be energised by some external means, such as the electric-light mains or an accumulator.



A simple diagrammatic sequence showing the stages in the process of reception at which high- and low-frequency amplification are introduced. It will be seen that before detection the wireless-wave energy consists of both high- and low-frequency amplification and that after detection there is only low-frequency current, the high-frequency current having been filtered out by the detector

PERFECT TRACKING WITH THE SIMPSON ARM & PICK-UP



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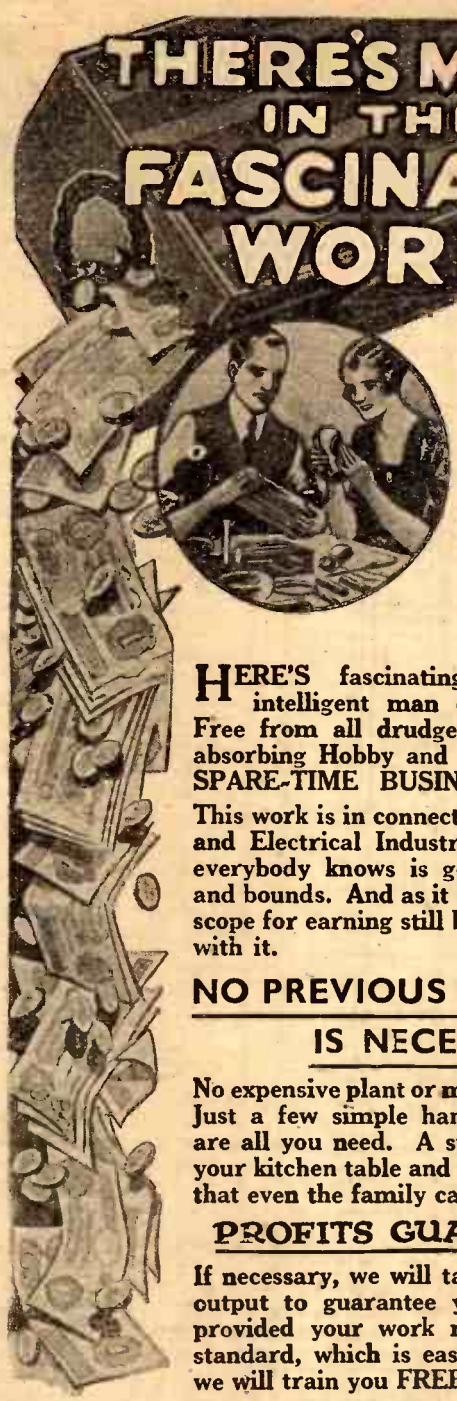

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"Amateur Wireless." 4/3/33.

In My Wireless Den

Weekly Notes: Theoretical and Practical

PENTODES AND TONE

IT is usual to connect a resistance and condenser across the output circuit of a pentode for the purpose of reducing the relative strength of the higher notes.

Some people say for bringing up the bass, but in actual fact you cut off some of the higher notes. If you increase the capacity of the condenser the higher notes are further reduced.

The same effect is brought about by lowering the value of the resistance. If the resistance be short circuited, leaving only the condenser across the circuit, the higher notes may be cut off entirely.

The best practice is to proportion the resistance and condenser to suit the valve and the loud-speaker. Usual values are .015 microfarad and 15,000 ohms, but it is surprising what a wide range of valves may be tried and be found to work satisfactorily.

The chief thing to bear in mind is that the condenser must be capable of standing up to high voltages, actually several times the normal high-tension. Many a user has found to his cost that the condenser may break down if it is not well made.

THESE ELECTROLYTICS

ELECTROLYTIC condensers have been employed in sets for a period long enough for us to state that they are satisfactory and economical.

There are the two types, the wet or aqueous and the dry. Both are useful and have relative advantages.

In the dry type there are many patterns of various voltage ratings and capacities. One example is rated at 50 microfarads, 12 volts; there are other of 8 microfarads, 200 volts, and so on. The chief point is to choose the pattern which will always withstand the voltages developed in the circuit.

These voltages are not always so small as they may seem. There are sometimes surge voltages. In mains sets the valves heat up slowly and, therefore, take a few seconds to arrive at their normal working state. Meanwhile the condensers may be subjected to much more than the steady working voltage which we know exists while the set is running. These points must be taken into account when choosing condensers, or breakdowns may occur.

DETECTOR WORKING

A DETECTOR valve having a resistance in its anode circuit should usually be given the maximum voltage available.

There will be a drop in voltage across the resistance and the actual voltage at the anode of the valve will be less than the total by the amount of the drop.

Thus if the anode circuit resistance is 20,000 ohms, and the current is 2 milliamperes, the voltage drop is 40. Now with a battery voltage of 120, the anode will have a voltage of 80.

This is usually about right. Sometimes the current is heavier when the drop is greater, or the resistance may be more than the value assured.

It is necessary to add the decoupling resistance to the anode resistance proper, when one is used as in a resistance fed transformer circuit.

If the anode voltage is too low the valve will not handle a normal signal without distorting it, and the output suffers as well. A valve may be a more sensitive detector when the anode voltage is low, but it cannot deal with such large inputs as when the voltage is higher.

ATLAS Q.P.P. MAINS UNIT

MAINS units for use with quiescent-push-pull receivers are now being manufactured by H. Clarke & Co. (Manchester), Ltd. Several models are available, and a typical unit of the Q.P.P. range is shown by the accompanying photograph. The model Q.P.24 is for 200-250-volt A.C. mains, and has three H.T. tappings. The

The new Atlas Q.P.24 mains unit, specially designed for Q.P.P. receivers

average output is 150 volts at 12 milliamperes, but peak outputs up to 20 milliamperes are passed without any appreciable voltage drop, owing to the extremely fine voltage regulation. The cash price of the Q.P.24 is £3 12s. 6d. The Q.P.26 unit has a similar specification to the Q.P.24, but is fitted with a trickle charger with an output of .5 amperes. The cash price of this model is £5. A D.C. mains unit for Q.P.P. receivers is available, and this is the model D.Q.P., the cash price of which is £2 5s. It gives the same output as the Q.P.24 unit. Easy-payment terms are available for all these units, and full details can be obtained free on mention of "A.W." from Messrs. H. Clarke & Co. (Manchester), Ltd., George Street, Patricroft, Manchester.

"THE JAMES 'PUSH-PUSH' (Q.P.P.) THREE"

(Continued from page 373)

kept down to the fairly low value of 5,000 ohms. The high-tension lead from the anode circuit of this valve is marked H.T.4 and should be taken to about 120 volts.

In the output circuit two pentodes are used. The smaller pentodes are satisfactory.

A bias of from 7.5 to 9 volts is needed and it should be noted that the bias is much larger than is normal for these valves as used in the ordinary way. The object is to reduce the standing current (no signal) to a small value, such as 2-3 milliamperes, for the pair of valves. The anode circuit is joined through H.T.+4 to the highest voltage of the battery, about 120 volts.

There are now the two pentode screen leads to be connected and one should be taken to the tap below the maximum, such as 115 volts. The others can also be taken to this tap for the time being. Tap H.T.+1, for the screen of the screen-grid valve, should be taken to the maximum allowable voltage for the type of valve, such as 80 volts.

SUITABLE VALVES FOR JAMES "PUSH-PUSH (Q.P.P). THREE"

Make	*H.F.*	*Detector*	*Output*
Mullard	PM12V	PM1HL	(2) PM22A
Cossor ..	220VSG	HL210	PT220
Marconi	VS2	HL2	PT2
Osram ..	VS2	HL2	•PT2
Mazda ..	S215VM	HL2	Pen220
Six Sixty	SS215VSG	SS210HL	SS230PT
Lissen ..	SG215V	HL210	PT225
Micromesh	—	HLB1	PenB1
Triotron	—	SD2	P215
Tungsram	—	PD220	PP230
Eta ..	—	BY1814	—

The adjustments are really quite easy and can be made quickly. A moving-coil loud-speaker is recommended.

You cannot go far wrong as the components and the circuit are specially arranged, but the setting of the bias and the screen voltages have to be carried out by the user. In many cases the two pentode screens can have the same voltage as the two valves will normally be near enough alike to give the desired results.

Incidentally, larger pentodes than those recommended can be used, but the bias must be increased to reduce the standing current for the pair of valves to from 3 to 4 milliamperes and the output transformer must suit them.

A Meter for 12 to 2,000 Metres

It should be noted that in the components for the "Meter for 12—2,000 Metres," described last week, the values of the two large condensers were given incorrectly. These should be .01 mfd. as shown on the blueprint, and not .25 mfd. as stated.

In the Wilkins & Wright announcement of "A.W." for February 25, the variable condensers specified for the "James Push-push (Q.P.P.) Three" were incorrectly shown. The correct Utility condensers for this set are the disc-drive type W318 (price 13s. complete) as specified by W. James.

BROADCASTING STATIONS

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

Metres	Kilo-cycles	Station and Call Sign	Power (Kw.)
13.97	21,470	Daventry (GSH)	15.0
16.88	17,770	Daventry (GSG)	15.0
19.737	15,200	Zeesen (DJB) ...	8.0
19.82	15,140	Daventry (GSF)	15.0
25.28	11,865	Daventry (GSE)	20.0
25.4	11,810	Rome (2RO) ...	15.0
25.53	11,750	Daventry (G5D)	20.0
31.20	9,615	Lisbon (CTIAA)	2.0
31.3	9,585	Daventry (GSC)	20.0
31.31	9,580	Radio Nations ...	20.0
31.38	9,560	Zeesen (DJA) ...	8.0
31.51	9,520	Skamleback	0.5
31.55	9,510	Daventry (G5B)	20.0
32.26	9,300	Rabat	0.5
40.3	7,464	Radio Nations ...	20.0
43.75	6,865	Vitus/Paris	0.3
45.38	6,611	Moscow	12.0
49.4	6,070	Vienna (UOR2)	2.0
49.59	6,050	Daventry (GSA)	20.0
49.83	6,020	Zeesen (DJC) ...	10.0
50.0	6,000	Moscow	20.0
52	5,769	Prague	0.5
207.3	1,447	Seraing	0.2
207.5	1,445	Pecz	3.0
209.7	1,430.4	Magyarovar	3.0
211.3	1,420	Newcastle	1.0
211.3	1,420	Antwerp	0.4
214.3	1,400	Aberdeen	1.0
214.3	1,400	Warsaw (2)	1.9
216	1,391	Chatelineau (EL)	2.0
217.1	1,382	Konigsberg	0.9
217.1	1,382	Brussels (Conf.)	0.25
218	1,373	Salzburg.....	0.5
218.5	1,373	Plymouth	0.2
219.6	1,366	Binche	0.3
220	1,363.7	Beziers	0.5
223.2	1,344	Swedish Relays...	—
224.4	1,337	Cork (6CK)	1.2
225.9	1,328	Fecamp	10.0
227.4	1,319	Flensburg	0.5
230.6	1,301	Malmo	1.2
231.8	1,294	Kiel	0.25
232	0,293	Liege (Wallone)	0.3
233.4	1,285	Lodz	2.2
236	1,270.9	Kristianssand ...	0.5
236.4	1,269	Bordeaux (S.O.)	3.0
237.2	1,265	Nimes	1.0
238.9	1,256	Nurnberg	2.0
240.1	1,249	Stavanger	0.5
241.3	1,243	Liege	0.3
242	1,238	Belfast	1.0
244.1	1,229	Basle	0.5
245.9	1,220	Berne	0.5
245.9	1,220	Cassel.....	0.25
245.9	1,220	Linz	0.5
245.9	1,220	Swansea	0.12
247.7	1,211	Trieste	10.0
249.5	1,202.6	Juan-les-Pins ...	1.0
250	1,200	Prague (Strasnice)	5.0
250	1,200	Radio Schaerbeek	0.3
252.9	1,186	Barcelona (EAJ15)	6.0
253.4	1,184	Gleiwitz.....	5.0
255.1	1,176	Toulouse (PTT)	0.7
256.7	1,168	Horby	10.0
259.3	1,157	Frankfurt-a-M. ...	17.0
259.3	1,157	Treves	2.0
261.6	1,147	London National	50.0
263.8	1,137	Moravska-Ostrava	11.0
265.7	1,129	Lille (PTT).....	1.3
267.1	1,123	Valencia	8.0
267.8	1,120	Nyiregyhaza	6.0
268.3	1,118.9	Bremen	0.3
269.4	1,112	Bari	20.0
271	1,107	Cointe-Liege.....	0.3
271.5	1,105	Rennes	1.3
273.7	1,096	Turin (Torino)	7.0
276.5	1,085	Hellsberg	60.0
279.7	1,072.4	Bratislava	14.0
281	1,067	Copenhagen	0.75
282.1	1,064	Lisbon (CTIAA)	2.0
283	1,058	Innsbruck	0.5
283	1,058	Berlin (E)	0.5
283	1,058	Magdeburg	0.5
283	1,058	Stettin	0.5
284.8	1,053	Radio Lyons	1.0
286	1,049	Montpellier	0.8
288.5	1,040	Bournemouth ...	1.0
288.5	1,040	Plymouth	0.12
288.5	1,040	Scottish National	50.0
291	1,031	Vilpuri	13.0
293	1,022	Kosice	2.5
293.7	1,021.5	Limoges (PTT)	0.7
296.1	1,013	Huizen	20.0
298.8	1,004	Tallin	11.0
301.5	995	North National...	50.0
304.3	986	Bordeaux (PTT)	13.0
306.8	978	Zagreb (Agram)	0.75
307.5	975.8	Falun	0.5
308.3	972.9	Vitus (Paris).....	1.0
309.9	968	Cardiff	1.0
212.8	959	Cracow	1.5
313.9	955.6	Genoa (Genova)	10.0
315.8	950	Marseilles	1.6
318.8	941	Naples (Napoli)	1.5
318.8	941	Sofia (Rodno Radio)	1.0
319.7	936	Dresden.....	0.25
321.9	932	Goteborg	10.0
325	923	Breslau	60.0
328.2	914	Poste Parisien ...	60.0
331.6	904	Milan Vigentino	20.0
332.2	902.9	Poznan	1.9
338.2	887	Brussels (No. 2)	15.0
341.7	878	Brunn (Brno) ...	35.0
345.2	869	Strasbourg (PTT)	11.5
348.6	860.5	Barcelona (EAJ1)	8.0
351.8	853	Leningrad (RV7O)	15.0
352.1	852	Graz	7.0
355.8	843	London Regional	50.0
360.5	832	Muhlacker.....	60.0
363.6	825	Algiers (PTT) ...	16.0
365.5	820.7	Bergen	1.0
367.2	817	Fredriksstad	0.7
368.1	815	Bolzano	1.0
368.1	815	Helsinki.....	13.2
369	813	Seville (EAJS) ...	1.5
370.1	810	Radio LL (Paris)	0.8
372.2	806	Hamburg	1.5
376.4	797	Scottish Regional	50.0
381.7	788	Lvov	16.0
385	779	Radio Toulouse	60.0
385	779	Stalino (RV26)...	10.0
389.6	770	Leipzig	75.0
392	768	Archangel (RV36)	10.0
394	761	Bucharest	12.0
398.9	752	Midland Regional	25.0
403.8	743	Sottens	25.0
408.7	734	Katowice	12.0
413.8	725	Athlone.....	60
416.4	720.5	Radio Maroc (Rabat)	6.0
419.5	715	Berlin.....	1.5
424.2	709	Madrid (Espan.)	2.0
424.2	709	Madrid (EAJ7)...	3.0
424.3	707	Moscow (RV39)	10.0
430.4	697	Belgrade	2.8
431	696	Parede (CTIGL)	1.5
435.4	689	Makhatch-Kala ...	100.0
435.4	689	Stockholm.....	55.0
441.2	680	Rome (Roma) ...	60.0
447.1	671	Paris (PTT)	7.0
447.1	671	Danzig	0.5
449.7	667	Madona	15.0
450	666.5	Odessa (RW37)	20.0
451.8	664	Madona.....	25.0
453.2	662	Klagenfurt.....	0.5
453.2	662	Agen	0.5
453.8	661.3	Milan-Siziano ...	50.0
455.9	658	San Sebastian (EAJ8)	3.0
459	653	Beromuenster ...	60.0
465.8	644	Lyons (PTT)	1.6
472	635.6	Tiraspoli.....	10.0
472.4	635	Langenberg	60.0
480	625	North Regional...	50.0
483	621.1	Ivanovo-Vosnesensk	20.0
488.6	614	Prague 120.0	
495.8	605	Trondheim	1.2
501.7	598	Florence.....	20.0
509	590	Astrakhan (RV35)	10.0
509.3	589	Brussels (No. 1)	15.0
518.7	578.4	Vienna	15.0
525.4	571	Riga	15.0
532.9	563	Munich	60.0
537.6	558	Palermo	3.0
541.5	554	Sundsvall	10.0
550.5	545	Budapest (1).....	18.5
555.5	542	Tampere	1.0
559.7	536	Kaiserslautern ...	1.5
559.7	536	Augsburg	0.3
564.4	531.5	Freiburg.....	0.25
564.8	531.1	Wilno.....	16.0
565	531	Freiburg.....	0.25
566	530	Hanover.....	0.3
573.2	523.3	Grenoble (PTT)	2.0
574.7	522	Ljubljana	7.0
587.1	511	Tartu	0.5
680	442	Lausanne	0.6
719.4	416.6	Moscow (RV2) ...	20.0
746.2	402	Ostersund	0.6
759.5	395	Monte Ceneri (tests)	20.0
779.2	385	Petrozavodsk (RV29)	20.0
825	363.6	Sverdlovsk.....	36.0
833	360.1	Heston Airport...	5.0
845	355	Budapest (2).....	3.0
848.7	353.4	Rostov (RV12) ...	20.0
857.1	350	Leningrad 100.0	
882	340	Saratov (RV3) ...	20.0
937.5	320	Kharkov (RV4)...	20.0
967.9	310	Alma Ata (RV60)	10.0
1,000	300	Moscow (Popoff)	40.0
1,034.5	290	Kiev (RV9) 100.0	
1,043	287.6	Tiflis (RV7) 100.0	
1,071.4	280	Scheveningen-Haven	10.0
1,075	279	Oslo	60.0
1,107	271	Minsk (RV10) ...	35.0
1,153.8	260	Kalundborg	7.5
1,170	256	Taschkent (RV11)	25.0
1,190.5	252	Luxemburg 140.0	
1,200	250	Istanbul	5.0
1,200	250	Reykjavik	16.0
1,239.7	242	Boden.....	0.6
1,252.6	239.5	Vienna Exp.....	3.0
1,260.5	238	Bakou	35.0
1,304	230	Moscow (T.U.)...100.0	
1,354.4	221.5	Motala	30.0
1,380	217.4	Novosibirsk (RV6)	100.0
1,411.8	212.5	Warsaw.....120.0	
1,445.7	207.5	Eiffel Tower	13.5
1,481	202.5	Moscow (RV1)...500.0	
1,538	195	Ankara	7.0
1,554.4	193	Daventry (Nat.)	30.0
1,620	185	Norddeich (KVA)	10.0
1,634.9	183.5	Zeesen	60.0
1,685.3	178	Kharkov.....	25.0
1,725	174	Radio Paris.....	75.0
1,796	167	Lahti	54.0
1,875	160	Hilversum	8.5
1,920	156	Blaj.....	0.75
1,935	155	Kaunas	7.0
2,000	150	Craciunelu	1.0
2,625	119	Konigswuster-Hausen (press)	20.0
2,650	113	Eiffel Tower	15.0
2,900	103.5	Konigswuster-Hausen (press)	15.0

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Melotone Speaker Kit

IF you think that any improvement is possible in the mounting and baffle of your speaker, then write through my free Catalogue Service for a folder describing the Melotone speaker kit. This is a padded type baffle having several advantages and enabling a speaker to be provided with an effective baffle area. **954**

Rola Moving-coils

Rola dual-balanced pairs of speakers are described in the latest Rola folder. There is an impression that balanced pairs of speakers are expensive but this is discounted by the fact that two matched F5 speakers, complete with transformer, cost only £2 16s. 6d. the pair. The Rola pairs of speakers are supplied in specially matched groups, only one input transformer being necessary for each pair. **955**

Bulgin Kits

Two layouts have just been sent me by Bulgin. One is of the Simple Two-three battery driven kit and the other the Drive-all A.C. box universal unit. Both the receiver and the eliminator are made up mainly with well-known Bulgin components. The layouts give lists of components and wiring instructions. **956**

OBSERVER.

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Please write concisely, giving essential particulars.

A fee of one shilling postal order (not stamps), a stamped, addressed envelope and the coupon on the last page must accompany all queries.

Not more than two questions should be sent at any time.

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Slight modifications of a straightforward nature only can be made to blueprints. For more serious alterations the minimum charge is 2/6.

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THE IMPROVED "TONIC" self-generating trickle-charger kit keeps 2-volt accumulators fully charged. Electric mains and charging stations unnecessary. Ideal for remote places, 7/- each, postage 9d. Particulars, testimonials, with pleasure.—Williams, Netherend, Cradley, Birmingham.

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QUIESCENT PUSH-PULL.—Revolutionise your present Battery Receiver by replacing existing output valve with quiescent push-pull. Full moving-coil output (1½ watts). Current only 6 milliamps. Complete conversion kit, including 2 pentodes, specially matched transformers (push-pull), milliammeter and all necessary resistances, condensers, etc., £3 9s. Send for lists and diagrams.—Woods Radio, Holcombe Brook, near Bury.

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