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and
Radiovision

Every
Wednesday

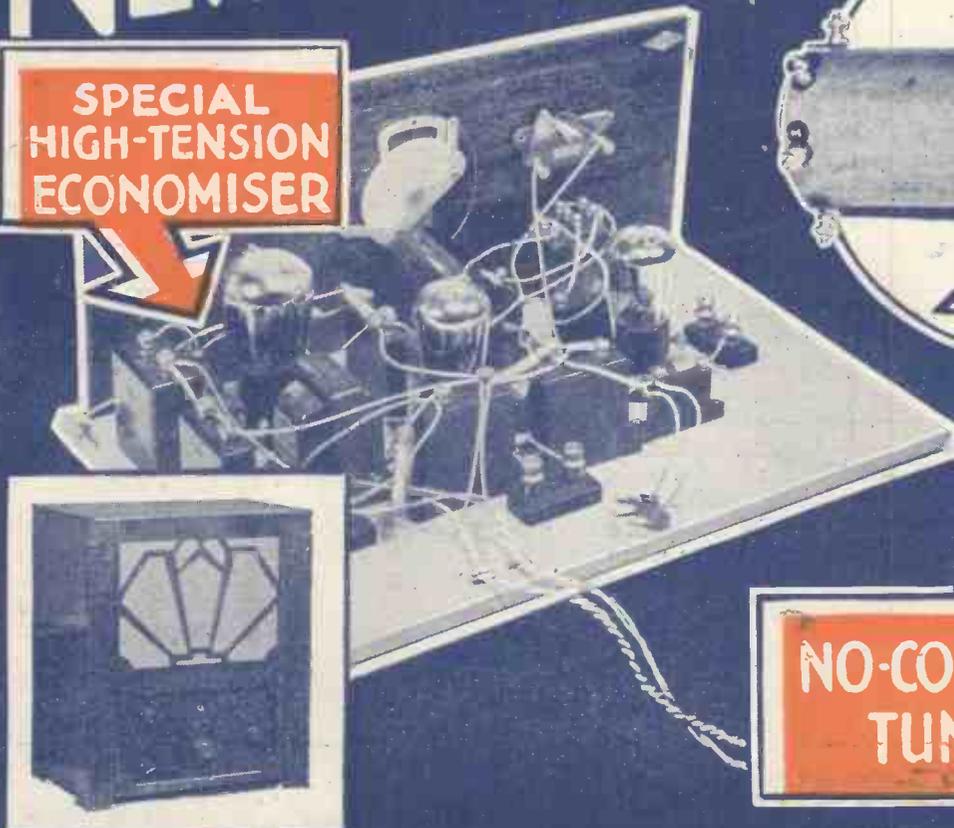
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Vol. XXIII. No. 583

Saturday, Aug. 12, 1933

A NEW-STYLE THREE

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HIGH-TENSION
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**NO-CONDENSER
TUNING**



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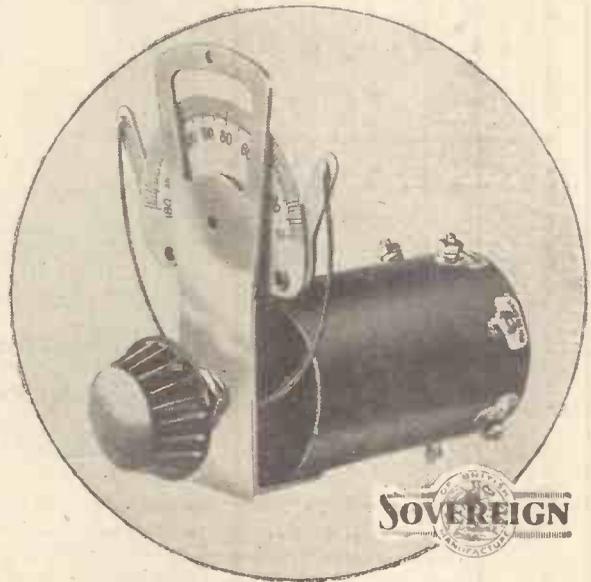
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T U N I N G C O I L S



STAND
85

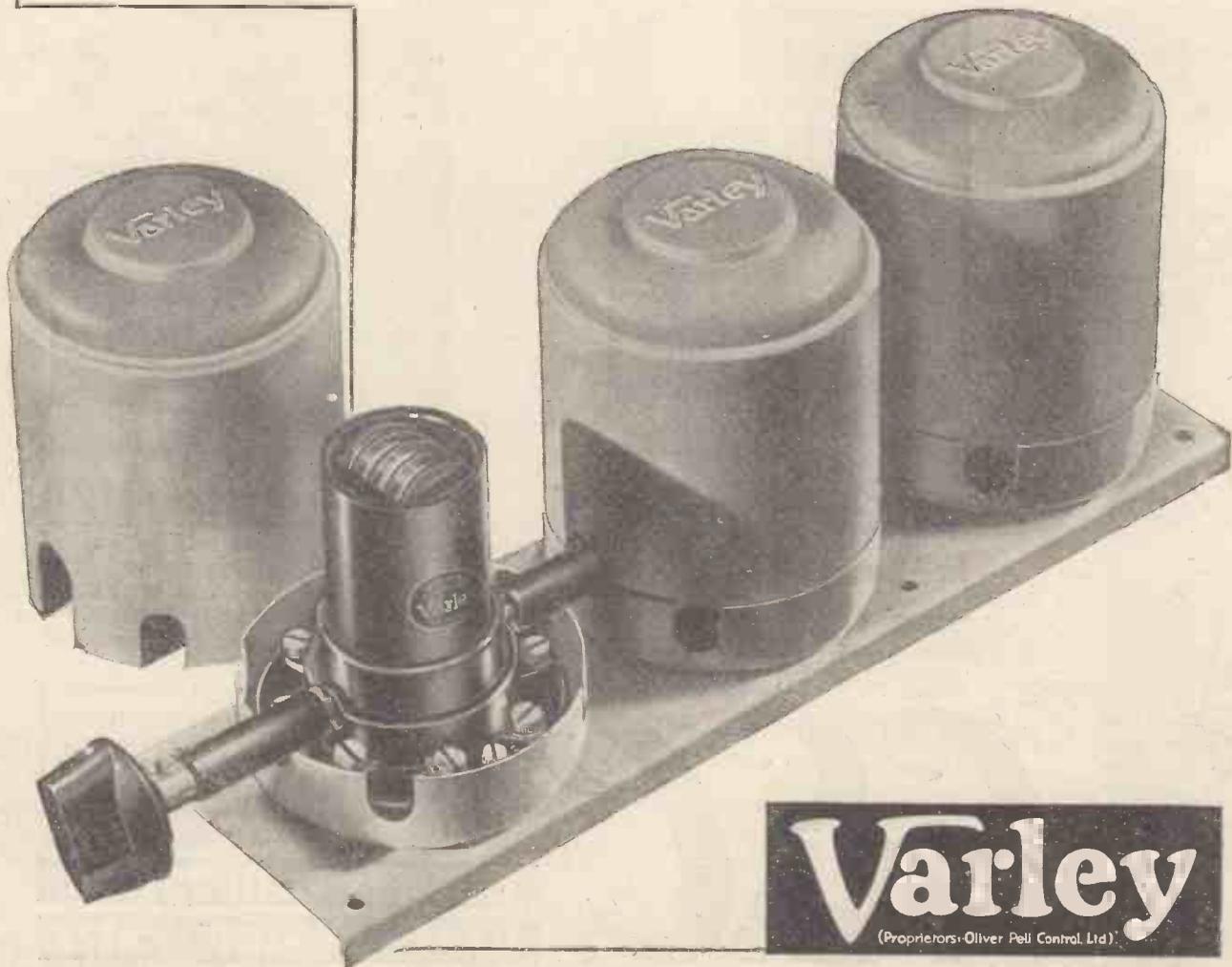
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1933-34

New coils, new components, new receivers and new radio-gramophones. Don't miss the Varley exhibit at Olympia! And if you are interested in Permeability Tuning, here is still another reason for visiting the Varley Stand.



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

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News and Gossip of the Week

OUR FIRST "SHOW" NUMBER

MANY pages of this issue are devoted to advance details of what you will see at Radiolympia, which opens its doors on August 15, less than a week after this issue is published. Thermion, on page 161, waxes enthusiastic about the exceptional interest of this year's show. Our Technical Staff gives a brief, though authoritative, survey of developments on pages 151 and 152.

FIRST SET WITH NO TUNING CONDENSERS!

In our centre pages this week we follow up our exclusive announcement of last week about a condenser-less tuning coil by giving full working details of a suitable set making use of this red-hot development of iron-core tuning. This set is notable also for the use of a high-tension economiser, a metal rectifier whose special function in saving the milliamperes is fully explained by "The Experimenters" in their chatty article this week on pages 153 and 154.

LADY VOCALIST FOR B.B.C. BAND

FEMININE influence is evidently growing at Broadcasting House, for no sooner have we recovered from the pleasant shock of hearing a lady announcer from the London station than the B.B.C. decides to introduce a

lady vocalist into Henry Hall's Dance Band. What with broadcasting every day, rehearsing and recording, Les Allen has had a fairly arduous time and really needs some assistance. A woman's voice will add a spice of variety to the dance programmes.

We tip Diana Clare for the job. No doubt you heard her the other night singing with Henry Hall's band?

SURPRISE AT IRISH SITE

WHEN the B.B.C. recently announced the purchase of the site near Lisburn for the erection of the new Northern Ireland Regional, many people were surprised, because the land is only about 200 ft. above sea level. The reason for the choice of this particular site is that the City of Belfast is blanketed on three sides—north, east, and west—by hills; so the engineers had to look to the south, where the ground is not so high, in order to make sure of reliable reception in Belfast of the new station's transmissions.

FUTURE OF MIDLAND REGIONAL

BY next summer the long-wave Droitwich station will be testing, but, although Midland Regional is to be erected on the same site, it is not scheduled to start broadcasting for several months after the high-power National takes over regular service.

As we showed in our map recently, Midland Regional will drop to the low wavelength of 296.2 metres and the B.B.C. is likely to wait for the general change round of wavelengths before transferring Midland Regional to Droitwich.

PREVENTING A BIRMINGHAM OUTCRY

REMEMBERING the outcry when Midland Regional was moved from the low-power Birmingham site to Daventry some years ago, the B.B.C. has prepared its plans very warily. At the moment Birmingham listeners get their Midland

This Week's "Specials"

	Page
A New High-tension Economiser ..	153
Don't Judge a Set by the Number of Valves! ..	159
The Lightning Bogey ..	162
The New-style Three ..	164
A New Radio Mystery ..	170

Regional programme from Daventry on a wavelength of 398.9 metres, and it is expected that the more powerful signals from the projected 50-kilowatt Midland Regional station at Droitwich, only fifteen miles from Birmingham, will be received at about the same strength.

THOSE CLEVER ENGINEERS!

HEREIN lies the cleverness of the engineers. If they had agreed to open the high-power Midland Regional at Droitwich when the new National was opened there is no doubt that the strength on the existing wavelength would be much greater than it is now, and then when the general B.B.C. reshuffle of wavelengths occurred on the closing of the medium-wave Nationals there would have been an appreciable reduction in the strength of Midland Regional in Birmingham when the wavelength was reduced.

SIR WALFORD DAVIES AGAIN

THOUSANDS of music lovers will welcome the news that Sir Walford Davies, aptly called "The Music Master of the Microphone," is to broadcast once a week after the main news bulletin. His new series, entitled "Keyboard Talks," is scheduled to start in the autumn. Although Sir Walford's talks to schools have continued without a break for many years it is a long time since he was heard in the evening programme, though many will recall with pleasure those talks of his on "Music and the Ordinary Listener."

BOOKED FOR RADIOLYMPIA SHOW

AT last the B.B.C. has found the right type of funny man for the much-heralded "Watt-Pepper" show being staged at Olympia



This piano has a wireless set with loud-speaker fitted on the front panel, and it can be played at the same time as reception is carried on

this year. After a hectic search Lupino Lane was booked, and he should make a hit with the exhibition crowds.

B.B.C.'S CRITIC APPOINTMENTS

AS we ventured to predict some weeks ago, the appointment for film criticism at the B.B.C. has caused a big surprise. *Oliver Baldwin is to be the new film critic.* He is in good company, for at the same time the B.B.C. has settled the appointments of its other critics, and Desmond MacCarthy and G. K. Chesterton will share the work of reviewing books, while "Archie" Haddon will talk about the theatre. An interesting gang!



Meet Charlie Kunz! He is the Pennsylvania-born leader of the Casani Club Dance orchestra, which figures very frequently in the August dance programmes of the B.B.C.

ERIC MASCHWITZ'S FIRST SHOT!

IF all Eric Maschwitz's shows in his forthcoming vaudeville drive in the autumn come up to the success of "Café Colette," he will have good reason to feel braced with himself. You can hear "Café Colette" again on September 6. The idea, in case you didn't hear the original show, is that Eric holds a small party in the vaudeville studio, while his guests dance and chat to the strains of the orchestra, just as they might do in a restaurant. The attraction of the broadcast is that for once in a way the effects sound perfectly genuine.

LIVELY POLITICS EXPECTED

WE are glad to hear that the B.B.C. has given complete freedom to the political parties in the choice of their speakers for the autumn arrangement. No censorship of any kind will be exercised. All the Big Shots at Westminster are down for hearing. If the new freedom-of-speech rule does not make our parliamentarians do their stuff nothing will.

"REDS" VERSUS "BLUES" AT THE B.B.C.

OCTOBER 1 is zero hour in the reorganisation war at Broadcasting House. On that day every member of the staff will come under one or the other of two categories, "red" and "blue." A wag at the B.B.C. suggests that everyone ought to wear a rosette of the appropriate colour to avoid confusion. Much as we applaud

organisation ideas aimed at improving efficiency we do hope that the reds, no less than the blues, will bear in mind their ultimate *raison d'être*—the entertainment of the listening millions.

END OF PROGRAMME RESEARCH

MANY of the charming boys who have been conscientiously engaged in what is called programme research are affected by the reorganisation changes. In future they will be given definite jobs to do. Bread and butter for the masses instead of caviare for the elite! One programme researcher has already come down to earth and is doing a little announcing. Another new voice among the announcing staff is R. G. Gretton, but his thunder was entirely stolen by Mrs. Borrett, whose appointment more or less coincided with his.

WILL SONG-PLUGGING STOP?

EVIDENTLY the B.B.C. has great faith in humanity, because it seems confident that the new arrangement with outside dance bands, whereby each performance is paid for at a minimum rate of £40, will effectively prevent "song-plugging." Now that these new contracts have been signed the B.B.C. will proceed immediately against any band discovered "plugging" in the future.

SUCCESS OF RECORDED PROGRAMMES

WHEN young Malcolm Frost returns from his world tour he will be placed in charge of recorded programmes, which have definitely caught on in many parts of the Empire. In Australia, for example, the two broadcasting chains competed strenuously for the exclusive rights to broadcast the twelve recorded programmes already made by the B.B.C. in London. Indeed, out in Australia, where the Empire signals are badly heard, these records seem likely to form a very important link with the London studios.

MORE AUTUMN TALKERS

BIG plans to make the autumn talks interesting are now being unfolded by B.B.C. programme officials. We are delighted to hear that Vernon Bartlett will do a new series of talks on foreign affairs. Howard Marshall, who won fame over the microphone last winter by his vigorous talks on the slum problem, is expected back in the autumn with a novel series.



To meet the seasonal rush of orders, the H.M.V. factory has introduced many time-saving methods of production, including this lift arrangement whereby all parts of the set can be examined without undue fatigue

"ROBERT E. LEE" BROADCAST

IN the Regional programme on August 16, and in the National on the 18th, you will be able to hear John Drinkwater's play *Robert E. Lee*. Mr. Drinkwater knows how to work up the glamour of the Civil War period of American history, and this new play should prove no exception, dealing as it does with the fine story of the Confederate General.

WELCOME TO STAND 10

IF you go to Olympia—and as a reader of "A.W." you can hardly afford not to go—you must certainly look us up. We shall be delighted to welcome you to our stand, which is No. 10 in the Grand Hall. Members of our technical staff will be there all the time, ready to give you free advice on radio problems that may be worrying you.

This year our stand is notable for several novelties and surprises. As we want to give you a pleasant surprise, we are not going to say any more about our special "stunts," but we can assure you that they are well worth paying us a visit to experience.

TELEVISION ANNIVERSARY PROGRAMME

ON August 22 the B.B.C. broadcasts its first anniversary television programme—rather an ironic commentary on the fact that not one in ten thousand listeners has ever seen a television programme. Yet for a year now the B.B.C. has broadcast television by the Baird system for four evenings a week, as, indeed, it still does, on Mondays, Tuesdays, Wednesdays and Fridays. Many famous artists have appeared before the television scanner at Broadcasting House, and to an illustrious list will be added a surprise on the anniversary night, when we understand Mr. Baird will appear "in person."

TELEVISION THIS AUTUMN

MANY amateurs are talking enthusiastically about television prospects this autumn. The B.B.C. is certainly becoming much more active, preparations for ultra-short wave television from the roof of Broadcasting House being well under way. We understand an entirely new system of film television will be tried out, and that this, with the Baird system, will provide a detail far greater than the present 30-line pictures being sent out on the medium waves. Talk of 120-line pictures is common, and it looks as though really television, at least for the select few who can fix up a televisor of the right type, together with a short-wave receiver, is rapidly approaching the realms of possibility.

"GOING SOUTH"

ON August 30 we shall hear a revised edition of Derek McCulloch's "Going South," a show that proved very popular when originally broadcast, consisting as it did of a series of local cameos of the Southern States of America. We shall see them through the eyes of a coloured Pullman conductor on the train going from New York to New Orleans. *En route* the train passes through the country of cotton and sugar plantations and along the banks of the Mississippi, and the visitor on the train hears the plantation songs and spirituals of the negroes at work or at worship. Many of these songs are well known to listeners, but they gain greatly by being broadcast against their natural background.

WHAT YOU WILL SEE EXHIBITION AT THE

An Olympia Forecast by the "AMATEUR WIRELESS" Technical Staff

ALL-ROUND progress has been made in radio this year, so much so that in a brief survey it is difficult to do full justice to every section. We should like to impress on readers that this is a year of remarkable development not only in complete sets, but in practically every component part and accessory.

Thanks to a far-sighted policy by the component manufacturers, many important developments have been released months

iron inside the coil producing the same effect on the wavelength as a condenser when it varies the capacity.

Short waves are unquestionably catching on among broadcast listeners, but interest is not sufficient, as a rule, to make listeners buy a special short-wave set. For this reason, set makers are designing sets to cover short, medium, and long wavebands without coil-changing. And for those making their own sets there will be several good all-wave coils at the show.

Last year constructors were intrigued with the Radiopak, a unit combining a three-gang condenser and three tuning coils. The idea was to make the home-constructed set tune more accurately, with the advantage that the number of wires was reduced and that the appearance was greatly enhanced.

Now the Radiopak idea has been widely adopted, and we shall see the J.B. Linacorem, a pack with iron-core coils and three-gang condenser, and the

Igranic Igranipak, a similar production.

The last named goes further than any of the others, because, in addition to a three-gang condenser, three separate coils, there are three five-pin valve holders, grid condenser and leak, wave-changing and mains switching. In other words, you have all the real "works" of a complete set except for the low-frequency amplifier. This should prove of interest to those keen on developing a good chassis into a de-luxe receiver.

In these pages the AMATEUR WIRELESS Technical Staff reviews some of the outstanding exhibits that every keen amateur should look out for at the Radio Exhibition, which this year will be open from Tuesday, August 15, until Thursday, August 24. This year there are more developments than ever before in the history of broadcasting, and this article will serve as a guide to some of the more important tendencies of the new season. When you visit Olympia come along to the AMATEUR WIRELESS stand—No. 10 in the Grand Hall.

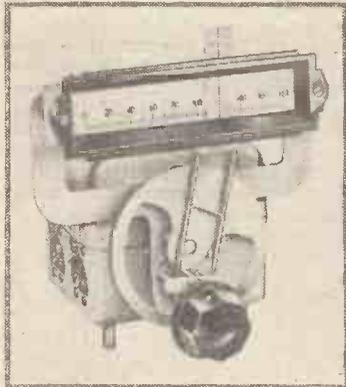
NEW VALVES

THIS year valves have undergone revolutionary improvements. The characteristics have been improved in all the ordinary valve types, but the greatest interest will probably centre in the entirely new types, such as high-frequency pentodes, for both battery and mains, pentagrid frequency changers for super-hets, and high-slope low-frequency pentodes with amazingly high amplification factors.

With the new coils already mentioned these new valve types can be used to their fullest advantage. That is why four valves this year, whether in straight or super-het circuits, provide phenomenal range and volume—much more than we used to get from six- and seven-valvers of but two or three years ago.

Four-valve super-hets have really been put on the map by multigrad valves, such as screen-grids, pentodes, and pentagrids.

Double-diode-triodes and pentodes have made automatic volume control really effective, as you will see from the many sets at the show.



One of the new full-vision scales made by J.B.



A representative moving-coil loud-speaker by Celestion. As can be seen, this is a massive job

before the show, with the result that set makers have been able to incorporate them in this year's sets to be seen at Olympia.

Our best plan is to divide our attention among the more important components and to explain briefly just how they are an improvement over last year.

TUNING COILS

AT last year's exhibition iron-core coils had not "arrived." Long before this year's show, though, most coil makers had brought out an iron-core coil, starting with the well-known Colvern Ferrocart. This iron-core coil development alone has greatly decreased the overall dimensions of this year's layouts.

Quite apart from their use as ordinary tuning coils, iron-core coils are now being used in the intermediate-frequency stages of superhet sets.

Nearly every set stand reflects the effect on design of these new coils. At least two stands will be showing an even "hotter" development—really a sequel to iron-core coils—permeability tuning.

Condenser-less tuning is brought within the bounds of practical design by the new permeability tuning coils, the movement of the



The Avominor, a useful multi-purpose test meter



One of the new W.B. Microlode loud-speakers, type P.M.6



The new Telsen condensers are totally enclosed in bakelite cases



The Block 2-volt accumulator, well known for its plateless construction

Although the universal mains valve has not yet been fully developed, there are signs, as you will see for yourself, that the valve makers now realise the need for a valve equally suitable for A.C. and D.C.

More than one set at the show will be designed for universal mains connection, using 20-volt D.C. valves.

Quite apart from the user convenience of universal mains sets, there is the often overlooked point that the production cost is greatly decreased, because the manufacturer can make a great many more universal sets than he would dare to make of sets for limited mains application.

For the battery man the class-B valves giving 2,000 milliwatts are bound to attract great attention, because this new type of valve provides real mains volume with a minimum expenditure of anode current.

No one can say that the battery user has been neglected by the valve makers this year. All past neglect has been more than compensated by the positive glut of new battery valve developments.

The high-frequency pentode is just one example of how the valve maker has realised the large potential market among battery users. First we had the mains version, but at the show you will see a really fine battery version—a high-frequency pentode with an amplification factor of 900!

Steep-slope detectors are among the many improved valves of normal three-electrode construction. Slopes of 1.8 to 2 milliampères per volt are quite normal, while pentode valves with magnification factors of 60 and 70 are more the rule than the exception.

With the new A.C. pentodes, notably the new Mazda, A.C.2/Pen, a full 2,000 milliwatts can be obtained from a pick-up without any intermediate amplification—simply a transformer in the grid circuit of the one and only valve. Economy and simplicity with a vengeance!

For mains working the delayed-action switch, used to prevent an excessive voltage from being applied to the anodes of A.C. valves while the heaters were still cold, has never been very popular. The valve makers have realised this, and knowing the danger of sudden voltage surges, have developed a whole range of indirectly heated rectifying valves, which take just as long to heat up as the

receiving valves, so that no special switch device is needed.

At last really high wattage power valves at reasonable prices are available: 25 watts for 35 shillings is the sort of thing you can expect at this year's show. We are thinking in particular of the Osram PX25. The high-spot valve of this class will be the DA100—a 100-watt output valve. You will have to pay for this colossal output—the price is 10 guineas.

COLD METAL RECTIFIERS

THIS year the Westinghouse Westector units—miniature metal rectifiers—have really come into their own. In a set with a self-contained loud-speaker the trouble of microphonicity is still formidable, but with a Westector in place of the normal valve detector mutual interference between loud-speaker and the set is completely cured.

The Westector makes automatic volume control simple and cheap and it can be used in almost any set that has a good high-frequency side to it. Lately it has been shown that this "cold valve" can aid in battery-set economising. Its rectifying action can be utilised to control automatically the current of the output valve, so as to keep down the anode current when the signals are weak.

In brief, the Westector has already proved itself useful for three different jobs; detection in big sets, especially as second detector in superhets; automatic volume control; and battery economy. Many commercial sets are making use of all three ideas.

TUNING CONDENSERS

NOW that car radio has come to stay, the component makers have been put on their mettle to reduce the dimensions of many parts in common use, notably the tuning condenser. The normal three-gang condenser takes up a great deal of the set's available space, but to cope with the midget dimensions of car radio and other sets this year's three-gang condensers have been reduced in size, so that they are now no larger than the single condensers of last year. What is more, they are more efficient, being compact and robust.

Even pre-set condensers have been reduced in size, and instead of the bakelite case and knob on the top we find this year a flat porcelain holder with a single plate and a small screw head for adjustment.

Reaction condensers have also been reduced in size, but as high-tension is usually applied to one side of them it has been necessary to isolate each plate by means of mica or other solid dielectric.

Ganging has been a big trouble with most constructors, so it is good news that at the coming show we shall find nearly all the gang condensers with trimmers fitted inside the

condenser, having an operating control coming through the hollow main drive.

The knob has the appearance of being split into two, the half nearer the panel being the ordinary tuning knob, and the back half the trimming adjustment. This enables the tuning circuits to be kept "in gang" over all parts of both wavebands.

GRAMO-RADIO EQUIPMENT

AS various parts of the receiving chain have been so greatly improved, it has been found essential to improve the response of most pick-ups on the market.

The improvement in valve amplification has shown how unnecessary is a high output from the pick-up. Nearly all this year's pick-ups have reduced the output to about .75 volt, and at the same time have boosted up the bass responses to make up for inevitable amplifying deficiencies.

Some of the new pick-ups have "hum-bucking" coils fitted integrally, to overcome hum picked up from nearby gramophone motors. Nearly all pick-ups have quick-change needle grips.

LOUD-SPEAKERS

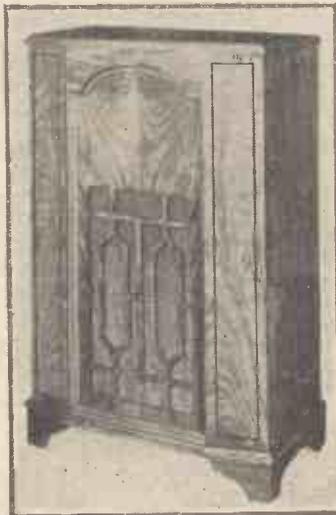
FROM a survey of the new season's loud-speakers, we cannot help being impressed with the amazingly low prices. As we go to press, a D.C. moving-coil loud-speaker has come to our notice costing only 17s. 6d.—cheaper than many balanced-armature units, in fact.

It is possible to buy permanent-magnet moving-coil loud-speakers from 25 shillings upwards. At the other end of the scale manufacturers have realised that some listeners want first-rate quality, for which they are prepared to pay as much as 10 guineas. These are to be shown, and they form a contrast to the many reliable but phenomenally cheap moving-coil chassis.

Dual loud-speakers have gained in favour since last year; in fact, one manufacturer is using three loud-speaker units in order to make sure of uniform quality throughout the frequency range.

Even the smallest loud-speaker units of the moving-coil type will handle up to 2 watts. There is very little chance of loud-speaker rattling now, even when driven by high-power output valves.

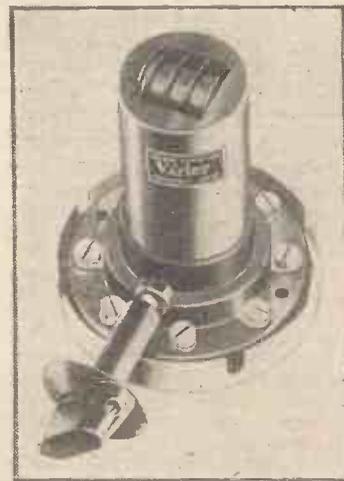
Altogether, loud-speakers will give better quality and more volume this year.



A handsome new cabinet by Camco—the Oxford model



A representative three-gang condenser from the Utility range



One of the new Varley coils that will be seen at the Show

Remember that next week's specially enlarged issue of AMATEUR WIRELESS will contain a complete guide to the exhibits at the Radio Show at Olympia, open from Tuesday, August 15, to Thursday, August 24.

A NEW HIGH-TENSION ECONOMISER

HERE is another new idea for the much-neglected battery set users—a simple method of regulating the anode-current consumption so that you do not waste valuable milliamperes when the signal decreases.

This process will immediately remind you of Q.P.P. and class-B amplification. There certainly is a resemblance, because the aim of the new system is to save anode current. But the method of achieving the saving in current is entirely different. The idea we are telling you about this week is an additional gadget or unit, and not a replacement for an existing valve.

It can be adapted to almost any set, provided

Most schemes produced for economy in high-tension consumption mean that efficiency is sacrificed in some way. But here we are able to give exclusive details of a new economy system sponsored by Westinghouse that really does cut down the running costs of a set with a pentode output stage. The device is incorporated in the "New-style Three," described on pages 164-166 of this issue

that set is not already fitted with Q.P.P. or Class B.

Let us get our ideas quite clear on what really affects the anode current of a power valve—either triode or pentode. The construction of the valve determines the impedance, which in turn controls the amount of electron flow from filament to anode, and so really the impedance controls the amount of current drawn from the high-tension battery. When you buy a power valve the impedance is, of course, a fixed quantity, but you can still control the anode current to suit operating conditions, by altering the negative voltage applied to the grid of the valve by means of a bias battery.

You have probably found for yourself that, as you increase the negative grid bias, you decrease the current flowing in the anode circuit. If you have never done this you ought to—buy or borrow a milliammeter, connect it in series with the anode circuit of the last valve—remembering to connect the positive terminal of the meter to the positive terminal of the battery!—and then you will readily appreciate how great is the control of the anode current exerted by the grid bias.

Normally the grid of the power valve is negatively biased in order to avoid distortion. If you do not apply enough negative bias to the valve you will get serious distortion and excessive anode current, which will very soon run down your high-tension battery. On the other hand, in your enthusiasm to save anode current you can easily apply too much bias, and that, although reducing the anode current very considerably, may again cause just as serious distortion as by under-biasing.

Obviously, in practice, a compromise must be made, so that we neither under- nor over bias the valve, and obtain reasonable free-

By

"The Experimenters"

dom from distortion with as low an anode current as possible.

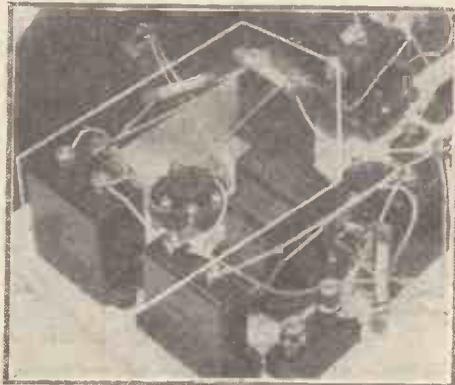
May we remind you that when a triode valve is used as an amplifier, the grid must always be negative with respect to the filament. It must on no account become positive, even momentarily, because this will cause distortion. There is the further very practical objection that when the grid is positive the anode current increases to a great extent.

Let us suppose the grid is negatively biased by 9 volts. The incoming signal, being an oscillation, is at one instant so many volts positive and the next instant the same amount negative. What we have to be sure of is that the positive swing applied to the grid does not more than counteract the negative bias on the grid—otherwise the signal will bias the grid positively.

Remember that a weak signal means a small voltage variation on the grid and a strong signal, such as the local station, means a large grid-voltage variation. Furthermore, the small grid-voltage variation will cause only a small anode-current variation, whereas the large grid-voltage variation will cause a larger anode-current variation.

If, now, you start by over-biasing the valve by applying a lot of negative voltage to the grid, the mean anode current will be so small that a powerful signal will upset the apple cart, because it will be impossible to obtain a correspondingly large anode-current variation.

We come to this point, then, that although a large negative bias is possible with a small signal, it is quite unsuitable for a large signal. From which you see that if we apply a constant negative bias of sufficiently small voltage to cope with the strong signals, we shall be wasting a good deal of the resulting high anode current when our signals are small.



This photograph shows the "economy high-tension" components fitted in the "New-style Three" (see pages 164-166 of this issue for constructional details)

That is what actually happens in a power valve arranged in the normal way—remember, we are not talking about Q.P.P. or class B. You adjust the bias so that the valve will handle the largest signals to be dealt with, and resign yourself to the waste of current during reception of weak signals, or during intervals of strong signals.

Effect of the Signal on Bias

Now, if we could in some way arrange that the bias on the grid were controlled by the value of the grid input voltage, we could avoid this waste of current. We could, in fact, arrive at the very useful state of affairs where a weak signal biased the valve to such an extent that the anode-current was very small, and a strong signal reduced that bias so as to get the required anode current variations from a large mean or standing anode current.

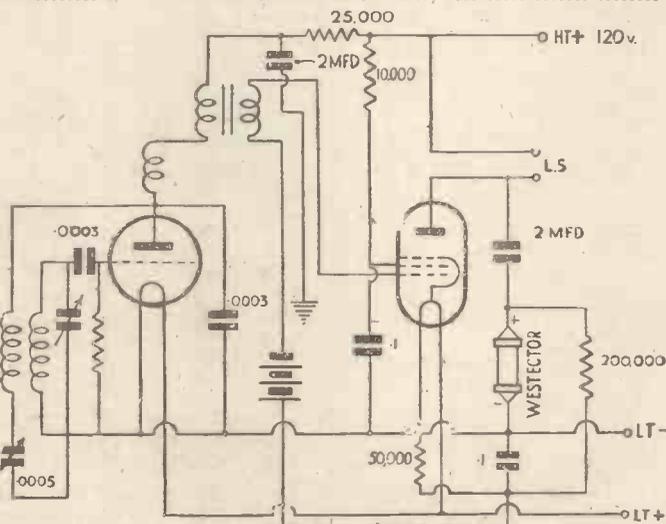
Actually, this great idea has been put into practice, thanks to the introduction of the Westinghouse metal rectifier, called the Westector.

A circuit has been evolved to enable the Westector to be used to control the anode current by variations of the grid-voltage input.

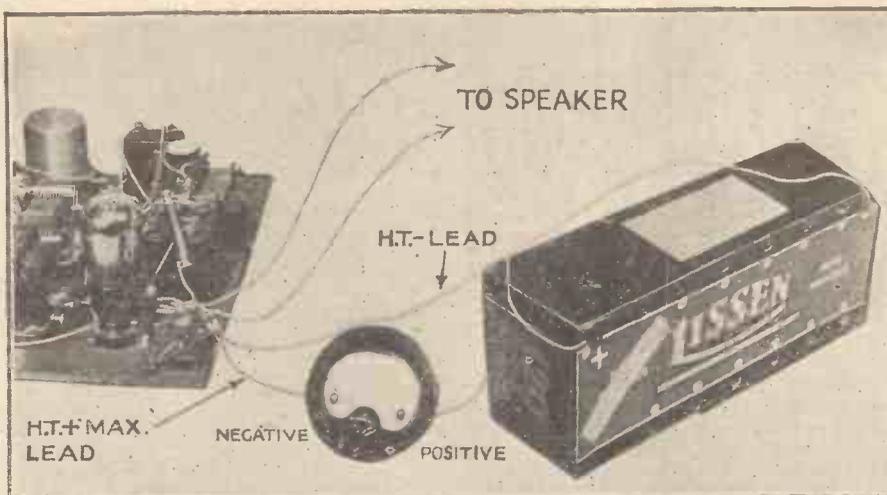
In the anode circuit of the power valve we have to deal with two separate kinds of current. There is the direct current, that is to say, the battery current, as expressed in terms of milliamperes drawn from the high-tension battery. Then there is the speech current, which is the variation of the anode current that works the loud-speaker—often referred to as the A.C. component, because it is a varying low-frequency alternating current.

It is this varying A.C. that provides us with the means of putting the "great idea" into practice. Obviously, loud-speaker volume depends on the strength of this A.C., and the greater the A.C. the greater is the volume. As volume depends on the signal input, it follows that the greater the signal input the greater is the A.C. in the anode circuit.

If you will look at the circuit, you will see that associated with the anode circuit of the power valve is a Westector, or metal rectifier, which converts the alternating current to direct current. We



In this typical circuit, consisting of the detector and low-frequency pentode output stages of a complete set, the Westector high-tension economiser is connected in the anode circuit of the pentode



A milliammeter connected in the maximum high-tension positive lead shows the effect of grid bias on the anode current

pass this rectified current through a resistance, and, of course, this sets up a voltage or potential difference between the two ends of the resistance.

This voltage is then arranged so that its effect is in opposition to the effect of the grid-bias battery. If you regard the grid-bias battery as a means of making the grid of the valve so many volts negative, this rectified voltage we are talking about must be regarded as a means of making the grid less negative, because it applies a certain amount of positive voltage.

Changing the Grid Bias

You must remember that the rectified anode voltage will vary according to the strength of the incoming signal, so that the result of a change in the strength of the signal is a change in the grid bias—which is what we want!

Now for how the idea works out in practice. You de-tune the set, or take off the aerial, and increase the grid bias until you have a standing or mean anode current of 1 milliampere or so—this is not critical. You replace the aerial, tune in a station, and immediately a signal reaches the grid of the power valve we get a varying speech current in the anode circuit, which is rectified by the Westector.

The resulting D.C. voltage is applied in opposition to the grid-bias battery. This

immediately decreases the amount of grid bias applied, so that the valve is operating without distortion, because the reduced grid bias causes a rise in the steady anode current and this enables a sufficiently large varying anode current to be obtained.

Should you then tune in a weak signal, the grid bias drops back to more or less the maximum negative; that is, more or less to the voltage actually given by the bias battery. The reason for this is that the anode speech current drops, so does the rectified D.C., and so the opposition voltage drops, leaving the normal negative bias voltage practically in full control of affairs.

We ought to emphasise that this automatic biasing action is not only valuable for compensating for the discrepancies between strong and weak signals, but also for taking advantage of the gaps and intervals in strong signals.

We have given a representative circuit just to indicate how little complication there is in the additional apparatus needed. All you want beyond the normal components of an amplifier is a Westector, a 2-microfarad condenser and a .1-microfarad condenser, a 200,000-ohm and a 50,000-ohm resistance.

To show how practicable this idea really is our colleagues of the constructional department have designed a set making use of it, and you can read all about this set on pages 162 and 164.

Loud-speaker Progress

WE have just received some advance details of an entirely new Epoch baby loud-speaker called the Super-Dwarf P.M., price £1 3s. 6d. This is not a novelty but a full-sized unit capable of handling an output of over 2,000 milliwatts. The overall dimensions allow for its use in midset, portable, and car-radio sets. The cone is 5 in. total width, while the overall depth is only 2½ in., one of the smallest units available.

The tone is very pleasing—very well balanced—and in spite of the small cone diameter there is ample bass without the use of a very large baffle. Sensitivity is well above the average, and quite on a par with loud-speakers of higher price.

The introduction of large output valves means larger loud-speakers. To meet such a demand the Epoch people have introduced a new unit something between the usual family models and the famous Super Cinema high-power unit.

It has not been given a name just yet, but look for it at Olympia. The cone is 11 ins. in diameter—and the loud-speaker is capable of reproducing down to 35 cycles.

There is 9 per cent. cobalt steel in the magnet,

which accounts for the sensitivity being comparable with an energised unit. The price has been fixed at £2 5s., including a 10 to 1 output transformer which has quite a high inductance at maximum output—quite a good point.

These units can be supplied in matched pairs for £4 10s. od., complete with baffle and transformer.

Brand new for Olympia is the new Epoch moving-coil microphone. This, we believe, is the first microphone within the reach of the home constructor to give a really true output. Supplied with a swivel table stand at the list price of £4 4s. it is certainly very cheap.



The new Epoch moving-coil microphone mounted on its stand

A Great Wireless Lawsuit

Who Invented Reaction?

THE swansong of the famous reaction patent has taken the form of a recent lawsuit which lasted for fourteen days and cost over £2,000 a day in barristers' and experts' fees.

The patent is no longer in force; it expired in 1929.

It covered the use of back-coupling between the plate and grid circuits of a valve short of the point where self-oscillation sets in. If the coupling is made too tight the valve generates continuous oscillations, which make the circuit worse than useless for the reception of ordinary broadcast.

In the year 1913 C. S. Franklin discovered that a moderate amount of reaction was a very valuable aid to selectivity. He promptly patented his discovery.

Alleged Infringements

On June 13 last Marconi's Wireless Telegraph Co., Ltd. (the owners of the patent), sued Philips Lamps, Ltd., for damages for various alleged infringements committed prior to the year 1929.

The defendants countered by attacking the validity of the patent; they also alleged that the patent specification was ambiguous.

Counsel for the Marconi Co. referred to the defendant's allegation that the patent was an old patent and that the owners had not ventured to bring any action upon it until some considerable time after it had lapsed. The answer was that there had never been any occasion to do so.

It was true that the inventor described a tuned-anode circuit in his patent specification, but counsel claimed that this also covered the use of an untuned circuit. The invention was one of striking merit, and the defendants had taken the "pith and marrow" of it. They had introduced some slight differences in their wireless receivers, but not sufficient to take them outside the scope of the reaction patent.

For the defence it was urged that the patent claims were limited to a triode valve and two circuits (a tuned-grid circuit and a tuned-anode circuit) coupled together, and that if one used an untuned anode circuit one did not come within those claims.

The hearing of evidence was concluded on July 3. On July 28 Mr. Justice Maugham pronounced his reserved judgment.

He held the reaction patent to be valid.

On the other hand, he found that the original reaction circuit was designed for high-frequency amplification of the signals and not for their detection. Further, the type of valve used by Franklin was of the "soft" variety, and had very different properties from the detector valve used by the defendants, which was of the modern or "hard" type.

Use in Tuned-anode Circuits

Finally, the question as to whether the patent was confined to the use of a tuned anode circuit was more doubtful. On the whole, he came to the conclusion that it had not been established.

On these grounds he decided that although the patent was valid, the circuit used by the defendants had sufficient differences not to fall within it. He therefore dismissed the claim for infringement.

Philips Lamps, Ltd., were awarded four-fifths of the costs of the action, the remaining fifth to go to the Marconi Co., who had defeated the defendants counter-attack on the validity of the patent.

What's this chap's circuit?

—whatever it is, the new Screened Pentode was designed for it.

He may have the oldest type of circuit. He may have the latest. He may have designed his own circuit, or it may be the outcome of the scientific researches of a vast radio organisation. It may be a three-valve, four-valve, five-valve A.C. set—but whatever it is, if it now employs one or more screened grid valves this new Mullard Screened Pentode will plug into it.

That is one of its great advantages. Not only does all the Power of the Pentode design of valve come into the first stages of the set, but all those old doubts which have always arisen when contemplating new valves—all those old "special circuit" pitfalls, are overcome. Ask your dealer about it. You remember the difference it made to your speaker stage when Mullards first originated the Pentode—so now plug in a Screened Pentode and bring Pentode Power into the early stages—bring your old receiver up to date.

TYPE V.P.4 Price 17/6

TYPE S.P.4 Price 17/6

ASK T.S.D. Whenever you want advice about your set or about your valves—ask T.S.D.—Mullard Technical Service Department—always at your service. You're under no obligation whatsoever. We help ourselves by helping you. When writing, whether your problem is big or small, give every detail, and address your envelope to T.S.D., Ref. B.M.N.

**VISIT US AT
STAND No. 71**

V.P.4

S.P.4

Mullard
THE · MASTER · VALVE

The Mullard Wireless Service Co., Ltd., Mullard House, Charing Cross Road, London, W.C.2

Arks

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





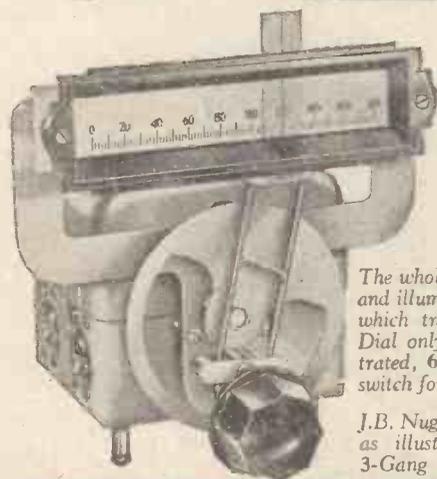
JUST ANOTHER WAY OF SAYING --

Whatever the circuit, the experienced constructor will always choose "J.B." . . . whether he needs a simple tuning condenser or a modern multi-stage Gang. For tuning iron-cored coils, in



STAND 116

particular, the accurate matching found in J.B. Gangs becomes imperative; and the mechanical rigidity of "J.B." ensures the permanence of this matching. In fact, the J.B. Gangs have proved so very satisfactory for use with these new coils that their general design will remain unchanged.



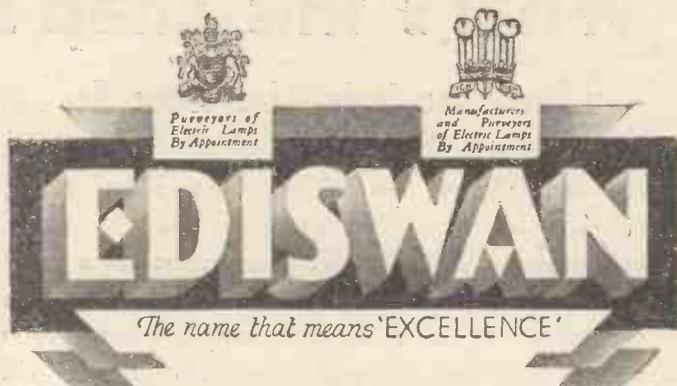
NEW J.B. STRAIGHT LINE DIAL

The whole scale always on view and illuminated by a lampholder which travels with the cursor. Dial only: type S.L.1 as illustrated, 6/6; type S.L.2 with switch for lamp, 7/6.

J.B. Nugang with cover and dial as illustrated, 2-Gang 21/6; 3-Gang 26/6; 4-Gang 35/-.

PRECISION INSTRUMENTS

Advertisement of Jackson Bros. (London) Ltd., 72 St. Thomas' St., London, S.E.1. Tel. Hay. 1827



An Injunction

. . . to all set owners who appreciate good reproduction to make a point of inspecting the ranges of R.K. reproducers and B.T.H. pick-ups displayed on the Ediswan Stand No. 82 at Olympia. R.K. units will be shown fitted in a wide variety of attractively designed cabinets at prices to suit the limits of every pocket. The latest B.T.H. pick-ups will be on parade too, reminding you that for as little as 21/- you can emulate the choice of many leading radiogram manufacturers. The Ediswan Stand is a show you simply must see.

OLYMPIA
Aug. 15 to 24

B.T.H. PICK-UP AND TONE ARM
and **RK**

MOVING COIL REPRODUCERS

The Edison Swan Electric Co. Ltd.  155 Charing Cross Road, London, W.C.2

GOOD RADIO DEALERS RECOMMEND EDISWAN

W212

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

On Your Wavelength!

Eve of the Show

WELL. Here we are with less than a week to go before the best wireless show that there has ever been opens its doors at Olympia. In another part of this issue—on page 161—I give my own forecast, so I won't deal at any length with the show here.

I just want to say that even if it does clash with your holiday, as it is bound to do in a good many cases, it will be very well worth your while to run up to London for a day, if you can possibly manage it, between August 15 and August 24.

There is no other such opportunity during the year of seeing the whole of the new season's wireless products, for, good as they are, the provincial exhibitions cannot be quite so big or quite so comprehensive as that at Olympia. Therefore come if you can, but even if you think you cannot, make a strong effort to do so.

For the Deaf

IN my article "Looking Forward to the Show" I give some account of an amazing piece of apparatus which makes it possible for deaf people—even in some cases those who have been deaf from birth—to obtain full enjoyment from the wireless programme. This is an exclusive piece of news, and as usual "A.W." comes out with it some time before you see it anywhere else.

Radio Patent Action Settled

THE Marconi-Philips case concerning reaction has come to an end at last. The judge has decided that the reaction patents were valid, but that there was no infringement by the Philips people. It is estimated that the whole action cost more than £30,000, and it seems a goodish bit when you think that it concerned such a tiny bit of the wireless set as the reaction coil. The case was a most interesting one to wireless folk, though unfortunately from our point of view it was not reported at any length in the lay papers.

The whole thing turned on one small but vastly important point. Long before reaction was invented as a means of building up signal strength it had been known that a valve could be made to oscillate by coupling plate and grid circuits. The reaction arrangement coupled them in much the same way, but the difference was that it strove to produce not oscillation, but that condition below the oscillating point in which the set is at its most sensitive.

It was curious that whilst working on the oscillator nobody at first tumbled to the fact that by making the coupling variable you could obtain a build-up not only in signal strength, but also in selectivity.

"Song-plugging" to Stop

FOR a long while the B.B.C. people have been waging war on the pernicious practice of song-plugging, which meant in plain English that payments were made to orchestra leaders to include certain songs in their programmes. This might—and probably did—mean that songs were included that had no special merit.

Any such system is obviously very bad, and the B.B.C. is to

be congratulated on the stand that it has taken. I am glad to see that the action that it brought has been settled out of court, both sides having agreed that song-plugging must cease. Let's hope that that will be the end of it.

No Danger in Mains Sets!

DON'T let the fact that a man lost his life the other day by tinkering with the internal arrangements of an all-mains set without taking the trouble to switch off first of all, give you the idea that these sets have any element of danger about them. They are just as safe as safe could be if only you will remember not to go exploring their in'ards with screwdriver and pliers until you have disconnected from the mains.

Heaps of kinds of apparatus are dangerous if you misuse them. You wouldn't, for example, find a motor car precisely healthy if you started testing for a leak in the carburetter with a lighted match!

Always, I suppose, there will be people who do silly things. As somebody once said, you can make apparatus fool-proof, but you cannot make it damfool-proof. Hardly a month passes without somebody's pointing a gun at somebody else and pulling the trigger, only to discover too late that the weapon was loaded.

There is only one precaution that you need take with a mains set, and that is the one I have just mentioned. It is almost equally important to disconnect the high-tension battery before you mess about with the in'ards of a battery set, but people still blow valves and tie themselves into knots by failing to do so.

Short-short Waves

MARCHESE MARCONI is busily engaged in a long series of experiments with "ultra-shorts." Landing from his yacht *Elettra* for a brief spell ashore the other day, he admitted that he had been able to achieve some rather remarkable results.

He has been able to "beam" these very short waves so successfully that they can be focused into the narrowest of narrow "pencils," so that there is no chance of their

being intercepted by anyone for whom the transmission is not intended.

"The practical application of these waves to the telephone is assured," he said, "and the voice is heard much more distinctly with them than over the telephone."

He is now tackling the problem of the scattering of ultra-short wave beams by mountains and other natural or artificial obstacles. Though he declined to make any statement on the point, it is believed that considerable progress has been made in this direction.

Your Voice on 5 Metres

I AM a great believer in the future of the ultra-short waves, largely because of the minute power that is required for transmissions made upon them. *It is not, perhaps, generally known that our own G.P.O. is making regular use of ultra-shorts for the telephone line across the Bristol Channel.* If you speak from Devonshire to Wales on the 'phone your voice accomplishes part of its journey by means of a transmission on a little more than 5 metres.

A Dutch Ether Giant

POSSIBLY you may have found that Huizen is coming in with very great strength during the evenings nowadays. This is due to the fact that the Huizen programmes are being sent out after 4 p.m. by the new 50-kilowatt transmitter at Kootwijk on the Dutch long wavelength of 1,875 metres.

The Dutch made a hard fight at Lucerne to retain 1,875 metres after January 15, but the wavelength could not be given to them, and they will share 1,345 metres with a distant Russian station. Meantime, Kootwijk comes in magnificently, and any reader who has not tried for the station should do so without delay.

Stages Instead of Valves

THE Ekco people are renowned for their bright ideas, and one of their best has just been hatched. It concerns the description of wireless receiving sets.

Hitherto sets have always been known by the number of their valves, a system I attacked a long time ago, when I showed how misleading it was to include a valve rectifier in the number.

The position is considerably more complicated this year, partly because of the coming of the all-metal detector and partly because of the "portmanteau" valves, which may really be twins or even triplets within the same bulb. A double-diode pentode, for instance, is really three valves in one.

The only logical way of describing sets is by the number of stages—high-frequency, intermediate-frequency, detector, or low-frequency—that they contain; this is the classification that the Ekco folk are to adopt in future. It is a thoroughly sound scheme and I trust that it will be generally taken up. We ought, though, to have a perfectly clear and water-tight definition of what a "stage" means, otherwise we shall be just as confused as before.

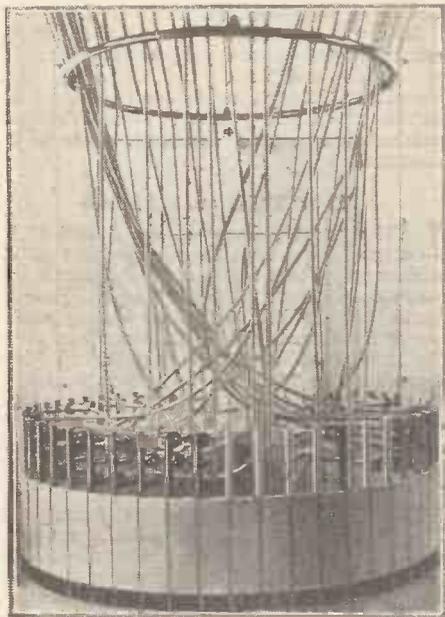


Here you see Mr. E. N. Hitchcock, a keen wireless fan of the village of Dursley, Gloucestershire, who recently held when in polar regions a two-way conversation with the Michigan University Expedition

France's "Dumb" Stations

A SURPRISING state of affairs exists in France owing to the present number of mute high-powered wireless stations, each fully equipped down to the last grid leak.

You probably know that French stations are of two classes. There is, first of all, the Government chain of PTT stations, which will eventually consist of fourteen super-power transmitters under the regional plan evolved by General Ferrié. Then there are numbers of privately owned stations in different parts of the country.



In view of the developments in shielded down-leads this picture is of special interest, because it shows how, at the Beelitz transatlantic station near Berlin, as many as three receivers can be used off the same aerial by means of metal-shielded leads

The latter can broadcast only by permission of the Government, but during the last year at least three big stations have been put up without their owners having taken the trouble to ask leave to do so. "First build your station and then ask leave to use it," seems to be rather a poor motto, especially as in every case the Government has refused permission.

High-power Toulouse on 8 Kilowatts

AMONGST the stations in question are Radio-Vitus, which is a 50-kilowatt plant standing silent; Radio Nice, which is similarly placed; and Toulouse St. Agnan, which after months and months of petitioning has at last got leave to employ 8 out of its possible 60 kilowatts.

The outlook for these big privately owned stations does not seem very hopeful, for there are no wavelengths available for them under the Lucerne Plan and all that they can do, if they broadcast at all after January 15, is to make use of the French common waves, where their power will be limited to 5 kilowatts.

No Wavelength "Wobbles" Allowed

UNDER the Lucerne Plan, stations with exclusive wavelengths will not be allowed to "wobble" more than 50 cycles and those on certain common wavelengths will have to keep to within 10 cycles of their proper frequency. This means that there will have to be an immense improvement all round in wavelength keeping.

In this connection it is rather interesting to examine the last monthly report of the U.I.R. to see how stations have been behaving them-

selves of late. Very, very few stations kept their average wobble during the month of June down to 10 cycles.

Amongst those that did were Langenberg, Dublin, Sottens, Hamburg, and the Scottish National. The last-named was the best behaved of all stations, since it never deviated by more than 10 cycles from its proper frequency.

B.B.C. Stations on "Black List"

ON the other hand, the London Regional was more than 500 cycles off its frequency at times, and its average wobble was nearly a quarter of a kilocycle. Cardiff was a good deal worse, but the booby prize goes to Bratislava with an average wobble of $2\frac{1}{2}$ kilocycles and a maximum error of over 3.

It is rather interesting to note that the German stations, which are, on the whole, the best wavelength keepers in Europe do not make use of U.I.R. special wavemeters.

A "Super-eye"

DR. HENROTEAU, of Ottawa, has, it appears, invented a new type of photoelectric cell which he calls an electric camera or "super-eye." Exactly how it functions is not made clear, though it is said to be able to transmit moving scenes on a large scale, such as a football or cricket match, and in natural colours.

The pictures are reproduced at the receiving end by the same "super-eye," which has no scanning disc or other moving parts, and can be operated from an ordinary wireless set. Unless the learned doctor has stumbled on something of an absolutely revolutionary character, I am afraid the newspaper account sounds altogether too good to be true.

Yet it is dangerous in these progressive times to be too dogmatic or to set too narrow a limit to the possibilities of scientific discovery. In this particular case a certain amount of scepticism is inevitable, and we can only wait for more precise details before passing judgment.

Valves for Car Radio

I WONDER just how much this car radio will catch on in this country, and to what extent we shall have special valves for the purpose? I hear that a standard rating has been agreed upon for the heaters of any special valves, that is 13 to 14 volts at 1 to 3 amperes, which is rather on a par with the usual direct-current valve, but has a voltage suitable for the average car battery.

The nominal voltage, of course, on a car lighting set is 12, but during the running period the battery is continually on charge and the voltage rises to 14 volts or more.

Next Week's Bumper Number!

EVERY listener who wants to keep abreast of the latest radio developments must get next week's issue of AMATEUR WIRELESS, which will contain a complete guide to the exhibits at the Radio Exhibition at Olympia.

If you are going to the show, this guide will give you a good idea beforehand of what you want to see specially, while if you are not able to go to Olympia the guide will tell you, all you want to know about the new season's radio products.

Look out for a special three-colour cover on all bookstalls and at all newsagents on Wednesday next. At the usual price of 3d. this greatly enlarged issue will represent outstanding value. Better Order a Copy Now!

In America the position is rather curious. The standard A.C. valve there has a 2.5-volt heater and D.C. valves as such are practically non-existent. The average car battery, too, is 6 volts and not 12 as over here, and hence, when the automobile tubes were developed they were made with heaters to suit—actually, 6.3 volts.

The wattage of these heaters is a little less than the standard A.C. type but the designers decided that this could be tolerated and the result was a range of reasonably efficient and compact tubes.

Universal Mains Valves

THEN someone hit on the idea of using these tubes on D.C. supply and found that they worked admirably. This led to the development of the A.C.-D.C. set, which has been all the rage over the water for some time.

The same tubes were used and the sets were so designed that they would operate on any type of supply. The efficiency of these sets was not good but this was due to the fact that the high-tension supply was limited to a little over 100 volts, the standard voltage in America being 110 A.C.

Now I hear that the automobile tube is replacing the A.C. tube even in *pukka* sets, so that the 2.5-volt tube is gradually dying out and the only type of mains valve in the future will be the 6.3-volt type. What a contrast from conditions over here, where we have at least two standard A.C. voltages and three D.C. voltages to which we now propose to add an "automobile" valve!

Fournier D'Albe

DR. E. E. FOURNIER D'ALBE, whose death I regret to record, was a frequent contributor to "A.W." up to the time when his health first began to fail. He was one of the foremost authorities on the properties of selenium, and his book "The Moon Element" remains a standard work of reference on this subject.

Selenium, by the way, comes from the Greek word for moon, and was so christened by its discoverer, Berzelius, because of its close similarity to another element, tellurium, which signifies the earth.

Much of Fournier d'Albe's work on the light-sensitive properties of the selenium cell was carried out before there was any talk of television as a commercial proposition. His own contribution to television took the form of an ingenious system in which the ordinary scanning-disk was replaced by a series of grouped "sound" resonators. Circumstances, however, compelled him to abandon the scheme before he could develop it beyond the experimental stage.

The Optophone

HE was also the inventor of an ingenious arrangement called the optophone for utilising the properties of selenium to enable a blind person to read ordinary print.

Each printed word is focused in succession on to a selenium cell so that its shadow gives rise to a definite sound in a pair of headphones attached to the apparatus.

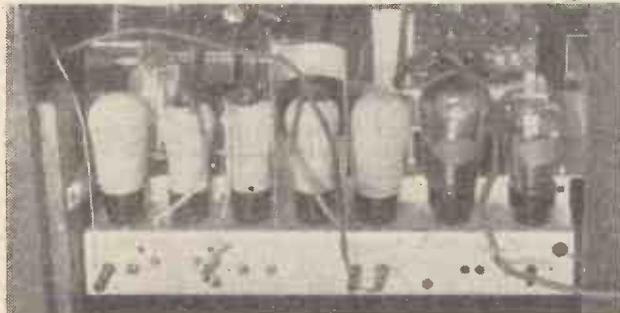
The particular sound produced is so characteristic that after a certain period of training it is possible for a trained ear—and blind persons are unusually acute in this respect—to identify and distinguish one word from another, and so "read" directly by sound.

Unfortunately, the necessary training is rather prolonged, and for this reason the optophone did not prove so successful from the commercial point of view as it deserved.

A sad commentary on the lot of the inventor lies in the fact that Dr. Fournier d'Albe was gazetted to receive a Civil List pension on the very week in which he died.

THERMION

Don't Judge a Set by the Number of Valves!



Says PERCY W. HARRIS, M.Inst.Rad.E.

OFTEN a man says to me, "I have only a two-valve set," or "Mine's only a three-valve receiver!" apologetically, as if, through some combination of circumstances, he is being deprived of what seem to him to be the obvious benefits of a multi-valve receiver. Again, I sometimes hear when visiting a remark such as, "Of course, you can't get much on this, old man, it's only a three-valver!" as if the number of valves alone is the determining factor in the success of a set and the multi-valve set necessarily ideal.

I have heard remarks of this kind so often lately that it occurs to me that a short article on the relation of the number of valves to efficiency might be helpful.

The progress of a science or art is often hindered by a false outlook on the part of those practising it. Unfortunately, the method of charging royalties on manufactured sets in this country (according to the number of valves they contain) has led manufacturers to reduce the number of valves to the lowest limit, while at the same time the valve manufacturer has endeavoured to raise the efficiency of the individual valves to the highest possible point.

After all, a valve serves several purposes, and as these are in the main concerned with magnification, a three-valve set with high-efficiency valves can well be much better than a six-valver in which the individual specimens are of much lower efficiency.

Three Questions of Design

This constant increase in the efficiency of valves is by no means an unmixed blessing. While, generally speaking, increased magnification means increased sensitivity, this latter is by no means the only property we look for in a receiver. Whenever I have a new design to test I ask myself the triple question of how it performs in sensitivity, selectivity and quality.

Those readers of *AMATEUR WIRELESS* who have studied the series I wrote recently in the "Beginners' Supplement" on how to design a set, ("Build As You Learn") will know that while it is comparatively easy to build a set with any one of these three virtues strongly marked if the other two are sacrificed, it is by no means easy to get all three into a simple and inexpensive receiver. Tremendous sensitivity at the sacrifice of both selectivity and quality is easy to obtain, and similarly there is no difficulty in making a "quality" receiver if the selectivity does not worry you.

To obtain a satisfactory combination of all three the designer must be very careful about many things, most of which I have already explained in the series referred to.

Generally speaking, the selectivity of a receiver depends upon the number of tuned circuits incorporated—the more tuned circuits the higher the selectivity. Take, for example, many modern designs of "high-frequency, detector and low-frequency" set where a band-pass circuit precedes the high-

frequency valve. Here we have two tuned circuits coupled to one another, the second being connected to the high-frequency valve, while a third tuned circuit is connected to the next or detector valve.

Let us imagine that a high-frequency valve has an overall magnification of eight and the incoming signal has the strength of two units (whatever units we happen to choose). The strength of the signal, then, handed to the detector valve is sixteen.

Now this signal has already passed through three tuned circuits before it reaches the detector. Let us alter the band-pass so that the first tuned circuit is connected to a high-frequency valve and that this is coupled to a second high-frequency valve through the second tuned circuit, the third tuned circuit being connected as before to the detector valve.

The position now is that we still have three tuned circuits before the detector valve, although we have two high-frequency valves. Let us imagine, too, that the magnification of each of these valves is only four instead of eight. The incoming signal is now two, as before, and becomes eight on being applied to the second high-frequency valve, which in turn magnifies it four more times so that its strength is thirty-two by the time it reaches the detector.

The interesting position has arisen that although the two new high-frequency valves are individually only half the efficiency of the original valve we used, the use of two of them

has given us a stronger signal on the detector than was possible with the one. If the efficiency of the new valves is still further reduced we very soon reach a point where the combined magnification of the two valves is no greater than that of the one efficient valve previously used.

It is often easier in set design (at least, on the high-frequency side) to use two comparatively inefficient high-frequency valves than one efficient one to obtain a certain high-frequency magnification.

In manufactured sets it is not necessary to work with the same precision or accuracy of adjustment in such cases and this is why in the United States, where patent royalties are paid not on the number of valves in a set, but on the manufacturer's cost of the set, it is the custom to use lower efficiency valves and more of them. The three-valve set is unknown in America, as scarcely any have less than six, while eight-, ten-, twelve-, and even sixteen-valve sets are by no means unusual.

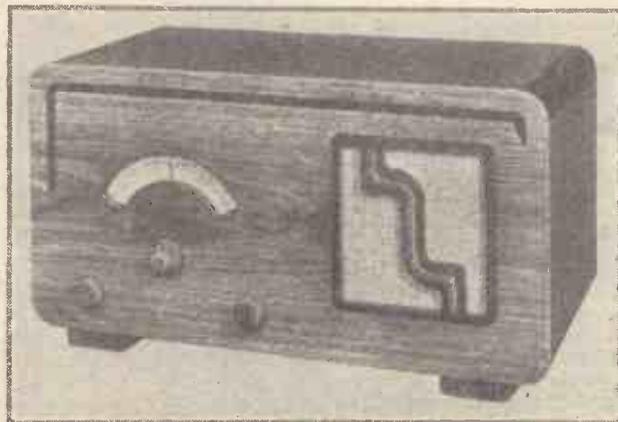
Comparing Input with Output

The only way in which a set can be compared when it comes to sensitivity is to compare the output with the input, and there are now standard methods of doing this on both sides of the Atlantic. One method is to take what is called a standard output and see what strength of input signal is required to produce this output. There are a number of four-valve receivers in this country which on this basis are appreciably more efficient than eight-valve sets in America.

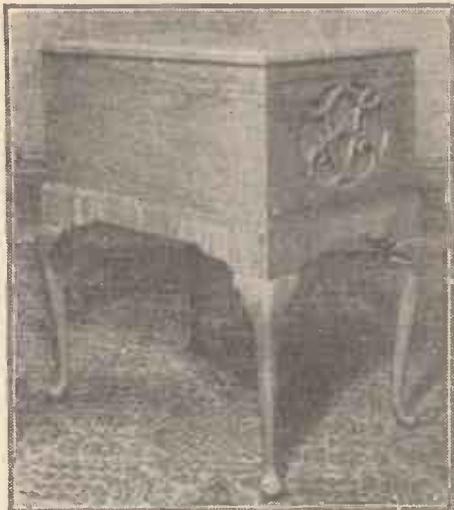
Personally, I have for years been against the method of charging royalties according to the number of valves used. If all sets using the same number of valves were the same price there might be some rhyme and reason in the method, but when you consider that the manufacturer of, say, a four-valve set with all kinds of refinements, precision tuning, single control, and every conceivable improvement that can be put into it, and selling, we'll say, for £30, has to pay exactly the same royalty as the manufacturer who with the greatest cleverness and ingenuity has been able to reduce his manufacturing cost so as to sell the set for £6 or £7, you will see what I mean.

In America the manufacturer pays on the shipping cost of his set minus the cabinet, and therefore if it suits his purpose to use seven valves instead of six and he can reduce his manufacturing cost so that his shipping price is no higher, then he pays no higher royalty to the patent owners.

For this reason American sets use a large number of comparatively low-efficiency valves and get an excellent overall performance at a very low price to the purchaser. In a multi-valve set of the super-heterodyne type there are often several valves which do no magnification whatever, so that it is very unsafe to assume that an increase in the number of



The new season's sets are attractive in appearance and the modern tendency is well exemplified by this Atlas model A4



Most unusual in form is the Ferranti Companion receiver, which is priced at 35 guineas. The circuit is a super-het

valves in a set always means an increase in magnification.

In an America circuit I recently examined there were no less than sixteen valves (the circuit was of the super-heterodyne type). Two of these valves were used for rectifying the mains current, two in the oscillator of the super-heterodyne, one for the automatic volume control, one as a special mush-limiting valve, and one as a "separator" valve so that variations in the aerial would not affect the tuning of the first tuned circuit. We thus here have seven valves, none of which is doing any magnification whatsoever!

As the output valves were in push-pull we have two valves giving no more magnification than one for, as you know, in the push-pull circuit the purpose of using two valves is to get less distortion and greater power-handling capacity.

A Radio Field Day

ONCE again that very keen band of wireless amateurs, the Golders Green and Hendon Radio Scientific Society, has held a valuable meeting, this time the seventh annual direction-finding competition, organised by Lieut.-Col. H. Ashley-Scarlett, D.S.O.

The meeting was held in the neighbourhood of Berkhamsted, St. Albans, Watford, and Amersham. The topography of the country made a very "searching" day of it for the competitors.

Under the direction of Mr. D. N. Corfield, whose call sign is G5CD, was arranged the "hidden" transmitting station. The wavelength used for the experiments was 164 metres, and this was kept constant by a crystal control.

The whole of the transmitting gear was fitted up in a mobile van.

High-tension current was obtained from an M.L. converter. The aerial power was between .5 and .7 ampere.

Excellent Quality Reported

The length of the aerial was about 12 ft. In spite of this short wave, the signal strength was good and the quality was reported from many points as being excellent.

A "check" transmitting station was controlled by Mr. A. R. Gardiner, whose call sign is G5RD, situated near King's Langley. This station proved to be of great assistance, as it enabled the competitors to adjust their apparatus on the field and to make alterations to correct for local conditions.

The judges of the competition were Mr. W. A. Hudson, M.P.S., Mr. Humfrey Andrews, B.Sc.,

After these deductions have been made the remaining valves can be considered from the magnification point of view, and as these valves are of lower efficiency than those we use in this country it does not follow that the set is so tremendously powerful compared with any we have here.

There is another feature, or rather, trend, in modern valves which is of great interest and that is the tendency to combine several functions in one valve so that, in effect, we get two or more valves in one bulb. Several years ago a German valve, the Loewe, was introduced with three stages and the valve couplings in one bulb. It did not make much headway in this country, although it is still used abroad. Recently, a number of special valves for use in super-heterodyne circuits have been brought out in which one cathode provides the emitting surface for both a diode or two-electrode rectifier and a triode or even tetrode (three- or four-electrode) valve.

Rectified High Frequency

With such valves high-frequency currents can be rectified and the rectified signals fed back to other electrodes and magnified just as if you had two separate valves.

Then again, we have class-B valves, which are really and practically two valves in one, and I should not be surprised to find other combination valves coming along shortly.

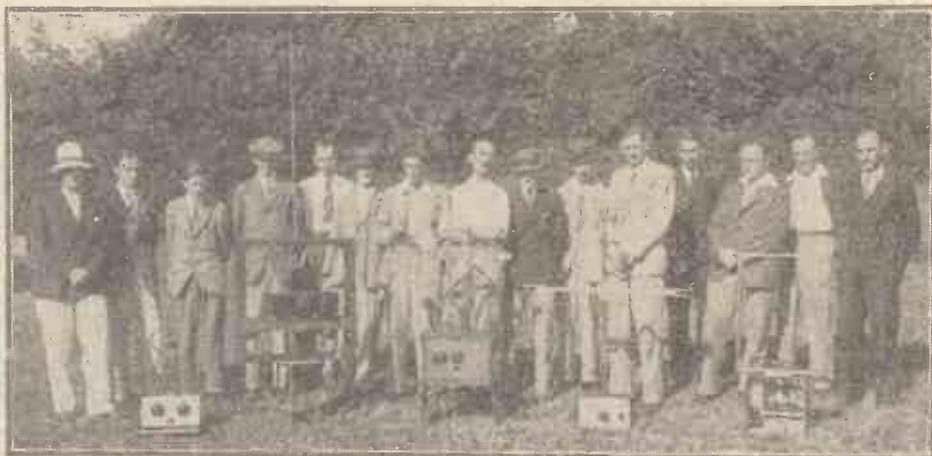
As we are concerned with the overall efficiency of a set and as improved circuits and improved valves are coming out all the time I think it very unlikely that the simple set will lose its popularity for many years to come. I hope, too, that in future there will be less talk about the number of valves in a set and more about set efficiency.

It is by no means outside the bounds of probability that a one-valve set will be evolved which will have the three properties of sensitivity, selectivity and quality combined with comparatively low cost. Radio is ever fascinating and ever changing, which is one of the reasons why some of us are still just as enthusiastic experimenters as ever!

A.C.G.I., M.I.E.E., and Wing-Commander G. Struan Marshall, R.A.F.

The results showed a great improvement over preceding year's outings, over 80 per cent of those taking part locating the hidden station. The average error of the first two groups was only .8 per cent.

Altogether a memorable day, and one that has proved how amateurs can undertake quite difficult direction-finding work and produce results of which professionals might be proud.



Enthusiastic entrants for the direction-finding competition recently held by the Golders Green and Hendon Radio Scientific Society

Your Low-frequency Transformer

By D. M. Robinson, B.Sc., Ph.D.

WHY must there be this expensive little piece of wire and iron between the low-frequency stages of my set; why cannot the signals from one valve go direct into the next?

Well really, it is due to the method of action of the valve itself. The output of a valve is a current, varying with the signal being received, but a valve cannot amplify a current; it can only operate when the signal is supplied in the form of a changing electrical pressure, or voltage, on its grid.

This requirement is met very satisfactorily by including a low-frequency transformer. Through one coil of this transformer (the primary) flows the current from the high-tension supply, varying to correspond with the signal being received. Thus the first valve has found a path for its emission current, and is happy.

But this current, in passing through the primary of the transformer, produces in the other (secondary) coil, a voltage varying to correspond with itself. Thus, if the terminals of the secondary are connected to the grid and filament of the next valve, it too will be satisfied, and will "amplify" this voltage, giving as output a current much greater than the original current put into our transformer.

With this current we can either work a loud-speaker, or repeat the trick, adding another transformer and another valve.

Easy Path for Magnetic Forces

In order that the transformer may accomplish the task set it—of producing in the secondary a voltage as large as possible and corresponding with the current in the primary—it is necessary that the magnetic forces linking the two coils have as easy a path as possible. This is obtained by winding the coils on cores of special iron.

In addition, by making the number of secondary turns double that of the primary turns, the voltage applied to the second grid is double what it otherwise would be; by making the number of turns treble, the voltage is three times normal, and so on.

So our transformer not only accommodates the curious requirements of the two valves which it connects together, but it does a bit of amplifying on its own account if the secondary has more turns than the primary.

The amount of this step-up is indicated by the ratio mark on the transformer. For example, 3:1 signifies that one winding has three times the number of turns of the other.



Thermion Looks Forward to the Show

IN previous years the radio manufacturer has kept all of his surprises up his capacious sleeve until the autumn, producing them after the manner of a conjuror at Olympia. The year of grace 1933 has been remarkable for an entire change of policy. Novelty after novelty has been showered upon us as month followed month.

Just think of what we have so far had: Q.P.P., class B, iron-cored coils, the double-diode-triode, the double-diode-pentode, the high-frequency pentode for both mains and battery valves, the Catkin valve, and the first inklings of permeability tuning. A perfect spate of novelties! Can there be anything left for us to see at Olympia?

Novelties and Practical Work

Yes, indeed; and it is just the way in which this year has panned out that is going to make next week's Exhibition the most interesting that ever was. What we are going to see is how set and component manufacturers have made use of all the aforesaid novelties for practical working purposes.

Never before has the set designer had such amazing opportunities of producing wonder-working apparatus. That he has made full use of these opportunities those of us know who have already been privileged to see the advance models of some of the more important receiving sets. And you, dear reader, will share our enthusiasm before you have been very long inside the big doors of Olympia.

Just think for a moment what is the position, and then you will see what Olympia has to offer this year. In 1932 there was only one way of making a super-het with seven stages, and that was to use seven valves, or six possibly if you cared to combine your oscillator with your first detector. This year there are super-hets that give you your seven stages with four valves only, and throw in automatic volume control into the bargain.

These are mains sets, but even in battery sets you can do some amazing work nowadays with the help of "portmanteau" valves. Where are they going to stop?

Inside the Valve Bulb!

Percy Harris laughingly suggested to me the other day that we shall soon be seeing the tuning coils and the tuning condensers inside the valve bulb!

The introduction of class B and Q.P.P. has been a revolution for the battery user. You will see the splendid results at Olympia.

For the past two or three years the big people in the set-manufacturing world simply have not bothered about the battery set. They saw that, with the valves then available, its performances must always be very much inferior to those of the mains set, unless the user was prepared to impose a drain of 40 or 50 milliamperes on his source of high-tension supply, which, of course, he wasn't.

That being so, they regarded the battery

set as something that could not do them full justice and they concentrated upon mains apparatus. Class B and Q.P.P. give a means of obtaining from 1 to 2 watts from the battery set, in return for a very small high-tension current outlay, a thing which would have been a matter of the greatest ease to prove utterly impossible of achievement not so long ago.

Now that first-rate volume and quality are obtainable from the battery set, the big manufacturers have entirely changed their attitude. Many of them come into the battery market for the first time this year, and in their sets you will find a very close approach to genuine mains performance.

Sets that I would particularly recommend to your attention at Olympia are the Ekco B.74, a battery super-het with seven stages; the McMichael Lodex Five, a straight set with two high-frequency stages, detector, driver and class-B output; and the Columbia CQA Battery Radiograph, Model 1003. The last contains a variable-mu high-frequency amplifier with band-pass input, a grid-leak detector, and pentode Q.P.P. on the wireless side. For gramophone purposes there is a double-spring motor and the turning over of the switch converts the detector into a first low-frequency valve.

One of the strong points of this apparatus is that, owing to C.Q.A. (Constant Quality Amplification), you retain the full richness of the reproduction on either radio or gramophone whether the volume is big or small.

There are dozens of other first-rate battery receiving sets, but I don't want to make this forecast into anything like a catalogue. I am just mentioning some of the apparatus I know about and that has made a special appeal to me.

And now for something of outstanding merit. In this country there are hundreds of thousands of deaf folk, many of whom have been denied all the joys of wireless. They are in for a real boon this year in a special set developed by the Multitone people.

Mr. Poliakoff, head of the Multitone firm, has devoted a large part of his life's work to the invention of devices to help the deaf; in fact, his tone-control transformer was designed in the first place for this purpose, and not for wireless at all.

The firm will show at Olympia a battery-operated receiving set with two variable-mu high-frequency stages and class-B output which can be used quite normally for loud-speaker reproduction of the programmes. *It has also an attachment which enables a deaf member of the family to hear the programmes to perfection and to control both the volume and the tone for himself quite independently of the loud-speaker reproduction.*

One remarkable feature of this set is that when neither wireless nor gramophone entertainment is required it enables a deaf person to take part in general conversation, the loud-speaker then acting as a microphone.

There is, of course, nothing new about this principle; it is its application in this particular way that is so remarkable.

Like myself, readers who visit the Exhibition will be enchanted with some of the new iron-cored coil "teams." As I write, the postman has just delivered to me a Wearite four-coil assembly and a Polar four-gang condenser to tune it, which I ordered a few days ago for a super-super-het.

The coils consist of band-pass twins, a high-frequency transformer, and an oscillator coupler all mounted on the same base and worked by the same switch. They occupy but a fraction of the space that such an assembly would have required even a year ago, and the four-gang condenser—whose dial is marked in wavelengths on both medium- and long-wave ranges—is equally compact. Don't fail to examine these and other iron-cored coils when you visit Olympia.

Enormous Advance in Mains Sets

If you are fortunate enough to have electric light in your house, you will find that this year's mains sets represent an enormous advance. Super-heterodynes abound and their prices are remarkably low.

Several of them have automatic volume control, and I can assure you that, once you have used a set fitted with A.V.C. for long-distance reception, you will never want to use anything else.

Don't, by the way, be afraid of purchasing a set provided with a station-name tuning dial. Makers know as well as you do that the Lucerne Plan will alter everything when it comes into force on January 15, and most of them have so arranged their dials that a replacement to suit the new arrangement can be carried out in a matter of minutes.

If you cannot run to a super-het, the new season's "straights," you will find, achieve an almost uncanny degree of selectivity, owing to their use of iron-cored coils. It is no exaggeration to say that some of the straights of the coming season are more selective than the super-hets of yesteryear.

Quality a Prime Consideration

Quality, as you will discover, has been made a prime consideration by the designers of both mains and battery sets. And the British idea of quality—for all that we are supposed to be an unmusical nation—is vastly superior to that which prevails in the U.S.A., where they still insist upon bass, even if it is (as it so often is) of the carpet-beater kind.

In the infancy of broadcast reception each Radio Exhibition produced a large crop of stunts. We are growing up now, and you will see fewer stunts this year than you have ever come across before.

On the other hand, there is probably no wireless exhibition in the world at which a greater number of genuinely good exhibits is to be found.

The Lightning Bogey



Nobody with an external telephone wire leading into the house thinks anything about lightning risk, so why should you worry about a small aerial wire? In this article L. S. KAYSIE reassures the nervous listener—or prospective listener—regarding lightning. He himself has had the extraordinary experience of standing near the place where a flash of lightning actually came to earth—and he is still alive to tell the tale!

DURING the past few weeks the newspapers have reported an unusual number of accidents caused by lightning. It is not easy to advance any satisfactory explanation for this, since thundery weather comes and goes without apparent rhyme or reason. But one comes across a curiously widespread tendency to put the blame on to "all this broadcasting."

This fantastic notion—for scientifically it is all moonshine—is combined with an equally unfounded dread of the ordinary garden aerial as a source of danger.

No "Attraction"

Whilst it is certainly a wise precaution to earth the aerial during an actual thunderstorm, that particular length of wire does not in itself "attract lightning" any more than, say, the outside telephone lines, or the ordinary electric supply mains, when these are carried overhead.

The fact of the matter is that lightning is bound to come to earth somewhere or other, and the presence of the garden aerial will not divert it appreciably from its appointed course. If the flash is predestined to "strike" in the close vicinity of the aerial, the wire will no doubt carry some of the current, but even in that case it scarcely affects the area of possible damage.

Newspapers almost invariably lay stress on the presence of a wireless set in any house that happens to be struck, but since more than half of the homes nowadays are so equipped, this cannot be said to cut any ice.

A far more significant and reassuring fact is that most insurance companies are willing to bear the extra wireless "risk" on an all-in policy free of charge. They do not ask for an extra premium for the telephone, or for lighting or heating appliances fed from the electric mains, and they obviously regard a wireless set as being on all fours with any other apparatus connected to an outside wire.

Effect of Height

The danger of being struck by lightning seems to increase with the height of the object exposed. Records show that trees, particularly when standing more or less alone, are definitely more perilous than any domestic aerial, although they are not conductors in the sense that a wire is.

The current which carries the lightning discharge is, however, of an oscillatory nature, and will take practically any path to earth that offers, though it prefers one which, like an isolated tree, reaches up from the earth and is many-pointed.

In certain cases its behaviour is curiously erratic. For example, there are many instances on record of buildings being struck and badly damaged even when protected by lightning-protectors. Usually the failure of these safe-

guards is attributed to defective earthing, though it is probable that the real cause is to be found in some bend or change of direction in the conducting wire.

Once started on its way, the flash always seems to prefer a straight path, and will jump from any conductor with "bends" on to the nearest object that offers a more direct path to earth.

Lightning itself is the result of the gradual building-up of positive and negative charges—one kind of charge being stored in the cloud whilst the other is concentrated on the nearest point of ground. The sudden merging of the two in a terrific flash is simply an attempt to restore equilibrium.

But the original strain is not immediately relieved. Like the waves which follow a stone thrown into water, secondary electric disturbances spread out from the primary discharge, and these can be very dangerous to anybody within range.

It is seldom that the victim of lightning intercepts the full force of the discharge. If he does, death is, of course, immediate and inevitable, since the power of the stroke is measured in millions of kilowatts and nothing living can stand against it. The only saving grace is that death comes before any possible realisation of what has happened.

More often, serious and even fatal consequences are caused by mere proximity to the point where the discharge strikes home. Here the damage is due to secondary effects—the so-called inductive action—which always ac-

companies the movement of electricity in bulk.

The result of a secondary shock on the human body usually takes one of two distinct forms.

The first is a paralysis of the nerve centres which control the automatic action of breathing. This is the less dangerous form, because if the victim is promptly subjected to one of the recognised life-saving methods—as used in cases of drowning—there is every chance that breathing will be restored, leaving him little the worse for a thrilling experience.

In the second case the nerve centres controlling the heart action are thrown out of gear, and here the consequences are more likely to be fatal, since it is seldom possible to apply any effective remedy.

At Close Quarters

To stand at comparatively close quarters to a direct discharge is an unforgettable experience. One sees a centre core of blue lambent flame, surrounded by a jagged or spiked "sheath" of brilliant yellow, something over a foot in diameter.

Although the crash of thunder follows almost instantaneously, it is not heard, the sense of hearing being momentarily obliterated. The eyes, too, are blind for some time to all except a persistent image of the vivid column of fire, whilst there is also a curious difficulty in breathing which lasts for some minutes.

Perhaps it is unnecessary to add that this personal experience occurred in the open country, many miles away from the nearest wireless aerial!

Short-wave Notes and News

BELOW 20 metres I hear distinct signs of improvement, particularly in the early evening between 7 and 9 o'clock. W3XAL has been quite a reliable signal at least four times out of seven this week.

Providing the GSG, the Empire station on 16.88 metres, can be cut out, I feel sure W3XAL will be the star station for the next few weeks.

Although the Westinghouse station, W8XX on 13.93 metres, is on the air between noon and 7 p.m., I have not heard of or seen any reports claiming reception of this station.

A little later in the year—say the early part of September, I shall not be surprised to pick it up again round about lunch time.

I have been able to put Amos and Andy on the loud-speaker four times this week—via W8XX on the 25.27-metre channel. This wavelength is not very good during the earlier part of the evening, owing to the very bad jamming from Rome on 25.4 metres, and the Empire station GSE on 25.28 metres.

If you use a straight set, there is very little hope of separating these three very powerful stations, all of which come in at good loud-speaker strength. It seems that, as little as I like them, the super-het is the only solution to this new selectivity problem.

I am using at the moment an experimental hook-up of a four-valve set with a high-frequency pentode, a screen-grid detector, and a special driver and class-B stage. It will have only a single tuning control with a ganged condenser and two sharply tuned circuits.

The class-B stage will give an undistorted output of 2,000 milliwatts with only a moderate output from the driver valve; but more about this later.

As I write these notes my short-waver is tuned to about 160 metres; the trawlers in the

North Sea are coming in quite strongly on the speaker. The shore station with which they keep in touch uses a wavelength of 162 metres and the call-sign "Humber Radio."

These trawlers are transmitting throughout the day at fairly frequent intervals, and some of the conversations—although it may be eavesdropping—are rather interesting.

You may not consider it worth while to buy or make a coil for the 100-200-metre band, but remember that the amateurs are between 150 and 175 metres, not counting the other odd experimental transmissions from Hendon and Heston.

Did you hear the Mollisons broadcasting from Pittsburg? I picked up the transmission from W8XX on the 25.27-metre channel round about 10 p.m. at quite fair loud-speaker strength, so I was surprised that the B.B.C. could not re-broadcast.

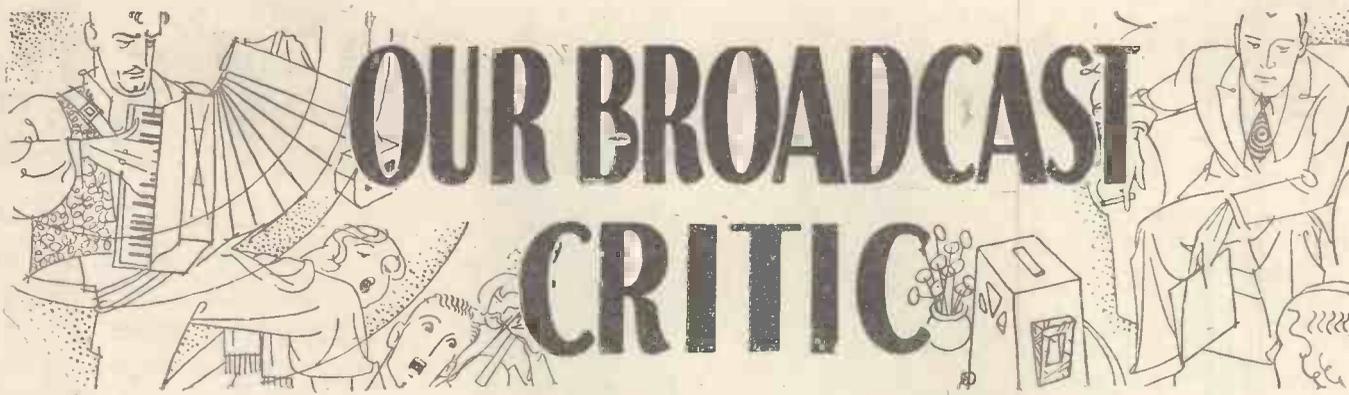
Re-broadcasting Difficulty

Of course, it is much more difficult to re-broadcast than merely to tune in Pittsburg; anyway, I listened until 10.20 p.m., when they had finished telling us all about their great fight.

VK2ME (Sydney) was an R6 to R7 signal this morning (Sunday) from 7 a.m. until nearly 8 o'clock. The programmes were very poor, but I still get a thrill hearing stations on the other side of the world.

A QSL card arrived yesterday from the New Zealand amateur station ZL4AO, situated in St. Clair, Dunedin. This is the most distant station I have ever heard—over 12,000 miles away and only using 200 watts!

There has been a great revival in really short-wave work. I refer to the 5-metre band. All of my transmitting friends seem excited about the prospects of 5-metre work. K. J.



A Shining Hour! :: Acceptable Sydney Baynes :: Argyle Theatre Disappoints
 Funny Men Who Weren't :: The Holyhead Road

EDDIE POLA'S hour was a shining hour. Eddie himself might be called the Pola Star, but the other radio stars were equally brilliant. The show was smart throughout, but whether we are to take it as a genuine imitation of American broadcasting or to regard it as a satire, I am not sure.

Perhaps it is fairer to regard it as a clever satire. Eddie certainly rubbed in the Americanisms fairly well. He invited us to pin our ears back, suggested the smelling salts for Grandma, Oh-Boyed, Oh-Yeahed, Gee-whizzed, and muscled-in on British air, executing the Pola Probe to his heart's content and probably to everyone else's amusement.

Slango-Saxon !

He must forgive some of us, though, if we feel that he has proved our old suspicions that whereas our language is derived from Anglo-Saxon, theirs is a development of *Slango-Saxon*.

We were also initiated into the wonders of sponsored programmes, and were left ruminating on the delicate refinement of having somebody's shoe-shine advertised in the middle of a chamber-music concert or at one of the Proms. Yet we know that such things will come to us only over the "D.G.'s" prostrate form.

May he live for ever!

Broadcasting House, with its ice-washed air, tries to help us keep cool this hot weather. Hence a delightful Pastoral by the Wireless Singers, representing Spring, Summer, and Autumn. Also, Frank Bridges conducted a really beautiful performance of Dvorak's *In der Natur* and Debussy's *Afternoon of a Faun*.

There is something to be said for auto-suggestion, even in high art.

A word for Sydney Baynes's light orchestra. Playing what the announcer called an *Awntract*, there was an attempt at delicacy of tone. Very acceptable.

And for Gershom Parkington, too. Musically speaking, there is not much wrong with the balance of that band.

These light orchestras do a good work. Often enough it is left—it has to be left—to them to fill up what are quite large spaces. Those I happened to hear during the week were the Paramount Astoria, the Western Studio, the Northern Studio and the Commodore, all of which struck me favourably.

Of course, most of us talk through such music, and rarely give it our undivided attention. Even so, these good people can be assured they are appreciated

The relay from the Argyle Theatre, Birkenhead, was disappointing. The announcer led off by apologising because there was to be nothing funny. He said it was too hot to laugh. He may have privately thought it was too hot to yawn, too.

The lady pianist did her best, but the piano they gave her had a tone like corrugated iron. Is that the best "th' Argyle" can do? For her third item she gave us an imitation of Liszt's D Minor Rhapsody as she thought Jack Payne would play it. But you *wouldn't*, would you, Jack?

Then came four singers whose names the announcer muddled so effectively that they will have to remain anonymous. However, there was no difficulty in hearing them.

A Welsh tenor sang something quite nice (all about love) and was followed by a gentleman who did clever things with a concertina (or it might have been a mouth-organ), a variety of tin whistle, and a trombone.

This must have been quite a good show—in the Argyle Theatre. It was hard luck that it made poor broadcasting. There it is again—everyone is confronted with this one great trouble about broadcasting: *we cannot see*. I know it is the obvious thing to point it out, but you cannot get away from the fact. Several times during that relay I heard roars of laughter from the audience, but had not the remotest idea why.

It was hard on everybody concerned, but surely they *knew* they were broadcasting, and that every time the theatre audience enjoyed something that missed the listeners it counted a point against them?

The only way seems to be to recognise it and act accordingly. Perhaps next time the Argyle Theatre will try a really good comedy show. I am sure it will be appreciated.

The Saturday night vaudeville: Was it wise to keep on with that theme of skitting at a Cinderella pantomime? If it had been a satire on the old-time performance *all through* it might have succeeded, but it gave me the impression it was used merely to introduce the various people in the show, all of whom seemed to be restricted by it.

Even Claude Hulbert was not himself, and it usually takes something to upset him. Bobbie Comber, as compère, did his best to make the show go, but the Cinderella part of the business was, candidly speaking, such poor stuff that he was not very successful.



Claude Hulbert took part in the recent Cinderella Show.



Marcel Dupré, to be heard in the first Prom.

What a mess vaudeville is getting into! I do not envy Eric Maschwitz his task of putting it straight. He told me the other day that none of these shows is of his design. September is his time. I, for one, hope he will be either severe upon or tactful about (whichever suits him) such jokes as "the blind man took a cup and saw, Sir," or "a blizzard is the inside of a chicken," and on people who say they always blow their noses before retiring, if a trombone has to be requisitioned in imitation.

It may be hard to tell them these sorts of things, but unless the humour is gone over with a very fine comb, vaudeville will fall into further disrepute. However, I am very hopeful.

I listened carefully to Mr. Filson Young's *The Road to Ireland* because, unfortunately, I happened to read some rather hard reviews of its first performance. I heard the second. Perhaps we all missed what we should have appreciated—*humour*. Of this there was none.

The historical parts were effectively written—particularly the section referring to Owen Glendover. Some of it sprinkled, but I, personally, lost interest in the descriptions because they sounded rather like a sort of radio guide-book, written for those who contemplated taking the Holyhead road *en route* for an Irish holiday. WHITAKER-WILSON.



Sir Henry Wood, conductor of the Proms.



Sydney Baynes, whose light orchestra is popular

**A New Season's
Design for You
to Build**



The NEW-STYLE

Specially designed by the **TECHNICAL STAFF**, this "hot" is one of the latest radio developments and a high-tension economy

IRON-CORE tuning! That is the revolutionary idea that has inspired the design of this week's three-valver. Tuning, that is to say, with a special coil but without any sort of variable tuning condenser.

If you are a regular reader you will already know something about the Sovereign tuner, because last week we gave first and exclusive details of this commercial version of iron-core or "permeability" tuning.

Dispensing with the Variable Condenser

We showed that the normal variable condenser could be dispensed with by varying the effective inductance of the coil and consequently its wavelength, by moving the coil backwards and forwards along the dust-iron core.

We explained that this new idea of permeability tuning was really a sequel to the widespread development of iron-core coils, such as Ferrocart and Nicore.

At this stage we cannot say how widespread will be the practical application of this iron-tuning system. It certainly does seem to have very great possibilities. Simplicity of design and cheapness are two obvious advantages.

Perhaps not quite so obvious is the great saving in receiver space, for this new type of tuner is very compact and takes the place of the usual tuning coil and the tuning condenser.

Some idea of the immediate practicability of the permeability tuner, as exemplified by the Sovereign device, can be gained from the design of this three-valver, which has as its central feature the new coil, or rather tuner, since it is much more than an ordinary coil.

Simplest Possible Winding

In this week's design, we have made no attempt to confine the components to the smallest possible dimensions, because our aim has been to introduce the new coil system in the simplest possible way. This explains why we have used a somewhat larger baseboard and panel than is absolutely necessary.

Before we give you practical details of the layout let us run through the various points about the theoretical circuit, the diagram of which will be found on these pages.

In the first place we decided that a two-valver would not have the most popular appeal, for while such a set will give good loud-speaker volume from locals it would not

be much good for those on the fringe of the regional service areas, nor for the reliable summer-time reception of foreigners.

As we had, for the present, anyway, to concentrate on a detector, low-frequency amplifier circuit we thought a three-valver with two stages, one a resistance-coupled and the second a transformer, would do the trick, and it does!

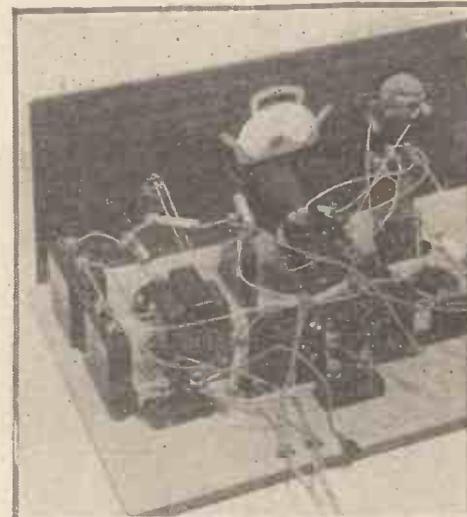
We might point out that with a resistance-coupled stage after the detector you obtain very smooth reaction from the detector, as well as good quality. The coupling condenser between the two stages is of good average value. If your loud-speaker is a trifle on the high-pitched side it is a good plan to increase the coupling condenser value to .1 microfarad.

You will note that the detector anode circuit is decoupled by means of a 30,000-ohm resistance and a 1-microfarad fixed condenser to earth. In practice this means you can run the set from a dry battery that is past its prime, because the high internal resistance of the battery will be counteracted by the decoupling arrangement.

Another precaution in the interests of stability and quality is the inclusion of a .25-megohm resistance as a grid stopper—

that is in series with the grid lead of the valve of the resistance-coupled stage.

As a final precaution, the transformer-coupling stage also includes decoupling components, again using a 30,000-ohm resistance and a 1-microfarad condenser. This resistance acts also as a voltage dropper, so that first low-frequency valve does not get an excessive voltage, which might cause too high an anode current. Decoupling, though many do not



Back view of the completed New-style Tuner. The resistances and Westector are held in position.

THE COMPONENTS YOU WILL NEED FOR THE NEW-STYLE

- CABINET**
Complete with baseboard 16 in. by 10 in. and plywood panel 15 in. by 7 in. (Peto-Scott Console).
- CHOKE, HIGH-FREQUENCY**
1—Lissen, type Disc (Telsen, Igranic, Graham Farish, Varley, Peto-Scott, R.I.).
- CONDENSERS, FIXED**
One .0001-mfd., one .0002-mfd. and two .01-mfd. (T.C.C., Telsen, Dubilier, Lissen, Graham Farish, Goltone).
1—1-mfd. (T.C.C., Dubilier, Telsen, Lissen).
Three 1-mfd. and one 2-mfd. (T.C.C., Dubilier, Peak, Lissen, Graham Farish, Goltone, Igranic).
- CONDENSERS, VARIABLE**
1—.0005-mfd. reaction (Lissen, Graham-Farish, Telsen, Goltone, Utility).
1—.0003-mfd. preset (Sovereign, Telsen, Goltone).
- HOLDERS, VALVE**
Two 4-pin, one 5-pin (W.B., Lissen, Benjamin, Bulgin, Telsen, Ferranti).
- PLUGS**
8—Wander plugs, marked: H.T.+1, H.T.+2, H.T.—, (2) G.B.,+ G.B.—1, G.B.—2. Tap. (Belling-Lee, Clix, Eelex).

- 2—Spade terminals, marked: L.T.+ , L.T.— (Belling-Lee, Clix, Eelex).

- RESISTANCES, FIXED**
Two 30,000-ohm, two 50,000-ohm, one 200,000-ohm, one 250,000-ohm and two 1-megohm (Dubilier, Erle, B.A.T., Graham Farish, Lissen).

VALVES TO USE

Mullard ...	PM1HL	PM2DX	PM23
Marconi ...	HL3	L210	—
Osvam ...	HL2	L210	—
Cosor ...	210HL	210LF	230PT
Mazda ...	HL210	L2	Pen220A
Six Sixty ...	210HL	210LF	230PP
Lissen ...	HL2	L2	PT240

- RECTIFIER**
1—Westector (Westinghouse, type W4).

- SUNDRIES**
3—Terminal blocks, marked: A.E., P.U. L.S. (Lissen).

- Connecting wire and sleeving (Lewcos).
- 3—Yards thin flex (Lewcoflex).
- 1—Peto-Scott coil-tap terminal block.

E THREE

"AMATEUR WIRELESS"
"E" three-valver incorporates
permeability tuning
arrangement that really works

realise it, is also a means of economising in the high-tension supply.

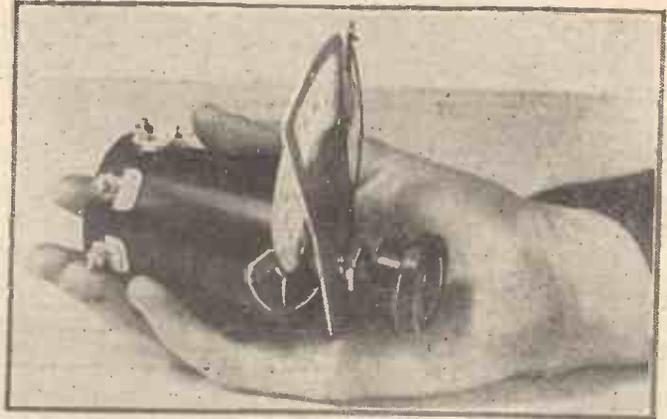
The output valve is a pentode power type. A separate high-tension lead is provided for the auxiliary or screen-grid of the pentode. This is an unusual arrangement, but as the whole idea is economy in this set we know that its provision will be appreciated.

The voltage applied to the screen has a very appreciable effect on the anode current,

and usually the voltage on the screen should be 20 volts lower than that on the anode. In practice it is advisable to reduce this voltage still lower, so that you use just sufficient voltage to get adequate volume. In that condition the anode current will be as low as possible.

We have now explained the rough outlines of the circuit but we want now to deal with some of the special points. Bearing in mind our watchword of *economy* we have assumed that you want to work this set from a standard-capacity battery.

We have therefore included a unique system of *battery economy*, on the lines exclusively disclosed in our pages last week. In brief this system limits the anode current of the power valve to a figure that is just enough to



How compact is the construction of the new permeability tuner is obvious from this photograph

—so little or no signal strength will be lost. But a rectifying action will take place, and one half of each alternation will pass through, thus giving us a very useful direct current, which varies according to the signal strength.

Now we use this current as a voltage by passing it through a potentiometer resistance. Across the pot. develops a voltage, which we tap off four-fifths of the way along, and apply this in opposition to the normal grid bias obtained from the grid-bias battery.

The result is that we get a sort of see-saw action. When the output increases the voltage developed across the resistance increases, so does the opposition to the grid-bias voltage, and finally the effect is to reduce the grid bias. See page 123 of our August 5 issue for a fuller explanation of this action.

No Sign of Any Variable Condenser

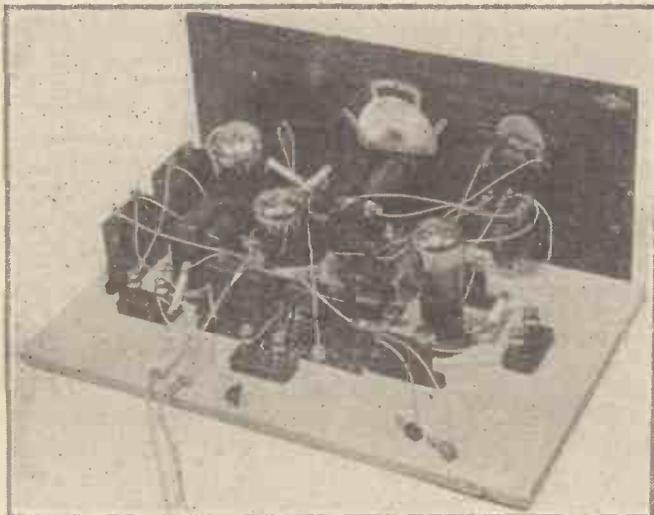
We are left to deal now with the *pièce de résistance* of the circuit—the Sovereign permeability tuner. As you can see from the circuit, there is no sign of a variable tuning condenser, the .0003-microfarad pre-set is merely an aerial condenser to provide for variation in aerial damping.

At first sight the switching system may seem unduly complicated, but actually we have two switches, which are on one spindle, actually a Wright & Weaire two-pole change-over. Apart from this switching, there is a small auxiliary switching idea, consisting of two sockets and a plug mounted just behind the tuner on the baseboard. This need only be used when you are very close to a powerful broadcasting station. It alters the aerial coupling and thus sharpens up the tuning.

The main switching is two change-overs,



Showing how the wiring is done



The set ready for test with the three valves fitted in position. You can see from the valve list which are the most suitable valves

NEW-STYLE THREE

SWITCHES

- 1—Two-pole double throw (Wearite, type 1.22).
- 1—Filament (Bulgin, type S102).

TRANSFORMER

- 1—Intervalve Lissen, type Hypernik (Telsen, Varley Multitone, R.I., Igranic).

TUNING UNIT

- Permeability tuning unit (Sovereign).

ACCESSORIES

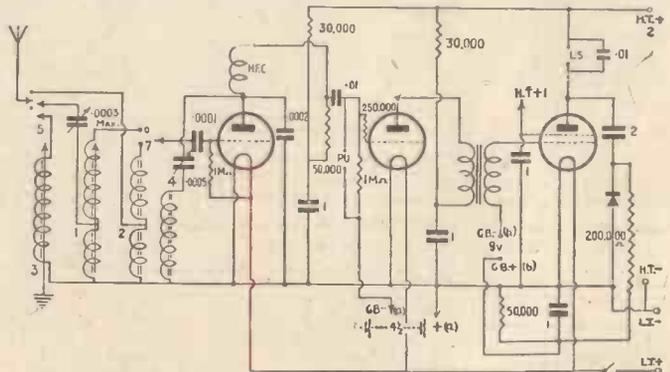
- 120-volt H.T. battery (Lissen, Ediswan, Drydex, Ever-Ready, Marconi, Pertrix).
- One 1½-volt and one 9-volt G.B. batteries (Lissen, Ediswan, Drydex, Ever-Ready, Marconi, Pertrix).
- 1—2-volt accumulator (Exide, Lissen, Pertrix, Ever-Ready).
- Loud-speaker permanent-magnet (Amplion, R. and A., W.B., Blue Spot, Marconi, Rola, Epoch, B.T.H.).
- Earthing device (Filt).
- Aerial wire (Electron).
- Down lead (Receptru).
- Lightning switch (Bulgin).

enable the valve to handle the input without distortion.

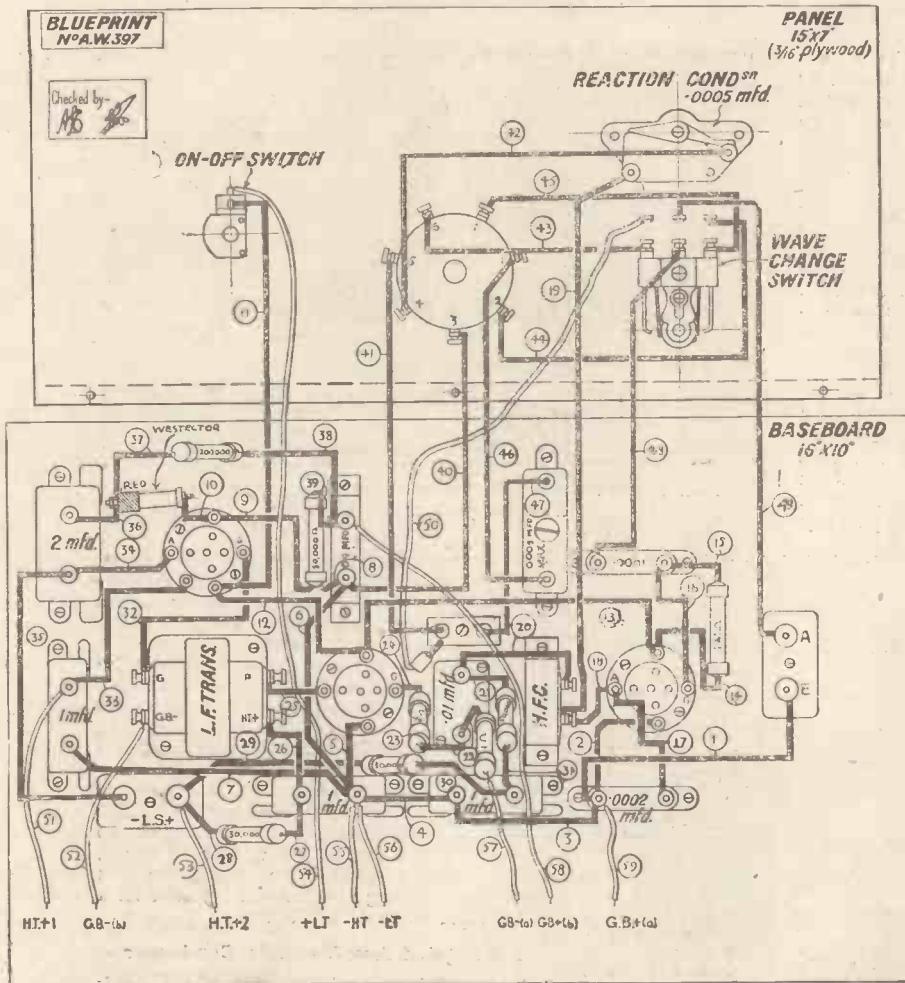
What happens is that we use a Westector to rectify the alternating currents carrying speech

signals in the anode circuit of the pentode. You can see from the circuit that at the anode of the pentode the signals, which are, of course, low-frequency alternations, are offered the choice of two paths, one in the normal way through the loud-speaker, and the second path through the Westector in series with a large fixed condenser.

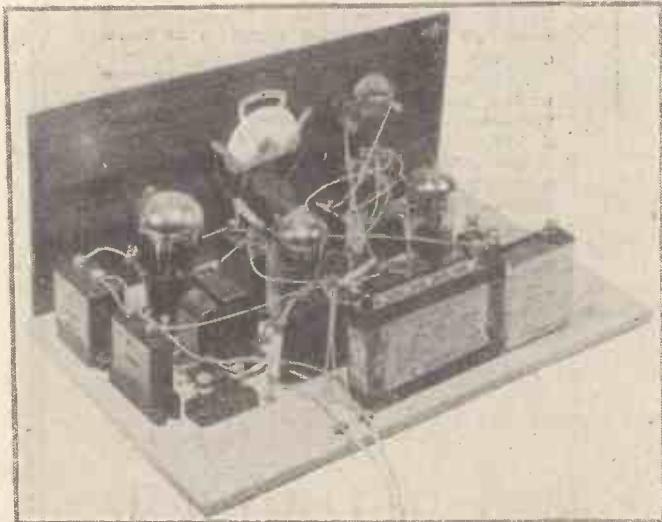
The alternations will pass through the loud-speaker in the usual way, but the Westector will offer a considerable impedance to the flow of this alternating current



Complete theoretical circuit diagram of the New-style Three. Note especially the iron-core tuning arrangement and the Westector economy scheme for the output stage



Reduced reproduction of the full-size blueprint, which can be obtained, price 1s., post paid, from "Amateur Wireless," 58-61 Fetter Lane, E.C.4



Back view of New-style Three with the valves and grid-bias batteries in position

one section is simply a wave-changer, shorting out the long-wave section for medium waves; the other section at the same time transfers the aerial tapping from the middle of the medium waves to the middle of the long-wave coil. This keeps the selectivity constant over both wavebands.

You may wonder how it is possible for this aerial-tuning circuit to work, as there is no tuning condenser. Actually, there is a certain amount of fixed capacity across the coil windings, made up of the inter-turn capacity effects.

What you have is a tuning circuit with a very high ratio of inductance to capacity, with the great advantage that this efficient ratio is constant over the whole waveband. You get the same degree of selectivity over all wavelengths and, of course, the same degree of sensitivity.

As you can see from the photographs, the practical layout of this three-valver has been made extremely simple, a wooden baseboard taking most of the parts, with a wooden panel fitted up at right angles to it to hold the variable controls.

There is a special point to note about the baseboard. It is sprayed with Metaplex, a new metallised liquid, which when put on to a wooden baseboard produces just as good an electrical screening effect as aluminium foil that has been so popular in the past.

On the panel we have mounted four controls. Looking from the front the centre knob is for tuning. It actuates a screwed rod, which moves the tuning coil up and down the iron core. You alter the knob just as you would for ordinary condenser tuning.

In the bottom left-hand corner we have the change-over switch. Above it is a .0005-microfarad reaction condenser. On the extreme right-hand top corner we have the on-off switch for the batteries.

Use of a Full-size Blueprint

For the layout of the baseboard components we suggest you consult the photographs accompanying this article. Then there is a full-size blueprint available, which gives the exact positions of all the components, as well as all the wiring between the various parts.

The price of this blueprint is one shilling post free from AMATEUR WIRELESS Blueprint Dept., 58-61 Fetter Lane, London, E.C.4.

The wiring is one with ordinary 20-gauge tinned-copper wire and 1-millimetre sleeving. You should note how the resistances are fixed. The idea is to hold them in position by their connecting wires.

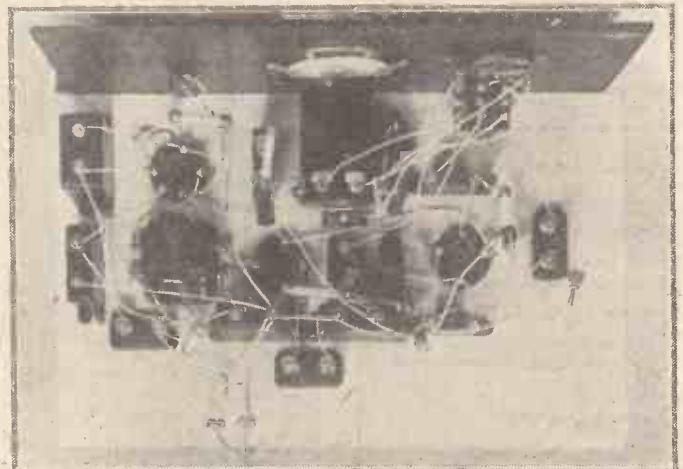
Note that in this set we use two grid-bias batteries. It is essential that the two grid-bias positives should not be connected; a single battery therefore cannot be used.

When you come to operate the knobs on this set you will find that the tuning is especially precise. A slow-motion action is obtained—thirty-six revolutions of the knob covering each waveband. The reaction is very smooth, and when you are trying for the maximum volume you should advance this as far in a clock-wise direction as possible.

A word on the pre-set condenser. Unlike its effect on the ordinary tuning coil, this pre-set materially alters the wavelength of the permeability tuning coil. You must therefore be careful in adjusting the pre-set, and to make allowances in the tuning adjustment.

An aerial of 50 ft. is the absolute maximum to use with this sort of set. If you use a much longer aerial the increase in damping increases the minimum wavelength and such stations as London National and Fécamp might be lost. Normally you can get Fécamp with 10 degrees to spare.

Don't forget that you can see this set—the original New-style Three—in the radio-department windows of Selfridges, which are situated in Somerset Street, just at the back of Oxford Street.



This plan view of the set shows how the baseboard parts are laid out. Remember that the baseboard has been sprayed with a special metallising preparation when bought



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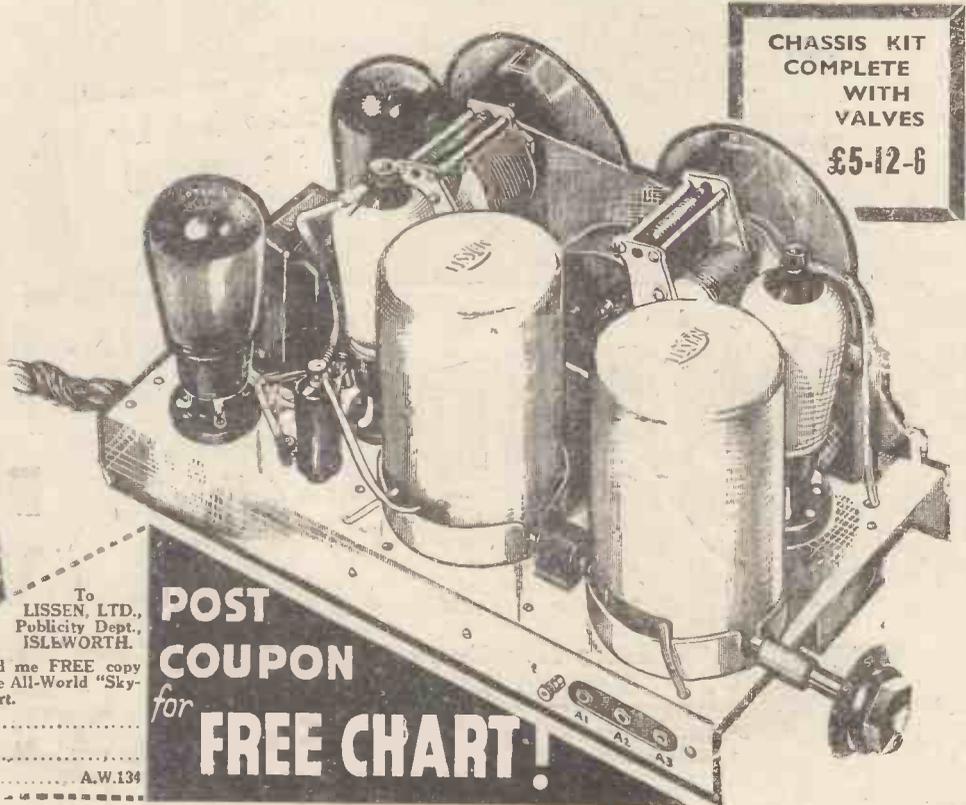


WORLD-WIDE RADIO
ALL-WAVE · ALL-WORLD
4 WAVELENGTHS INSTEAD OF 2
ENGLAND and EUROPE were always easy to get

At last the day of All-World Radio has arrived, and all the thrill of conquest has returned to radio reception with the introduction of a new Home Constructor's Kit Set by Lissen, which incorporates for the first time four wavelength ranges instead of two—which tunes from 12 to 2,000 metres—which brings America and Australia direct within range of British listeners who hitherto have only known the home stations and the chief Continental programmes.

The Lissen All-Wave All-World "Skyscraper" 4 marks a milestone in radio progress—a milestone so important that it can only be compared to the change from crystal sets to valves. As the first valve sets made practical a range of hundreds of miles, so the new principles involved in this Lissen All-Wave All-World "Skyscraper" make practical the thousands-of-miles ranges of Australia and America. It brings two whole new wavelength bands within reach of the ordinary listener—stations and programmes which before he was unable to receive—and leaves open for future development a field which may well be used to solve all the problems of ether-congestion at present perplexing the authorities.

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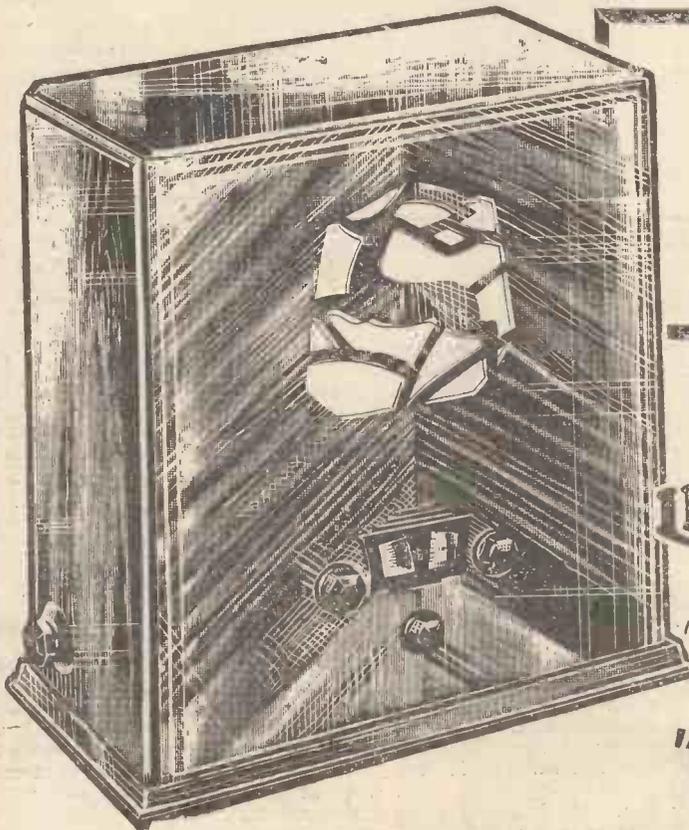


but you've never heard **AMERICA & AUSTRALIA!**

You build Lissen All-Wave All-World "Skyscraper" 4 for yourself. Lissen have made it a Home Constructor's Kit Set because they feel there are thousands who, when told how, can use their own hands. Building it yourself saves you pounds in first cost, it makes you an enthusiast to feel and to hear what a wonderful thing you have created!

And when you see the Great Free Chart of the All-Wave All-World "Skyscraper" which tells you how to build it and how to work it and

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But get the Chart and see for yourself—then build the Lissen All-Wave All-World "Skyscraper" 4 and become a pioneer of the World Range Radio of 1934—hear the ultra-short and short wavelength stations for the first time.

Post the Coupon on left for your **FREE COPY** of the All-Wave All-World "Skyscraper" 4, or ask your radio dealer.

NOW BUILD THE RECEIVER THAT SPANS THE WORLD!

LISSEN
ALL-WAVE ALL-WORLD
"SKYSCRAPER" 4

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

A New Radio Mystery

By Morton Barr

UNTIL recently there has been no definite evidence of radio waves interfering or interacting with each other whilst still in the ether. That is to say one station can transmit a certain programme on, say, 300 metres, whilst another station is simultaneously transmitting a different programme on 500 metres, and—given a sufficiently selective receiver—each programme can be clearly separated from the other.

Of course, if the receiving circuits are not sufficiently selective one must expect a certain amount of overlap or background interference, but this can be removed by improving the tuning of the set.

Interference by Cross-modulation

Also it sometimes happens—even with an ultra-selective set—that mutual interference will occur owing to what is called cross-modulation. Here the cause is due to a peculiarity or defect of the high-frequency valve. In general all ordinary cases of interference could be eliminated if the circuits used for reception were perfect.

But it has now been discovered that, under certain conditions, a type of mutual interference is liable to occur which is not due to any fault in the receiver—and for which no

particular programmes manage to merge together—or modulate each other—whilst still in the ether.

There are two significant points to be borne in mind. In the first place the effect was only observed after Luxembourg had started working. Luxembourg is, of course, one of the most powerful stations in Europe, being rated at 200 kilowatts. If it was in the close vicinity of Eindhoven, one might be disposed to attribute the effect to direct pick-up or inductive action. But it is over 200 kilometres away, and its local field strength at Eindhoven is only 10 millivolts per metre—which is not abnormally high—so that this theory must be dismissed.

The second significant point is that mutual interference occurs only with the particular stations previously mentioned—and with a few others of less importance. For instance, there is no sign of any overlap with Luxembourg when receiving, say, Langenberg, or any of the English stations.

Actually the stations involved are all situated approximately in the same plane as the line connecting Eindhoven and Luxembourg. Also they are all farther away from Eindhoven than Luxembourg, so that for some considerable portion of their travel through

Enlarged Number Next Week?

ONE of the events of the radio season is the publication of the special Radio Exhibition number of AMATEUR WIRELESS, which, this year, will be even better than in the past. It will be on sale at bookstalls and newsagents all over the country on Wednesday next.

Without giving away any secrets, we can say that this specially-enlarged issue will have an unusual three-colour cover, which you will not be able to miss.

Order a Copy from Your Newsagent NOW!

one has yet been able to find a satisfactory explanation.

It was first observed in the Philips laboratories at Eindhoven in Holland, soon after the new high-powered station at Luxembourg began operations.

Luxembourg, it will be remembered, transmits on a wavelength of 1,190 metres, so that it is well above the ordinary medium-wave stations, and should easily be separated from them by the simplest type of receiver.

But it is found that when a set—even of ultra-selective design—is tuned in at Eindhoven to certain stations, such as Beromunster at 460 metres, Budapest at 550 metres, Munich at 533 metres, or Radio Paris at 1,725 metres, there is a persistent background of the Luxembourg programme which cannot be eliminated.

The wavelength separation between Luxembourg and the various stations mentioned above is sufficient to rule out any possibility of ordinary overlap due to insensitivity. Further, since the background is present when different types of up-to-date receivers are used, the possibility of ordinary cross-modulation is also ruled out.

The only apparent solution to the mystery is that, in some peculiar way or other, these

Besides a complete guide to the exhibits at Olympia, this number of AMATEUR WIRELESS will contain full constructional details of a four-valve battery set incorporating every modern refinement, and there will also be details of a chassis-built A.C. set for those who want mains working.

Altogether we can promise that this year's Exhibition Number of AMATEUR WIRELESS will be even better value for 3d. than it has been in the past.

the ether the two sets of waves follow more or less the same route.

One suggested explanation is that the powerful transmission from Luxembourg is picked up by the distant transmitting aerial at, say, Beromunster. The latter then acts as a receiving aerial to modulate the incoming and outgoing waves together, so that they cannot thereafter be separated.

This does not, however, sound convincing, as it is difficult to see how any definite "merging" could occur unless both waves passed through the same modulator valve simultaneously. Also it does not explain the "directive" effect, since the same action could occur at any station within range, whereas the actual interference is confined to the stations previously mentioned.

A second and more likely possibility, assuming the two waves travel together over the same path, is that they may both be affected by a common resistance of a non-ohmic character. Both ground waves, for instance, will travel over the same soil, where they may be variably absorbed. Or a similar effect may take place with the space-waves in the Heaviside layer.

One thing is certain. Wireless waves are not usually modulated, one by the other.

What to Hear in the Proms

By Whitaker-Wilson

THERE is a good deal of really light music in the Proms this season. As usual, you will have your Wagner on Mondays, but you can hear the *Tannhäuser Overture* at the first Prom on August 12.

I recommend the following, taken from the Monday programmes: *Rienzi Overture* (August 14), *Prelude to Parsifal* (August 21), *The Siegfried Idyll* (August 28), *The Kaisermarsch* and the *Tannhäuser Overture*, both of which are down for September 4, *Prelude to Lohengrin* and the *Ride of the Valkyries* (September 11), *The Flying Dutchman Overture* and the *Siegfried Idyll* (September 18), *The Mastersingers Overture* (September 25), *The Funeral March from Götterdämmerung* (October 2).

A Goodly Array of Singers

These are purely orchestral, but there is a goodly array of singers. Walter Widdop sings in most of the Wagner Proms this year—August 14, 21; September 4, 18, and 25. Florence Austral sings three times: September 4, 18, and October 2.

Two lots of Tchaikovsky for you, August 15 and September 21. In the former listen to the piano concerto (Moisevitch is playing it) and also to the *Fourth Symphony*, even if only for that marvellous movement played by the plucked strings. In the latter Arthur Catterall plays the violin concerto, and you will also hear the *Pathetic Symphony*.

Hear a little Beethoven on Fridays. Specially attractive are the Emperor piano concerto played by Solomon (August 18), the *Eroica Symphony* (August 25), the violin concerto played by Szigeti (September 1), the ever-popular *Fifth Symphony* (September 8), the *Pastoral Symphony* (September 15), the *Leonora Overture No. 3* (September 22); and the *Choral Symphony* with the B.B.C. Chorus and four soloists on September 29.

Now for some popular items taken from the Saturday night programmes. On August 19 you will hear Elgar's *Cockaigne Overture*, and do listen to three of Holst's seven *Planets*.

Do not miss those jolly Sea Songs of Stanford. Keith Faulkner is going to sing them on August 26, and he will bring the house down, too! If you want Liszt's *Rhapsody in D and G*, do not look for it in the last Prom, where it generally is; it is down for September 2.

You will do well to hear Evelyn Scotney—about the best soprano in England at the moment—on September 9.

Do you want *Zampa*? And the Prologue to *Pagliacci*? All right, then, September 16. *Sound an Alarm* on September 23; the *Factotum* on September 30; and you had better listen to the whole of the last Prom, including the yelling at the end, on October 7.

Elgar conducts his second Symphony on August 17, well worth hearing. Schubert's *Rosamunde* music is down for August 31; Poushnoff plays Liszt's light and melodious piano *Concerto in E Flat* on September 17; Albert Sammons plays Elgar's violin concerto on October 5.

Special Composers' Nights

Special nights devoted to either one or two composers are: Tchaikovsky, August 15 and September 21; Bach-Handel, August 16 and September 13; Bach alone August 30 and September 27; Brahms August 23, September 6 and 20; October 4; Berlioz-Strauss, August 29, including the *Symphonic Fantastique* of the former, and *Till Eulenspiegel* of the latter—both worth hearing.

Not all these may be to your liking. Tastes differ so. On the other hand, if you will keep this little guide by you for reference, and make a point of hearing as many as you can of the various items I have named, I think you will enjoy them. WHITAKER-WILSON.

For the Beginner

Why Your Reception Varies

By PERCY W. HARRIS, M.Inst. Rad.E.

THE pleasant correspondence I have recently had with a number of newcomers to radio leads me to think that the general facts regarding long-distance reception are by no means generally known, while several more experienced readers have asked for guidance in the matter. Unless we have a general knowledge of these conditions, disappointment on the one hand, or undue elation on the other, may be our lot when testing a new wireless receiver.

Fundamental Facts

The fundamental facts which cannot be too often emphasised are these:—

- (1) Uniformity of reception from a given station is only possible within a hundred or two miles; often less than this.
- (2) Really long-distance reception is only possible after dark.
- (3) Enormous variations in reception of distant stations are likely to occur from hour to hour and from night to night, irrespective of the kind of set used.
- (4) Very large variation in reception conditions occur between different localities.

Under these main headings we can discuss some very important points and I hope that this article will be the means of answering a considerable number of specialised queries. Take, for example, item (1) above. If you are living within twenty or thirty miles of a main station and other conditions remain the same, you will generally be able to hear it at the same strength day or night (there are a few exceptions to this rule, but not many).

The daylight range of stations such as the London, Midland, Northern, and Scottish installation, is quite well known, and the B.B.C. engineers have marked down on their maps what are called "service areas" for the particular stations in question. Similarly the Rome station, to take an example at random, has a certain service area within which the Italian engineers know quite well that satisfactory reception is obtainable on the average set.

Outside the Service Area

If, now, we take a position half-way between Rome and, say, Manchester, and we provide a man with an ordinary three-valve set he will get just nothing from either of them in daylight, for he is out of the service area of both. After dark, however, he may hear one or the other or both at excellent strength, notwithstanding the fact that he is well outside the normal daylight service area. Readers in this country know quite well that the Rome station frequently comes in at tremendous strength over here, but only after dark.

This leads me to point No. 2. Enormous distance is obtainable after dark and the tremendous variations between day and

night conditions which puzzled us so much at the beginning of broadcasting is now fairly well explained. Each station radiates, as you know, energy from the aerial in all directions. Special forms of aerial and special conditions may make the radiation non-uniform but, generally speaking, we can say that it radiates freely in every direction. During daylight, when the sun is falling on the earth's atmosphere, radiation which passes upwards above the line joining the transmitting aerial with the various receiving aerials is lost—that is to say, it is just dissipated and has no effect on any receiving station, the only signals received being what is known as the "direct ray." After dark, however, a peculiar state of affairs sets in and a good deal of the radiation of the stations may be reflected down to earth again from a layer of conducting or semi-conducting air which acts as a kind of mirror for wireless waves. It thus happens that on a particular receiving aerial the direct ray from a distant station may not be strong enough to give any noticeable effect, but the reflected ray may be so strong as to give reception comparable in strength with that of the locals.

This layer is in a constantly changing state and just as a small boy with a piece of looking-glass on the other side of the street may move it about and every now and again reflect the sunlight into your eyes, so that variations of this conducting layer may occur in such a way that sometimes you get a powerful signal from a distant broadcasting station and sometimes you don't.

This, rising and falling is called "fading" and sometimes the reflected ray may interfere, or, so to speak, cancel out, the direct ray, actually weakening reception below normal.

Better Conditions Coming

Generally speaking, winter night conditions are more favourable than summer, and of winter nights a dull, muggy, and slightly damp evening may give you far better long-distance reception than one which is clear, frosty and starlit. Some nights may be so good that almost every station on the map seems to come in well, while twenty-four hours later you may spend the whole evening listening for, say, Rome, and not get it once—but with Rome that will not very often happen.

The Wunderlich Valve

THIS new American valve works from a centre-tapped input connected across two grids, one of which is wound between the meshes of the other. It is used as a detector of the grid-power type, giving an output approximately double that of an ordinary detector valve, free from any H.F. components. The valve is generally coupled directly to a pentode or push-pull amplifier, and should follow at least two stages of H.F. amplification. It is particularly adapted to give automatic volume control.

B.

Charging Accumulators

THE usual procedure, especially with a trickle-charger, is to use it pretty frequently, the idea being to keep the accumulator constantly up to scratch. As a matter of fact, it is better occasionally to let the accumulator run down to the "safety" level of 1.8 volts measured across each cell.

The accumulator must not, of course, be left in this condition, but should be recharged immediately. If this procedure is adopted now and again, the effective life of the battery is likely to be longer. M.

European Broadcasters

MILAN

Approximate distance from London, 598 miles. Ente Italiano Audizioni Radiofoniche. (Italy). 331.5 metres (905 kilocycles), 50 kilowatts. Relays the Turin



programme, together with Genoa and Florence. Transmits at intervals from 7 a.m. This station usually comes in quite well in the British Isles.

MADRID

Approximate distance from London, 786 miles. Aranjuez (EAQ). 30.43 metres, 20 kilowatts. Medium-wave broadcaster, Union Radio (EAJ7). 424.3 metres (707



kilocycles), 2 kilowatts. Transmits at intervals from 8 a.m. Late night news bulletin generally given just before the closedown at midnight.

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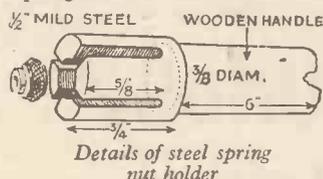
You will Help Yourself and Help Us by Mentioning "A.W." to Advertisers

That Radio Dodge

Here readers pass on hints and tips that they have found to be of use in their experimental and construction work; some of them may solve your particular problems

A STEEL SPRING NUT HOLDER

NOW that space is scarce in wireless sets, a good method to tighten nuts or remove them is by use of this simple steel spring holder.



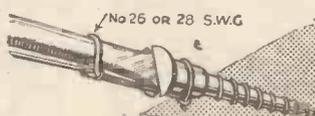
First drill a piece of mild steel of $\frac{1}{2}$ in. diameter, $\frac{3}{4}$ in. long, $\frac{1}{8}$ in. deep, and $\frac{3}{8}$ in. diameter. Then finish hole right through with a drill about the same size as the knurled nut, cut four saw cuts with hack saw about $\frac{3}{8}$ in. deep started from end with small hole, remove ragged edges with round file, put piece of wood tightly in $\frac{3}{8}$ diameter end, and holder can be used as shown.

A.R.C.

FIXING AWKWARD SCREWS

HOW often have you found it necessary to fix a screw or screw down a component in some awkward position where it was impossible to get your hand near to hold the screw upright or even perhaps to

place the screw in the hole? Obtain a short length of wire of No. 26 or No. 28 gauge, make a kind of noose round the screw just below the head, place the screwdriver in the slot, run the wire a short way up it, and make



This dodge will help you to fix awkward screws

another noose round the driver. Pull tight and leave enough wire to run up to your hand. This will hold the screw and driver in a straight line surprisingly firmly. The screw can now be pushed into the hole with the screwdriver and screwed down a short way.

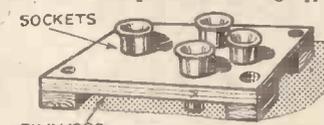
As soon as it has a good grip, a sharp tug on the wire will either unwind it or cause it to snap, leaving the screw firm and upright for screwing down.

A TEMPORARY VALVE HOLDER

CONSTRUCTORS who may require a temporary valve-holder can easily construct a simple one of the chassis-mounting type from old

high-tension battery sockets.

All that is required are four sockets and a piece of quarter-inch plywood about an inch and a half square. A valve should have a spot of ink applied to the end of each pin and be lightly

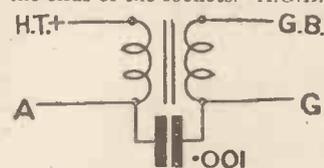


How the plywood is drilled as a valve holder

pressed in the centre of the piece of plywood.

Holes are drilled through each of the marks thus formed on the wood, the size of the holes being a tight fit for the sockets.

Smear each socket lightly with glue and press into the holes. A hole should be drilled in each corner of the wood for fixing, and the connections soldered to the ends of the sockets. A.G.B.



Bass notes increased by a fixed condenser

IMPROVING BASS RESPONSE

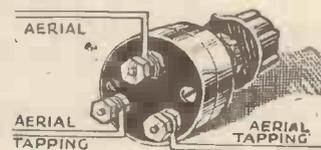
THE provision of a .001 or similar fixed condenser across the anode and grid terminals of the low-frequency transformer will apparently increase the bass response.

Any tendency to "motor-boat" in sets, using this idea, will be aggravated, however, and correct decoupling is an essential.

A.E.W.

CHOICE OF AERIAL TAPS

THE following simple switching arrangement will be of use to some readers whose sets have two aerial tappings. You



Simple twin-point switching for aerial tappings

require a radiogram change-over switch, preferably the Bulgian model.

The aerial is connected to the middle terminal of the switch and the other terminals of the switch are connected to the different aerial tappings. C.H.

When to Listen for the Short-wave Stations

DURING the brighter months of the year listeners are apt to lose interest in short-wave transmissions, putting forward the plea that during this period it is seldom possible to tune in at readable strength signals which were easily received a month or so ago.

Although it is true to a certain degree that our nightly logs perhaps do not contain the same number of entries as they did in such months as December or January, there is no necessity to give up a daily search on the higher frequencies as, although possibly we may not regularly tune in stations against which we had placed a three-star mark of excellence, we shall find a number of lesser-known transmitters which may provide interesting features.

Best Daylight Wavelengths

During daylight hours it is wise to concentrate on wavelengths included in the 14-16 metre band, and if the condenser dial is very slowly revolved it will not be long before a catch is made.

A service which was only recently opened is that connecting Algeria with France; on several occasions I have picked up the call of Bouffarik (Algiers) intended for Ste. Assise (France); the transmissions are usually made on 25.10 and 48.6 metres. Until private messages are put through the conversations

By J. Godchaux Abrahams

between operators are "clear"; later, of course, the transmission to ensure privacy is "scrambled."

There is always something to be found on the ether, and new entries will prove useful in your log. Take, for instance, the Great Britain-India telephony service. Many of the tests prior to its official opening were heard; they emanated from VWZ, Kirkee (near Poona) and were registered on 18.429 kilocycles and 17.400 kilocycles.

But to revert to better-known broadcasters, Rome, usually captured on 25.4 metres, will be found occasionally on 80 metres; these are purely experimental broadcasts and possibly not of regular occurrence, although judging from entries made they appear to recur mostly on Tuesdays and Fridays after 8 p.m. Radio Coloniale, Paris, although retaining its original wavelengths, seems to have made some alterations in its time schedule. On 19.68 metres it broadcasts daily a programme destined to French-Indo-China between G.M.T. 14.00 and 17.00; on 25.20 metres a transmission is made for Madagascar between 17.15 and 19.15, and from 21.00-23.00. On 25.60 metres, wireless entertainments are specially destined

to the Soudan, Senegal and French Equatorial Africa; from midnight to 03.00 to South America; with an extra broadcast from 03.00-05.00 for Canada, the United States and South America. During the last period announcements are made in French, English and Spanish.

CTIAA (Lisbon), which has steadily maintained its position on 31.25 metres, has recently adopted 31.18 metres (9,620 kilocycles) to avoid interference caused by neighbouring morse transmitters; also EAQ (Madrid) for a similar reason is now operating on 30 metres (10,000 kilocycles) and no longer on 30.43 metres.

Increased Power in New York

A station which has been consistently heard at good volume lately is W2XE, of Wayne (N.J.), which relays the Columbia WABC programmes from New York. Its power has been increased and it now operates on three separate channels, namely, from 16.00-18.00 B.S.T. on 19.646 metres (15,270 kilocycles); from 20.00-22.00 on 25.36 metres (11,830 kilocycles); and from 23.00-04.00 on 49.02 metres (6,120 kilocycles). In particular the 19.646 metres transmissions have been well received on this side of the Atlantic, as they are broadcast from an aerial which is directional to Great Britain.



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How the Foreigners Are Coming In

By Jay Coote

AFORETASTE of one of the little problems with which we may have to contend when the Lucerne Plan comes into force next year is already given to us every evening. Have you already logged the new Kalundborg high-power transmitter? It was successfully launched on the ether about a fortnight ago. Can you secure reception of the Copenhagen programmes without any interference from Radio Luxembourg?

Many listeners have had considerable trouble in separating, say, Königswusterhausen from Radio Paris or, for that matter, from Daventry National. With only a bare 8-kilocycle separation between Kalundborg and Radio Luxembourg, the difficulty in obtaining clear broadcasts from either station has been increased. The excessive power of Luxembourg makes the reception of the Copenhagen programmes somewhat of an achievement with the ordinary class of wireless set.

Later on the Air Than Rival

It is fortunate for listeners in the British Isles that the Dane remains somewhat later on the air than his rival. Although designed for an output of roughly 60 kilowatts, it is doubtful whether, for its actual service to Denmark, the new plant will be called upon to use its full energy; but this will depend entirely on the reports received from districts in a northerly and north-easterly direction, namely, from Greenland and Iceland, to which the transmissions are also destined.

From our point of view, therefore, the actual increase in power in the Danish broadcasts will not prove a very great benefit. If Luxembourg could be induced to abandon its present channel there is no doubt that much trouble would be avoided, as the retention of this arbitrarily chosen wavelength at the end of the year is likely to throw the Lucerne Plan off the rails—at least, on the longer channels of the broadcasting band.

Have you also noticed, on the other hand, how much better you can now hear the Hilversum entertainments on 1,875 metres? It is a curious fact that, although on various occasions mention has been made of the new Kootwijk 50-kilowatt station by which they are broadcast, quite a number of listeners to these programmes still remain under the impression that the old 7½-kilowatt Huizen station is being used.

Norwegian Nationalisation

Holland's present long-wave channel (1,875 metres) is prized as a very valuable asset and one for which a hefty struggle will ensue now that a special transmitter has been built to use it.

Since the nationalisation of the Norwegian broadcasting system, the Storting has taken immediate steps to carry out its new constructional programme, and orders for two 20-kilowatt transmitters have already been given to England. They are destined to replace the stations now working on much lower power at Trondheim and Bergen. The plant is to be of the most modern type and will incorporate the latest developments in radio technique.

Further details are now to hand regarding some alterations to be made shortly in the wavelengths of the German stations pending the adoption, in January, 1934, of the channels allotted to them by the Lucerne plan.

In addition to an almost general increase in output, there is to be a re-shuffling of the relay groups. Magdeburg in a few weeks' time will be added to the Hamburg network simul-

BROADCASTING STATIONS

Broadcasting stations classified in order of wavelengths. For the purpose of better comparison, the power indicated is that of the carrier waves.											
Metres	Kilo-cycles	Station and Call Sign	Power (Kw.)	Metres	Kilo-cycles	Station and Call Sign	Power (Kw.)	Metres	Kilo-cycles	Station and Call Sign	Power (Kw.)
25.4	11,810	Rome (ZRO)	15.0	263.8	1,137	Moravska-Ostrava	11.0	447.1	671	Paris (PTT)	7.0
25.51	11,760	Zeesen (DJD)	8.0	265.7	1,129	Lille (PTT)	1.3	449.8	667	Danzig	0.5
25.53	11,750	Daventry (GSD)	20.0	267.6	1,121	Valencia	6.0	451.8	664	Madona	25.0
25.63	11,705	Paris (Coloniale)	10.0	268.1	1,118.7	Bari	0.3	453	662	Agen	0.25
28.36	10,578	Paris (FYB)	—	268.9	1,115	Salonica	1.0	453.2	662	Odessa	10.0
30.0	10,000	Madrid (EAO)	20.0	269.8	1,112	Bari	20.0	453.2	662	Klagenfurt	0.5
31.25	9,598	Lisbon (CTIAA)	2.0	273.7	1,096	Turin (Torino)	7.0	453.2	662	Milan (Vigentino)	7.0
31.3	9,585	Daventry (GSC)	20.0	276.5	1,085	Heilsberg	60.0	456.6	657	San Sebastian (EJA)	5.0
31.38	9,560	Zeesen (DJA)	8.0	279.6	1,072.9	Bratislava	14.0	459.4	653	Beromuenster	60.0
31.55	9,510	Daventry (GSB)	20.0	281.2	1,067	Copenhagen	0.75	465.8	644	Lyons (PTT)	15.0
31.6	9,494	Poznan (SRI)	0.5	282.2	1,063	Lisbon (CTIAA)	2.0	465.8	644	Tartu	0.5
32.26	9,300	Rabat	0.5	283.6	1,058	Berlin (E)	0.5	472.4	635	Langenberg	60.0
38.47	7,799	Radio Nations (HBP)	—	283.6	1,058	Magdeburg	0.5	476	630.2	Simperopol	15.0
40.3	7,464	Radio Nations	20.0	286	1,049	Stettin	0.5	480	625.1	North Regional	50.0
45.38	6,611	Moscow	12.0	287	1,045	Montpellier	0.9	483	621.1	Ivanovo-Vosnesensk	20.2
46.67	6,426	London (Ontario) (VE9BY)	—	288.5	1,040	Radio Lyons	1.0	488.6	614	Prague	120.0
46.69	6,425	Boundbrook (W3XL)	—	288.5	1,040	Bournemouth	1.0	495.8	605	Trondheim	1.0
48.86	6,140	Pittsburgh (WBKK)	40.0	291	1,031	Scottish National	50.0	500.8	599	Florencia	20.0
49.1	6,109	Calcutta (VUC)	0.5	293	1,022	Vilpurl	10.0	501.7	598	Gorky	10.0
49.18	6,110	Chicago (W9XF)	5.0	293.7	1,021.5	Kosice	2.5	509	590	Astrakhan (RV35)	10.0
49.34	6,080	Chicago (W9XAA)	0.5	296.1	1,013	Limoges (PTT)	0.7	509.3	589	Brussels (No. 1)	15.0
49.4	6,073	Skamlebaek	0.5	298.8	1,004	Huizen	20.0	518.1	579	Vienna	100.0
49.4	6,073	Vienna (UOR2)	3.0	301.5	995	Tallin	11.0	525	572	Riga	15.0
49.43	6,069	Vancouver (VE9CF)	—	304.3	986	North National	50.0	539.2	563	Munich	60.0
49.5	6,060	Nairobi (VQ7LO)	0.5	304.3	986	Bordeaux (PTT)	13.0	539.7	558.8	Palermo	3.5
49.59	6,050	Daventry (GSA)	20.0	306.8	978	Vitus (Paris)	1.0	550.5	545	Budapest (I)	18.5
49.83	6,110	Chicago (W9XF)	5.0	307	977	Falun	0.5	559.7	536	Tampere	1.3
50.0	6,000	Moscow	20.0	309.9	968	West Regional	50.0	559.7	536	Augsburg	—
50.26	5,969	Vatican (HVJ)	10.0	312.8	959	Cracow	2.0	565	531	Hanover	0.5
58.31	5,145	Prague	0.5	312.8	959	Genoa (Genova)	10.0	564.2	531.7	Freiburg i/B	2.0
202.7	1,480	Kristinehamn	0.25	315.8	950	Marseilles	1.6	565	531	Vlino	22.0
205.8	1,458	Seralag	0.2	318.8	941	Naples (Napoli)	1.5	569.3	526.9	Grenoble (PTT)	2.0
206.2	1,455	Liege (Exp)	0.2	318.8	941	Sofia (Rodno Radio)	0.5	574.7	522	Ljubljana	7.5
208.8	1,440	Liege (Wallonie)	0.3	319.7	936	Dresden	0.25	719.4	416.6	Moscow (RV2)	20.0
209.8	1,429	Miskolcz	1.25	321.9	932	Goteborg	10.0	743	404	Samara	10.0
209.8	1,429	Magyarovar	1.25	325	923	Breslau	60.0	760	395	Geneva	1.25
209.8	1,429	Pecs	1.25	328.2	914	Poste Parisien	60.0	770	389	Ostersund	0.6
211.3	1,420	Newcastle	1.0	331.5	905	Milan (Siziano)	50.0	779.2	385	Petrozavodsk (RV29)	20.0
214.3	1,400	Aberdeen	1.0	335	896	Poznan	2.0	833	360.1	Heston Airport	5.0
214.9	1,396	Antwerp	0.4	338.2	887	Brussels (No. 2)	15.0	840	357.1	Budapest (2)	3.0
215.6	1,391	Chatelineau (EL)	3.0	342.1	877	Brunn (Brno)	32.0	857.1	350	Leningrad	100.0
217.1	1,382	Konigsberg	0.9	345.2	869	Strasbourg (PTT)	11.5	882	340	Saratov (RV3)	20.0
217.1	1,382	Dublin	1.2	348.8	860	Barcelona (EAJ1)	8.0	937.5	320	Khar'kov (RV4)	20.0
218.5	1,373	Salzburg	0.5	351	854.7	Leningrad (RV70)	10.0	967.7	310	Alma Ata (RV60)	10.0
218.5	1,373	Plymouth	0.2	352.1	852	Graz	7.0	986.9	304	Sverdlovsk	60.0
220	1,363.8	Beziere	0.5	355.9	843	London Regional	50.0	1,000	300	Moscow	100.0
222.3	1,354	Liege (Coince)	0.15	358.4	837	Tiraspol	10.0	1,034.5	290	Kiev (RV9)	100.0
223.2	1,344	Swedish Relyas	—	360.6	832	Muhlacker	60.0	1,071.4	280	Tiflis (RV7)	100.0
224.4	1,337	Cork (6CK)	1.2	363.6	825	Algiers (PTT)	16.0	1,083	277	Oslo	60.0
225.9	1,327.3	Fecamp	10.0	364.1	824	Bergen	1.0	1,107	271	Minsk	35.0
227.4	1,319	Flensburg	0.5	368.1	815	Bolzano	1.0	1,117	268.5	Moscow (RV58)	40.0
230.6	1,301	Malmö	1.2	368.1	815	Helsinki	13.2	1,141.8	262.8	Monte Ceneri	15.0
231.7	1,294.5	Kiel	0.25	368.1	815	Seville (EAJ5)	1.5	1,153.8	260	Kalundborg	7.5
235	1,283	Lodz	2.2	368.8	813.5	Santiago (EAJ4)	0.2	1,171.5	256	Taschkent (RV11)	25.0
235.5	1,274	Kristiansand	0.5	372.2	806	Radio LL (Paris)	0.8	1,190.5	252	Luxembourg	200.0
236.2	1,270	Bordeaux (S.O.)	3.0	374.4	797	Hamburg	1.5	1,200	250	Istanbul	5.0
237.2	1,265	Nimes	1.0	381.7	788	Lwow	16.0	1,200	250	Stavanger	21.0
238.9	1,256	Nurnberg	2.0	384.6	780	Radio Toulouse	8.0	1,229.5	244	Boden	0.6
240.6	1,247	Stavanger	0.5	385	779	Stalino (RV26)	10.0	1,255	239	Vienna (Exp.)	3.0
242.3	1,238	Belfast	1.0	389.6	770	Leipzig	120.0	1,266	237	Bakou	35.0
242.7	1,236	Liege	0.3	394.2	761	Bucharest	12.0	1,304	230	Moscow (I.U.)	100.0
244.1	1,229	Basle	0.5	398.9	752	Midland Regional	25.0	1,411.8	212.5	Warsaw	120.0
244.1	1,229	Berne	0.5	399	752	Vladikavkaz	10.0	1,445.8	207.5	Eiffel Tower	13.5
245.9	1,220	Cassel	0.5	403	743	Sottens	25.0	1,481	202.5	Moscow (RV1)	500.0
245.9	1,220	Linx	0.5	407.7	734	Katowice	12.0	1,538	195	Ankara	7.0
245.9	1,220	Schaerbeek	0.25	413	725	Athlone	80.0	1,554.4	193	Daventry (Nat.)	30.0
247.7	1,211	Trieste	10.0	416.4	720.5	Radio Maroc (Rabat)	6.0	1,600	187.5	Irkutsk	10.0
249.9	1,200.4	Juan-les-Pins	1.0	419.5	715	Berlin	1.5	1,620	185	Norddeich (KVA)	10.0
252.3	1,189	Barcelona (EAJ15)	6.0	424.3	707	Moscow-Stalin	100.0	1,634.9	183.5	Zeesen	60.0
255	1,175	Toulouse (PTT)	0.7	424.3	707	Madrid (EAJ7)	3.0	1,685.3	178	Kharkov	25.0
259.3	1,157	Treves (Trier)	2.0	424.3	707	Madrid (Espana)	2.0	1,725	174	Radio Paris	75.0
261.6	1,147	London National	50.0	430.4	697	Belgrade	2.8	1,796	167	Lahti	40.0
261.6	1,147	West (Nat.)	50.0	435.4	689	Makhatch-Kala	100.0	1,875	160	Kootwijk	50.0
				441.2	680	Rome (Roma)	60.0	1,935	155	Kaunas	7.0
								2,650	113	Eiffel Tower	15.0

taneously with the opening of the new Hanover and Bremen transmitters; Freiburg-im Breisgau, which has been completely rebuilt, will join Frankfurt-am-Main to operate on a wavelength also common to Trier and Cassel, and the same mother station will feed a smaller plant to be erected at Coblenz, on the Rhine.

Muhlacker, however, in view of its reconstruction, will suspend its broadcasts towards the end of September, and its daily duties will again devolve on the old 1½-kilowatt Stuttgart station, which was retained as a stand-by in case of emergency.

A recent stay at a well-known seaside resort somewhat enlightened me as regards the foreign stations regularly tuned in by dwellers on the south coast. A stroll around the immediate neighbourhood seemed to prove that, except for special items such as "star" programmes, news bulletins, weather forecasts, sacred services, and perhaps some variety hours from our home stations, in particular Daventry National and London Regional,

owners of wireless sets appear to listen mostly to Radio Paris, Luxembourg, Fecamp, and Hilversum.

German, Austrian, Belgian, and Swiss stations, no doubt, in view of their exclusive foreign announcements, are not so favoured. From this I gather that the loss of Radio Normandie and of Radio Luxembourg—should it come about—would be felt almost as severely on our southern shores as by their local listeners. On Sundays, in particular, dance music from one or the other could be heard all over the neighbourhood.

Generally speaking, reception in districts bordering on the English channel of broadcasts emanating from a south-easterly direction is exceptionally good, and even with a comparatively small set there is no difficulty in logging broadcasts from Spain, North Africa, or from equally distant points in Central Europe. Possibly greater facility in tuning in these transmissions is due to the fact that these coastal towns are well outside the swamp areas of powerful transmitters.

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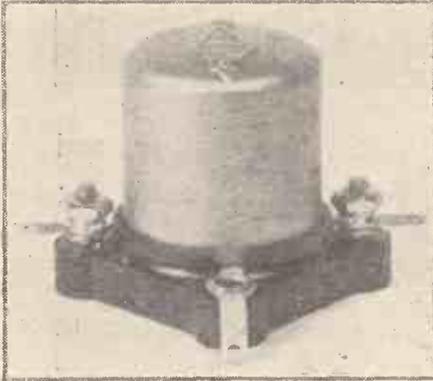
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A Weekly Review of New Components and Tests of Apparatus
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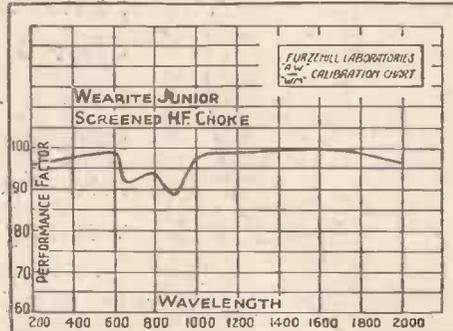
The new Wearite screened high-frequency choke is highly efficient for its small size

WEARITE JUNIOR H.F. CHOKE

WE have tested this week the junior Wearite screened high-frequency choke. This choke is very small, being under 1½ in. in height and standing on a base approximately 1½ in. square. The windings are accommodated in a slotted ebonite former, four slots being employed, which is mounted on a small moulded base with two terminals and soldering tags for the connections. A small screening can is securely fastened to the base, and a spare soldering tag is provided for earthing.

The choke was tested in accordance with our usual practice, and the curve reproduced on this page shows the performance factor

plotted against wavelength. It will be seen that over the working range of wavelengths, that is between 200 and 600, and 1,000 and 2,000 metres, the performance is definitely good, but there is some irregularity between 600 and 1,000 metres. Care should be taken if the choke is used in the latter wavelength band. The inductance of the choke is approximately



A curve showing the performance factor of the Wearite junior H.F. choke

200,000 microhenries, and the D.C. resistance 700 ohms. Retailing at 2s., the price is very reasonable.

BELLING-LEE PICK-UP

A VERY neat gramophone pick-up is that made by Belling & Lee, Ltd. The pick-up head, which is smaller than the

average, is carried on the end of the telescopic arm. The angle of the head on the tonearm is also adjustable, thus enabling correct tracking to be obtained in all circumstances. A template is provided which renders fixing extremely simple.

On test the actual voltage output was found to be a little lower than is usual, but the output was reasonably uniform over the audio range. The normal rapid rise in the lower frequencies met on the average pick-up was not observed on test, it being presumably left to the user to employ any compensation that may be considered necessary.

AIRCLIPSE AERIAL

THE Airclipse auto-inductive aerial has been designed to take the place of the usual form of aerial. It consists of a cardboard former carrying three windings, which are in no way inter-connected. Two of these windings, having inductances of from 450 microhenries, are connected to the aerial and earth terminals of the set respectively.

The third winding, consisting of only three or four turns, is connected to the earth lead that has been previously removed from the set. The complete outfit is mounted in a neat bakelite case. On test the aerial worked satisfactorily on the local stations and on the more powerful foreigners.



A novel aerial device is the Airclipse, which gives satisfactory results

What Can Our Valve Designers Learn from America?

There is still no question that America leads the world in many phases of radio development; just now this is particularly true in the case of multiple valves for special purposes. In this article the AMATEUR WIRELESS Technical Staff reviews the latest valve developments taking place in the United States; these notes will give the enthusiast some idea of what to expect over here.

DURING the past few years America has undoubtedly forged ahead with valves to do special jobs. Many British engineers will probably contend that the majority of the special valve types are "freak" productions not really needed for good reception. As against this contention we would remind them that such valves as the double-diode-triode, the double-diode-pentode, and even the high-frequency pentode have been introduced into this country long after similar valves were available in America. Indeed, we have begun to think that the best way to forecast coming British valves is to look up a list of current American valves!

There is really a very good reason for the so-called "freak" valves in America to-day. Over there they have realised that it is too expensive for the ordinary man to change from one type to another as new circuits are

developed. The result is that American valves are often available now to work in three different ways. An amateur can buy one valve and see which of three systems he prefers. For the amateur this is surely a fine idea?

The valves we propose dealing with in this article give a good idea of the general trend of development in America, and we are bold enough to suggest that most or all of them will be produced over here in the future.

For a start we have the triple-grid power amplifier valve. This is very similar in construction to our normal pentode valve, but the three grids are brought out to three separate terminals. Either by inter-connection of these grids or by changing the various voltages on them you can use the valve firstly as an ordinary three-electrode output valve, giving an output of 1,250 milliwatts, secondly as a power pentode valve to give 3,000 milliwatts, and thirdly as a class-B valve giving 1,500 milliwatts. How useful this valve would be in this country! You could buy just the one valve and at very small expense have the choice of three different outputs.

A Triple-grid Detector

Next we come to the triple-grid detector or amplifier. This valve again has a variety of applications. Firstly, it can be used as an anode-bend detector, secondly as a screen-grid amplifier with a wide grid base, and thirdly as an automatic-volume-control valve. Here again you buy one valve and obtain three distinct functions just by altering the circuit arrangement.

Then there is the power pentode. With only 95 anode volts this will give you an undistorted output of 900 milliwatts, but by altering various voltages and circuit constants it can be made to give 3,000 milliwatts. In other words, you can fill a small room in the house or the whole hall with this valve. Flexibility surely is the watchword of American valve manufacturers to-day!

Wide Power-output Range

Next we have a double-grid power amplifier, not to be confused with the English bi-grid valve. By suitable inter-connections of the grids you can obtain an ordinary three electrode valve output, but a pair of them in push-pull will give 3,000 milliwatts. Alternatively, the valves can be used in a class-B stage. It is interesting to note that the nominal output of this valve is only 170 milliwatts, but by altering the grid connections we can get up to 3,000 milliwatts.

The class-B valve is already well known in this country, but the American mains version, called the class-B twin amplifier, will, with an input of 380 milliwatts, deliver 5,500 milliwatts output. Thus, the ordinary small power output valve of the average set in this country could precede such a valve without over-loading it, giving, of course, an enormous undistorted output.

Some of the American valves seem quite ordinary when considered alone. Take, for example, a valve with an impedance of 3,000 ohms and an amplification factor of 4.2. Quite normal, isn't it? But now connect them in

push-pull and you get the enormous power output of 15,000 milliwatts with a maximum anode current of only 300 volts! In this country to get an output of even 10,000 you would need a power valve costing between seven and eight pounds.

So on to the pentagrid. This is a valve developed mainly for sets of the super-het type. It gives perfect results as a combined first detector and frequency changer. It has five grids, an anode, a cathode, and a heater. The official American title is electron-coupled frequency converter. This is a valve we badly want; it would solve the bulk of our super-het problems, providing an easy way of varying the coupling between the first detector and the oscillator.

Advances in Mains Rectification

Leaving normal receiving valves, the Americans have made a lot of advances in mains rectification. For example, there is a rectifier doubler valve, which does away with the mains transformer. Whatever voltage is put into this valve, double that voltage is obtained at the output. We understand there is an Austrian valve with similar characteristics, having the further advantage of a high-voltage filament, so that with this valve the mains transformer could be entirely done away with as there would be no device needing any voltage different from that of the mains supply.

In view of the special mains-supply requirements of class-B and Q.P.P. amplification, the Americans have produced devices for ensuring a very good output regulation. As you probably know, the voltage surges in these new systems of amplification make it absolutely essential that the regulation should be first-rate.

Mercury-vapour Valves

Often this is impossible with the ordinary mains-rectifying valve, but now comes the mercury-vapour valve, not original, certainly, but in this country, for some reason or other, it is only used for large amplifiers. The latest American mercury-vapour rectifiers will provide for a current variation of as much as 100 milliamperes without appreciable variation in the voltage output.

Just another example of the American custom of supplying valves to meet the needs of the times is the special 6.3 and 12.6-volt heaters for the valves used in American car sets. The normal 6- and 12-volt heaters would be overrun by the battery charging effect of the car in motion, and so the heaters are specially designed to work at maximum efficiency when the car is under way, that is, when the dynamo of the car is actually charging the accumulators supplying the valves with their heat.

Significance of the Hexode

The last important American valve development we can mention here is the hexode. It is significant that valve makers in this country are thinking of taking up this particular valve type. It consists of an anode, four grids, two cathodes, and a heater. Its main job is a tetrode modulator and a three-electrode oscillator for super-het sets. It would be a formidable rival to the pentagrid.

English buyers may take some consolation from the fact that we are not so far behind America in valve developments from the news that Tungram are supplying a class-B output valve giving the enormous output of 20,000 milliwatts! This should prove an admirable valve for use in dance halls and other situations where a really large output is wanted.

This maker has also brought out some interesting mains valves equally suitable for A.C. and D.C. It seems likely that in the near future we may look forward to great progress in mains sets designed for universal application to A.C. and D.C. supplies—a great boon to listeners now on D.C. who may be changed over to A.C. when the grid system of electricity reaches them.



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2	3 6	4 0	9 0	13 0
3	5 0	6 0	—	—
4	5 6	7 0	17 6	25 0
5	7 3	9 0	22 0	31 0
6	8 6	10 6	25 0	37 6
8	11 0	14 0	—	—
10	14 0	17 6	—	—

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0.5	1 11	2 4	2 6
1	2 0	2 9	3 0
2	2 8	3 9	4 0
3	—	—	—
4	5 0	6 9	7 3
5	—	—	—
6	7 0	10 0	—
8	9 0	13 0	—
10	11 6	16 0	—

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.0004/5	0 8	2 0	1 3
.001/4	1 0	2 6	1 6
.005/6	1 6	3 0	2 0
.01	2 0	—	3 0

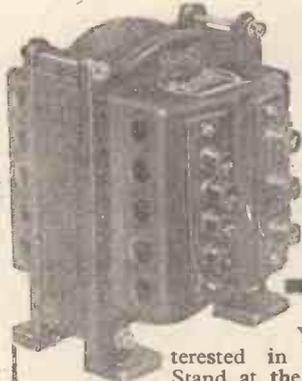
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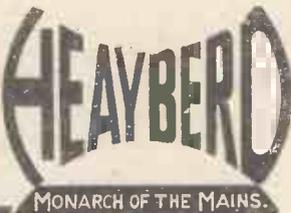
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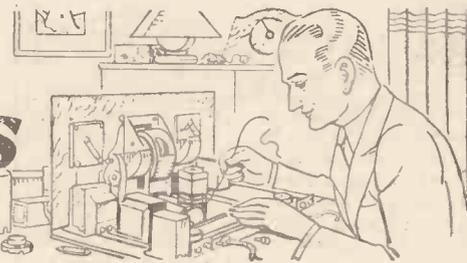
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In My Wireless Den



Practical Radio Hints by W. JAMES

Transformer Limitations :: Screen-grid Amplification
Second-detector Troubles :: High-frequency Stoppers

TRANSFORMER LIMITATIONS

I WONDER whether the limitations of small low-frequency transformers are fully realised. It is a fact that the quality of the reproduction depends upon the way the transformer is used. The frequency-amplification curve may be a fairly straight line, but in practice distortion may well occur.

This is likely to be due to the production of harmonics by the transformer. A transformer has an iron core. Sometimes the quality of the iron is good, sometimes bad. Very often a steady current passes through the primary winding. The magnitude of this affects the result.

It is really not at all easy to get good results with a cheap transformer, because you can never tell exactly how it should be used. The steady current is likely to be from zero, in a resistance-fed arrangement, to 4 or more milliamperes when the transformer is used in the normal way.

The same difficulties are not experienced when a transformer of good design is used. It is generally correct to state that the core must be substantial and of good quality, although a smaller core of special steel will work well. The good transformers cost more than a few shillings but are cheap when good quality is required.

SCREEN-GRID AMPLIFICATION

THE amount of amplification to be obtained from a screen-grid high-frequency stage depends chiefly upon the coils and the values used in the circuit, but the "strays" affect the situation. With shielded coils magnetic couplings are usually negligible, and the sections of a gang-tuning condenser are usually well enough screened to avoid trouble.

There is a little leakage or stray capacity in the valve itself, and this acts to limit the amount of the magnification to be obtained with stability. A more serious stray coupling may be that due to the wiring.

This can be avoided by the constructor,

in fact, it should be possible so to arrange the circuit that the chief stray coupling is that due to the valve itself. This is kept very small by the makers.

To avoid couplings due to wiring, keep the wires as short as possible and screen the grid leads. If fairly heavy-screened sleeving is used and the connecting wire is fine, the capacity added to the circuit will be negligible.

The metal covering must, of course, be earthed.

SECOND-DETECTOR TROUBLES

A VITAL part of a super-heterodyne circuit is the second detector. It is here that so often trouble starts. The valve has normally to handle a fairly strong signal. The mean frequency may be 126 kilocycles, as compared with the 170 kilocycles which is about the lowest in the long-wavelength band of broadcast frequencies.

There are two points here. One is the strength of the signal and the other is the relatively low frequency. The difficulty is to confine the signal to the detector circuit and to handle it properly.

An ordinary three-electrode detector is satisfactory provided the valve is of medium impedance and has a large anode voltage. The filtering of the high-frequency currents in the anode circuit is not so easy. By-pass condensers must be larger than usual. As a rule a special high-frequency choke must be used, the ordinary type not being effective at the lower frequency.

Owing to the strength of the currents the position of the detector stage is important and shielding may be necessary.

HIGH-FREQUENCY STOPPERS

AT one time it used to be thought essential to fit a high-frequency stopper in the grid lead of the first low-frequency valve. It took the form of a grid leak of about 100,000 ohms. This leak acted, with the capacity of the valve, as a filter and was quite effective.

It is not good practice to have a resistance of more than about 250,000 ohms in the grid circuit of a pentode, however, and this is no doubt partly the reason why so many sets now constructed do not have this simple filter.

Another reason is that detector high-frequency filters are more efficient but, still, there are times when the resistance high-frequency stopper in the grid leak is of value. Sometimes a 50,000-ohm resistance is enough, particularly if a tiny condenser of, say, .00005 microfarad is joined between the grid of the valve and its filament or cathode.

This arrangement will effectually stop the last trace of high-frequency from reaching the grid of the valve and may in some cases cure an unstable set.

It is surprising how much trouble can be caused by high-frequency reaching the output stage, and it is better to stop it entering the stage rather than to fit a condenser to the output to pass the currents from the anode to the filament.

35/-



RADIOLYMPIA
Stand 202 (Gallery)

CHAS. A. OSBORN

NEW RADIO-GRAM CABINET

BY

OSBORN

MODEL No. 201. Figured Oak, 3 ft. 2 in. high, 1 ft. 10 in. wide, 1 ft. 4 in. deep. Height between motor board and baseboard 12 1/2 in. Height for pick-up, 4 in. Accommodates a base board 18 in. by 14 in. or smaller. Ample room for any type of speaker and batteries. Morticed and tenoned throughout. Silk fabric, baffle board and baseboard are included. The panel above fret will be cut to your specification. Same Osborn standard of workmanship, but at this amazing price—35/- inc.

Prices

Machined Ready to Assemble **£1 15 0**
Assembled Ready to Polish **£2 10 0**
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ALL MODELS CARRIAGE PAID.

Osborn Super Acoustic Baffle Board. Prevents 90 per cent speaker worry. Any size hole cut FREE. Guaranteed no vibration. 18 in. by 18 in., 3/-; 24 in. by 24 in., 5/-; 30 in. by 30 in., 8/-; 36 in. by 36 in., 11/3. Carriage paid U.K. Send for FREE SAMPLE.

WRITE FOR FREE CATALOGUE

OUR BLUEPRINT SERVICE

Constructors of receivers described in this journal should make full use of our blueprint service and avoid all risk of failure. See page 184

DEPT. (A.W.), REGENT WORKS, ARLINGTON ST., LONDON, N.1. Tel. G-1-2
enroll 6906. Showrooms: 21 Essex Rd., Islington, N.1. Tel.: Clerkenwell 6634

The "Truth" About the Valve

By Bosphor Pronz

DO you really want to know the truth about the valve? You do. Very well, then.

Forget all this well-meaning stuff about wireless made easy, and follow me carefully and thoughtfully along the line of experiment and inquiry which I myself devised, and by which I learnt the plain and unmetallised truth.

Your starting point is a valve in your left hand and a tidy-sized hammer in your right hand. If you are left handed, reverse the positions of the valve and hammer. Are you ready?

One Last Lingering Look

Grasp the valve firmly in the one hand and balance the hammer in the other. Place your feet slightly apart and lean your body a little from the perpendicular in the direction of your valve side. Take one last, fond and lingering look at the valve. Now give it a sharp, quick or rapid blow with the hammer on its glass bulb.

Nothing happened? Repeat the blow, making it sharper, quicker or more rapid. Nothing happened again? Then let your temper rise slightly, mutter something under your breath, and catch the valve a really nasty one, and there you are. BANG! FLASH! Thank you.

Ignoring the trivial side of the experiment, namely the loss of a good valve, what have you learnt, if any? Bang! Flash! What did those two things signify? What was the phenomenon? To learn the significance of the Bang! Flash! you must repeat this striking experiment, not with another valve, dear me! no, one can sacrifice too much in the interests of science. You must repeat the experiment with a glass flask or bottle, empty but corked.

Ready again? A shrewd and well-aimed blow with the hammer, this time just below the cork, and the glass flask or bottle is shattered. Jolly well done. You observed what happened, and what did not happen?

When your valve went westwards ho! bang! flash! When your bottle went westwards ho! no bang, never a flash. Curious, very curious. Perhaps you expected a bigger bang and a bigger flash from the bottle?

Valve—bang!—flash! very illuminating. Bottle—no bang!—no flash!—very illuminating. Wherefore the bang, flash in the one case, and the no bang, no flash in the other?

Let us get this clear. What was in the flask or bottle before you broke it? Nothing. Ah! I expected that answer, correct in the bucolic sense, but incorrect in the scientific sense, my good sir.

There Was Something In The Bottle!

Speaking scientifically, there was something in the bottle or flask—air. Because there was air in the flask or bottle, no bang, no flash.

In the valve—ah! now, that was different. In the valve there was what we scientists call a vacuum, bald space, you know—airless. Makes all the difference. Every valve has its vacuum.

The funny thing about a vacuum is this. Nature abhors it, and air is nature. Where there's a vacuum, there's always air sitting around that vacuum waiting to rush in. Might have to wait years that air might, but it gets its chance in the end. Everything comes to the air that waits.

When you caught your valve that nasty smack with the hammer, you broke the vacuum inside the valve, and that patiently-waiting air round the vacuum was so pleased its chance had come at last that it rushed in with a glad

whoop of victory, that was the bang you heard, and a little display of fireworks, the flash. So you won't mind having smashed a good valve in the least, will you?

You might have read dozens of those wireless-made-easy articles without believing in or appreciating the vacuum inside the valve. Now you are able to believe in and appreciate the vacuum inside the valve for you've destroyed one. All clear? We've hammered that in all right, haven't we? So pleased.

Let us carry on the good work. Remove the remaining portion of the glass bulb from your broken valve. No need to cut yourself. What do you see? A metallic structure of sorts. Note the outer portion of this structure, the collecting plate. A curious shape for a collecting plate I grant you but that plate is intended to collect electrons.

An Electron—The Very First Thing

You know what an electron is, of course. It is the very first thing the new writer on wireless tells you about, especially the writer of the wireless-made-easy type. An electron is a particle of negative electricity, a teeny-weeny particle. There are many pretty little stories about these electrons; but this isn't Children's Hour and we must get on.

The fashion now is to speak of negative electrons travelling from negative to positive. It used to be the fashion to speak of positive electrons travelling from positive to negative. Changing things about like this, positive to negative, negative to positive, pos. to neg., neg. to pos., is called magnetic drift.

Look inside this box-shaped plate with its open ends. What else do you see? A little spiral staircase of wire? Good. Let me tell you a great secret. That little spiral staircase is the grid, the place where the aerial signals are had on toast, if you see what I mean.

Up The Spiral Staircase

The signals which come from the aerial dash up that spiral staircase, and, finding it leads nowhere but has an open top, down those signals dash again.

They dash up and down that spiral staircase and get so hot and bothered about it that the electrons jumping from the filament to the plate have to dodge them so causing changes in the plate current q.v.

There now, I've mentioned the other thing in the valve, the filament. In every good valve there is a filament, or jumping-off ground for the teeny-weeny electrons. In a dud valve the filament is missing. The easiest way to turn a good valve into a dud valve is to connect the high-tension battery to the filament.

This will show you how important the filament is, and why our high-tension batteries are called high-tension batteries. You see an accumulator is called a low-tension battery because the running costs are low when you use it to heat your valve filaments. On the other hand, a high-tension battery means high costs if you—but I expect you know all about that.

On page 110 of AMATEUR WIRELESS dated July 29, 1933, a reference was made to the light-sensitive properties of copper-oxide rectifiers. In this the direction of current flow when operating as a rectifier was given as from copper to copper oxide. This, of course, is incorrect, the flow of current in the conducting direction being from the copper oxide to the copper. Similarly the direction given for the flow of current when exposed to light is incorrect, it being in this case in the high-resistance direction from the copper to the oxide.

WHAT OUR READERS THINK

TOO MANY SOPRANOS?

To the Editor, "Amateur Wireless."

SIR,—Reading Mr. Whitaker-Wilson's notes in this week's "A.W.", I saw an observation on the good intonation and the accuracy of pitch of the Wireless Military Band.

I don't recollect having ever seen Whitaker-Wilson comment on the consistently bad intonation of many of the vocalists from the National and Regional stations.

I confess I am not very interested in singing numbers, containing as they do no harmony, but a singer whose idea of pitch is limited to a quarter of a tone each way is to me a person to be avoided whenever possible.

I often wonder what evidence the B.B.C. has of the popularity of the vocal number. At one time we used to have one song between two or three orchestral pieces, but now we have "groups" of from three to five songs, with one or perhaps two orchestral pieces between.

I feel sure that the B.B.C. cannot be aware of the number of people like myself who shut off for ten or fifteen minutes on hearing the announcement of "a group of songs."

J. W. (Leigh-on-Sea).

POSITION OF THE PICK-UP

SIR,—In your issue of July 29, on page 105 you do not state your reason for "Overlapping on the Records."

Under this heading you write that "by mistake" the pick-up needle is often arranged to come on the centre line passing through the centre of the turntable.

Geometrically, this latter is the correct one if wear on the lines is to be eliminated, because this condition necessitates the point of contact being always at a tangent to the lines of the record. Any position on either side of this point entails a drag on the side of the line.

A. A. (Liverpool).

TELEVISION OUT OF LONDON

SIR,—I have read with great interest your correspondence on receiving television signals at long distances from London. Fading is very bad on London National, and even for sound broadcasting is quite useless after dark. How much more useless, then, must it be for television which is, I understand, much more susceptible to distortion.

If television sets are to be marketed this autumn their sale will surely be very limited while television signals are sent out only from the London National. Why cannot the B.B.C. give us all a chance to experiment?

Only by a widespread diffusion of television signals can we ever hope for real progress. It occurs to me that Daventry National would be a much more satisfactory station for vision broadcasting, because that station has practically a nation-wide range. J. B. (Kettering).

CAR RADIO CHAMPIONED

SIR,—As one who has for more than three years had radio on a car I should like to add my endorsement to those who have been writing to you in praise of this idea. I have never found it in the least distracting. On the contrary, in my work as a traveller, it often keeps me awake at night, at times when there would otherwise be a real danger of dozing at the wheel.

The idea of using a portable of the ordinary type is quite sound, so long as you take care to fit resistances in the plugs to prevent crackles.

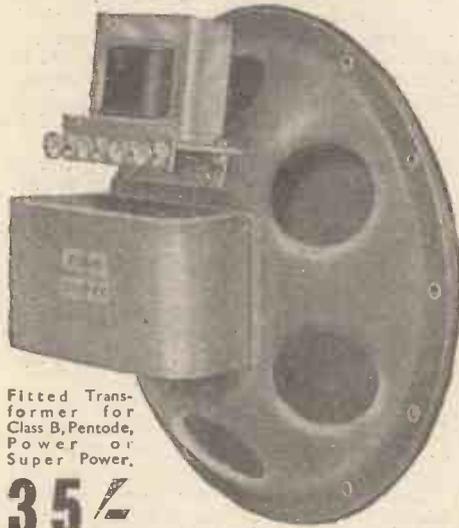
R. J. (King's Lynn).

GOODMANS

OLYMPIA
AUGUST
15TH to 24TH

STAND No.
109

FOUR-SQUARE Model "P" De Luxe P.M.M.C. Speaker. Equipped with high cobalt content Magnet. Employs entirely new system of Cone mounting, eliminating all undesirable resonances. Extreme sensitivity with full Bass response gives performance in the highest class.



Fitted Transformer for Class B, Pentode, Power or Super Power.

35/-

LET'S CLEAR THE AIR!

- THOUSANDS OF LISTENERS complain that Interference prevents enjoyment of Wireless Programmes.
- THOUSANDS OF HOTEL KEEPERS cannot entertain their guests with wireless, without liability for copyright fees.
- THOUSANDS OF D.C. SETS are rendered valueless when mains are changed. This may happen to you at any time without compensation.
- NEARLY SIX MILLION LICENCE HOLDERS are without organised representation and protection.

RADIO MUTUAL is seeking legislation to combat interference and the abolition of all unfair restrictions and anomalies. It represents and protects Wireless Licence Holders.

Negotiations are being carried on with regard to these matters by RADIO MUTUAL and progress will be advertised in this paper.

EVERY LICENCE HOLDER SHOULD SUPPORT THIS WORK & SHARE IN ITS COST

RADIO MUTUAL means personal service to you. If Wireless disappoints you, tell us about it. Become a subscriber to-day by sending a Postal Order for two shillings to

The Secretary,
RADIO MUTUAL LTD.
15, King Street, St. James's,
London, S.W.1

You are invited to quote your Receiving Licence Number

News for Set Buyers

FOR the first time E. K. Cole concentrates on one type of receiver. It will be known as the type 74, and will be available in three models for A.C. and D.C. mains and for battery operation, with the choice of two cabinets for each model.

These are made of bakelite, as last year, but they are now black instead of brown and the metal parts are chromium plated. On the D.C. and A.C. receivers *delayed automatic volume control* is fitted.

The battery model is a little different from the mains models, having two screen-grid stages, detector, driver, and class-B output valve but no A.V.C.

Automatic volume control and automatic tone compensation are two important features in the Kolster Brandes six-valve super-het model 666. The cabinet is of the latest design, and the receiver has been built with the idea of embodying a Rejctostat, as mentioned last week on page 126. Prices are not yet fixed.

C.A.C. are bringing out this year some excellent receivers designed by W. I. G. Page. One of the most interesting of these receivers is a two-valver using a high-frequency pentode as a power-grid detector, followed by a low-frequency pentode. The C.A.C. stand is worth seeing for the cabinet display alone, these being of unique and advanced design.

Five guineas will buy the new Telsen Air Marshal, a three-valve battery receiver in either an oak or walnut cabinet and a moving-coil speaker. The A.C.-mains receiver, model 464, is also remarkably cheap at 9 guineas, as it embodies such outstanding features as iron-core coils and a continuously variable tone control.

We are very glad to see that at least four of the new H.M.V. receivers will embody automatic volume control. One of the most interesting of these sets is the super-het Concert Seven, model 467, listed at 21 guineas.

Some of the main features of this set include a static-suppressor switch, duplex tone control, diode rectification, automatic volume control, and a moving-coil loud-speaker handling 2,500 milliwatts.

Not very long ago you could not have bought a good three-valver for £11 17s. 6d., but this year that is the price of the new Marconiphone 260 receiver. It is a four-valve set, battery operated, with band-pass tuning, moving-coil loud-speaker, and the special PCP output which gives such remarkable volume with only low current consumption.

The name of McMichael has always been associated with very high quality products. This year the prices are not only reduced, but the specifications of the various sets have been very much augmented.

The Twin Super-Vox is a four-valve all-electric set with two moving-coil loud-speakers. The receiver circuit is quite conventional, having two high-frequency stages and a pentode output stage. An interesting feature is that no reaction control is used.

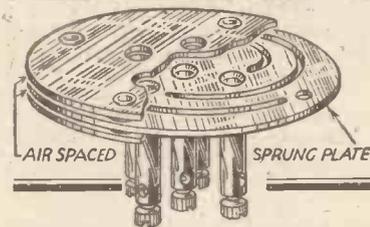
When the receiver is switched from gramophone to radio, a top-note cut-off to stop heterodyne whistles is automatically switched into circuit; this allows for more perfect reproduction from the pick-up.

We understand that Murphy Radio are not showing at the exhibition this year, which is rather a pity, as their receivers are always of very advanced design. The B5 is a battery super-het, designed to give as near as possible A.C. receiver results. A five-valve circuit is used with class-B output. The price complete with accessories is £14 10s.

CLIX

"AIRSPRUNG"

ANTI-MICROPHONIC
Non-Metal, Chassis-Mounting
VALVEHOLDER



Powerful Loudspeakers working close to valves throw off sound waves which create distortion. This NEW CLIX Valveholder is designed to absorb all such vibrations, thus preventing distortion and prolonging the effective life of the valve. Ideal for Short-Wave work. Sockets are practically air-insulated.
4-Pin, 1/2d. : 5-Pin, 1/3d.

CLIX Valveholders, Terminals and Strips Specified for the
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SEE THE FULL CLIX RANGE ON

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"Fun with a Photocell"

We have some £5 Photo Cells for Talks, Light Tests, Timing Controls, etc., at bargain prices. Response to light 50 microamps per lumen. 40 watt lamp, 75 c.m. King B.T.P., 15/-; R.C.A. 25/-; Holders, 1/-; Back Prisms, 5/6; Focus Lens, 3/6. **SELENIUM CELLS.** Light sensitive resistance, gold grids, moisture-proof. L to D ratio 5 to 1, 5/- each. Mounted in Bakelite, 7/6. Super Model in Oxy-brass body with window, 10/-.

MICROPHONES 1/-
Microphone Buttons for all purposes, 1/-; Booklet free. Announcers No. 11 Mikes, 5/6; Pedestal type, 18/6. Microphone Carbon Granules. In glass capsule, enough for four buttons, Grade No. 1, 8d.; No. 2, Medium, 1/-; No. 3, Fine, 1/6; Carbon, solid back, blocks, 3d.; Mouthpieces, curved or straight, 10d. Carbon diaphragm, 55 mm., 4d. Panel brackets, pivoted, 5/-. Reed Receiver Unit for Amplifier making, 3/-. Headphones, 2/9 pair.

True-View Camerascopes, Brown's Double Lens, 2/-. Set Builders, All-metal Chassis Brownie, fitted 2-valve holders, all drilled for Brownie components, 3/6. Loud-speaker Fret Silk, 12 in. by 10 in., 1/-; 24 in. by 24 in., 3/-. 35 gau. enam. Cop. Wire, 2/6 lb. Switches, all types, Radio to 1,000 amps, cheap.

TELESCOPES.—Naval Gun-sighting Telescopes, internal focus ring, 24 in. long, 2 in. dia., weight 6 lb., magnification 6, for short and long range. Cost £25. Sale, 17/6. Spotting Telescopes, 17 in. by 1 1/2 in., by Watson, 25/-.

The GENEROMETER BATTERY SUPERSEDER makes H.T. from your L.T. battery, rectified and smoothed. Gives 3 tappings and lasts indefinitely. A boon to those who are not on the mains. Reduced from £3/15/-. New and Guaranteed, 37/6.

Double Current DYNAMOS, cost Govt. £15. Two comms. D.C., 6-8 velt., 3-5 amps. and H.T. 400-600 volt., 100 mm., 5 1/2 in. dia., 12 in. long, 17 lb., 4,000 revs., ball bearings. Guaranteed 12 months. Sacrificed at 22/6. Car. size 2/6.

PERMANENT MAGNETS.—Tungsten steel. Powerful horseshoe, 5 in., No. 1 is 1 lb., 2/6; 4 in., No. 2, 1 lb., 2/-; No. 3, 1 lb., 1/8; No. 4, 1 lb., 1/-.

NEW COBALT-STEEL SPEAKER MAGNETS. We are able to offer some 1933 Four-claw M.C. Speaker Permanent Magnets at manufacturers' price. A great opportunity.

ELECTRADIX RADIOS 218 UPPER THAMES STREET, LONDON, E.C.4

Sets of the Season

PYE P/B PORTABLE SUPER-HET



Housed in a well-designed walnut cabinet, this new Pye portable is entirely self-contained

BRIEF SPECIFICATION

Makers : Pye Radio, Ltd.

Price : 14 guineas.

Valve Combination : Super-het circuit; first high-frequency amplifier (S215VM), frequency-changer (S215VM), intermediate-frequency amplifier (S215VM), cold-metal second detector (Westinghouse), class-B output (PD220).

Power Supply : Self-contained batteries.

Anode Current : Varies with volume, but 10 milliamperes average.

Type : Self-contained portable, with moving-coil loud-speaker.

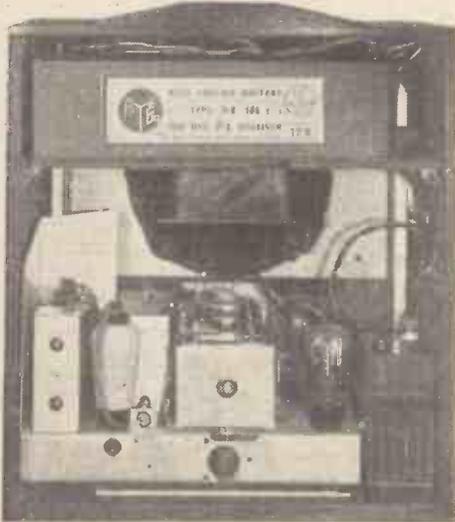
Remarks : A.V.C. and class-B systems incorporated in this portable give wonderful consistency to foreigners and excellent volume and quality.

LAST week we prepared you for this report on the new Pye portable, but we must confess that we were not ourselves prepared for such a really outstanding performance as we obtained during recent tests.

As you probably know by now, this portable is the first to make use of *delayed automatic volume control*. What is more to the point, this system really works in this set, works so well that you simply cannot tell when most of the stations are "fading," because they don't! All you hear is a rise and fall in the background noise.

Most of the powerful foreigners to-day have an initial signal strength that is high even at the minimum point—when the fade is at the maximum—so that the field strength is well above static level at all times.

Which means that automatic volume control—the automatic increase in the high-frequency amplification when the signal fades



It is easy to get at the valves and batteries of the Pye P/B portable

a little, is very well worth while. The new Pye portable emphasises this contention.

It is an advanced design in every way. Although externally quite conventional, in its walnut cabinet with handle on the top and turntable below, the internal circuit is notable for several new developments.

First, perhaps, is the A.V.C. on the high-frequency side. Secondly, the use of a powerful super-het circuit in which all trace of second-channel and other super-het bugbears have been eliminated.

Thirdly, the use of metal detectors for the second detector of this super-het and for the delay action on the A.V.C. Fourthly, in a circuit bristling with detail improvements, we must not forget to mention the use of class-B output, which largely accounts for the really fine quality given by the self-contained permanent-magnet moving-coil loud-speaker.

Anode-current Economy

Our first test was to measure the anode current. This varies in class B according to the volume output—that, indeed, is the great attraction of the system. We found that for very good volume, though not the maximum possible, the average anode current was 10 milliamperes, which is remarkably low in view of the fact that we are dealing not merely with the class-B output but with the other five valves of the super-het circuit.

Control, as we soon found when working the set under normal reception conditions, some twenty miles south of Brookmans Park; is rendered delightfully easy by the simple arrangement of the knobs on the front, below the fret of the loud-speaker.

The centre knob works a well-marked tuning scale, which is divided into two sections, for medium and long waves. Waveband changing is done with the second knob, and the third is a manual control of the volume.

This volume control is quite distinct from the A.V.C., its function being as in any other set—namely, to alter the overall amount of signal amplification to cope with the very wide differences of signal strength encountered in an ether tour of Europe.

The audibility range of the volume control is wide, even the powerful locals being cut down to silence before the minimum point is reached. A smooth mechanical control, this, and one that makes a great deal of difference to the general feeling of pliability in working the set.

The automatic volume control is the most remarkable thing about this portable, and the more you work it the better it is. The slight *apparent* loss of selectivity caused by A.V.C. is proved to be only apparent when you try to separate stations. There is not the slightest difficulty in getting clean-cut reception of most foreigners.

acknowledged THE WORLD'S BEST



The most popular and efficient type of fixed resistance for all general purposes. "Better than wire-wound." All values 50 ohms to 5 megohms. 100° F. Temperature rise.

Ohms	Milliamps	Ohms	Milliamps
1,000	40	20,000	8
2,000	35	30,000	6.75
3,000	29	40,000	6
Other values pro rata.		100,000	3.5

Heavy Duty type, approximately double the above ratings.

OHMITE RESISTANCES

1/6

HEAVY DUTY TYPE 2/3

Send for copy of New Catalogue ready shortly.

GRAHAM FARISH PRODUCTS

Advertisement of Graham Farish, Ltd.,
Masons Hill, Bromley, Kent.

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

REPAIRS to Loud-speakers, transformers and headphones, 4/- each; Blue Spots or Wufs's, 5/-; mains eliminators, etc., quoted for; prompt service; satisfaction guaranteed; terms to trade.—Loud-Speaker Repair Co., 5 Balham Grove, London. Battersea 1321.

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.

GRAMOPHONES, Radiograms, Motors, Arms, Pick-ups, Loud-speaker; Horns, Springs, Needles, Repairs, cheapest.—Catalogue, Regentm, 120 Old Street, London, E.C.1.

REAL SERVICE.—All makes Components, etc. Guaranteed, keenest prices. Write price list or quotation.—Childs' Radio Factors, 29 Moray Road, London, N.4.

LET'S CLEAR THE AIR! See Page 182.

A LIBERAL ALLOWANCE will be made for your second-hand apparatus in part exchange for new goods. Write now to The Radio Exchange Co., 68 Colville Road, London, E.11.

"UNIVERSAL" RADIO BARGAINS.—Burgoyne Transportable Three, complete all batteries, Mullard Valves, 57/6. Dario Super Transformers, 3/6. Lissenoda Speaker Units, 1/11. Millgate Pick-ups, 4/6. Soundex Moving Coil, 13/3. "Universal" Permanent-Magnet Moving-Coil Speakers, massive Magnet, 12/11. Ready Radio Meteor Kits, including Walnut Cabinet and Soundex Moving Coil, in sealed carton, 62/6. Valves from 1/11. Harlie, 27/6 Pick-up, 13/6. Thousands of other bargains. Stamp for list and print of our Super Three. Peekham Agents for Milnes H.T. Units.—"Universal," 20 Victoria Road, Peekham, S.E.15.

USED AND NEW RADIO COMPONENTS AND SETS ON EASY TERMS.—Dual-wave Coil, 5/6. L.F. Transformers, 4/0.—Arlin, 44 Ranelagh Road, Westminster, S.W.1.

BANKRUPT BARGAINS.—List free with 3-v. diagram. 3-v. kit, 17/-. M.C. speakers from 13/6. Speaker units, batteries, valves, sets, transformers all at keenest prices. Part exchange.—Trioiron valves supplied to the trade in dozen lots at rock bottom.—Butlin, 143b Preston Road, Brighton. Preston 4030.

**SPECIAL ISSUE
NEXT WEEK!**

Look out next week for the Special Exhibition Number of **AMATEUR WIRELESS**—greatly enlarged and with a fine coloured cover.

This number will tell you all about the best things in the new-season's radio and is one that you certainly should not miss.

The price will be 3d., as usual, and this represents the finest value you can get in radio journalism to-day.

AMATEUR WIRELESS

Next Wednesday

**POSTCARD
RADIO LITERATURE**

GET THESE CATALOGUES FREE

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

By **OBSERVER**

About Condensers

FROM the Wego Condenser Co., Ltd., I have received an interesting booklet giving details of their fixed condensers. A complete range of tubular condensers rated for 400-volt working and ranging in capacities from .00005 microfarad to .05 microfarad are listed. There is another range of tubular condensers ranging from .1 to .5 microfarad rated at 250-volt working. This interesting publication also gives details of other condensers ranging from the ordinary 1-microfarad type to the 12,000-volt D.C.-test transmitting condensers. Interested constructors can obtain a copy of the booklet free through this special service. **12**

News from Wearite

As the most recent battery sets described in "A.W." have shown, the tendency now is for the best designs to have iron-cored tuning coils and class-B output stages. Two interesting leaflets that tell you all about these new developments have been issued by Wright and Weaire, Ltd. Their leaflet on the new Nucleon iron-core coils gives practical information on the design of iron-cored coils and several circuits showing how the coils can be used. The other leaflet concerns the new Wearite class-B transformer and choke. If you are the possessor of a straight battery set, I recommend you to get these two leaflets. **13**

For Gramo-radio Fans

Are you interested in gramo-radio apparatus? If so, you should have a copy of the Harlie catalogue in which is listed every conceivable bit of apparatus for converting an ordinary table set into a complete radiogram. There are ordinary pick-ups with built-in volume controls, pick-ups for fitting on the tonearm of your acoustical gramophone listed in this catalogue, together with an array of switches, automatic stops and scratch filters. In addition, there are details of complete units that will convert battery or mains sets to complete radio gramophones. I strongly advise you to get in touch with Harlie's through this free service. **14**

All About Patents

King's Patent Agency have sent me a comprehensive booklet dealing with patents and trade marks. There are chapters giving all the necessary information about the procedure of patenting in this country and abroad. Readers with creative minds should get a copy of this really useful publication. It is free, of course! **15**

Pye's New Portable

Have you seen the specification of the new Pye six-valve super-het portable, which has a class-B output stage and a permanent-magnet moving-coil loud-speaker? But they are not all the virtues of this new set. It incorporates a form of automatic volume control which means that you can tune in many stations without altering the setting of the volume control. I strongly suggest that you should investigate the specification of this new-season's set, the price of which is only £14 14s. **16**

FULL-SIZE BLUEPRINTS

When ordering, please send Postal Order, NOT STAMPS. Quote the blueprint number shown below; not the number of this issue.

CRYSTAL SET (6d.)

1931 Crystal Set AW308

ONE-VALVE SETS (1s. each)

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Portable Short-wave One AW354

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Clarion-voice 2 (SG Det, Pen) AW371
Home Station A.C. 2 (D, Pen) AW374
B.B.C. National Two (D, Trans) AW377
Melody Ranger Two (D, Trans) AW388
Full-volume 2 (SG Det, Pen) AW392
"A.W." Iron-core Two (D, Trans) AW395
"A.W." Iron-core Two with Q.P.P. AW396
Screen-grid Two (SG Det, Trans) WM289
A Two for 7 Metres (D, Trans) WM295
New-style Radiogram (D, Trans) WM299
A.C. Quality Gem (D, Trans) WM312

THREE-VALVE SETS (1s. each)

£2 2s. Family Three (D, 2 Trans) AW368
Build As You Learn Three AW366
Build As You Learn SG 3 (SG, D, Trans) AW372
James Push-Push Three (SG, D, Q.P.P.) (1/6) AW378
Everybody's Home Radiogram (SG, D, Trans) AW381
Home-Lover's New All-electric 3 for A.C. mains (SG, D, Trans) AW383
Our Up-to-the-Minute Three (SG, Westector, LF, Trans) AW384
Class-B Three (D, Trans, class B) AW386
S.S.3 (A.C.) (SG, SG Det, Pen) AW390
"Up-to-the-Minute Three" with Class-B, 1/6 AW384B
New Britain's Favourite Three (D, LF, Class B) AW394
Multi-mag Three (D, 2 Trans) WM288
Percy Harris A.C. Radiogram (D, RC, Trans) WM294
Prosperity Three for Batteries (SG, D, Pen) WM296
1933 Economy S.G. Three (SG, D, Trans) WM306
Harris Ehetgram (SG, D, Pen) WM308
A.C. Calibrator (SG, D, Pen) WM309
Narrow-pass Three (SG, SG Det, Pen) WM314
£6 6s. Radiogram (D, RC, Trans) WM318
Simple-tune Three (SG, SG Det, Pen) WM327
Tyers Iron-core Three (SG, SG Det, Pen) WM330

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"A.C. Melody Ranger" (SG, D, RC, Trans) AW380
Gold Coaster (A.C. Short-waver) WM292
Triple-tune Four (2 SG, D, Trans) WM293
Calibrator (SG, D, RC, Trans) WM300
Table Quad (SG, D, RC, Trans) WM303
"Words and Music" Radiogram (2SG, D, Trans) WM307
Home Short-waver (SG, D, RC, Trans) WM311
"Words and Music" Radiogram de Luxe (SG, D, RC, Q.P.P.) WM307a
Empire Short-waver (SG, D, RC, Trans) WM313
Calibrator de Luxe (SG, D, RC, Trans) WM316
D.C. Calibrator (SG, D, Push-pull Pen) WM328
All-metal A.C. Four (2 SG, D, Pen) WM329

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

James Short-wave Super (Super-het) AW328
Simple Super (Super-het) AW340
Super-quality Five (2 HF, D, RC, Trans) WM320
Ideal Home Super (Super-het) WM280
Easytune 60 (Super-het) WM284

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

New Century Super (Super-het) with copy of "A.W." 4d., post free AW363
New A.C. Century Super (A.C. Super-het) AW365
1932 Super 60 (Super-het) WM269
1932 A.C. Super 60 (A.C. Super-het) WM272
James Class-B Super (Super-het) WM326

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

Super Senior (Super-het) WM256
Seventy-Seven Super (A.C. Super-het) WM305
Q.P.P. Super 60 (Super-het) WM319

PORTABLES (1s. 6d. each)

General-purpose Portable (SG, D, RC, Trans) AW351
Midget Class-B Portable (SG, D, LF, Class B) AW389
Holiday Portable (SG, D, LF, Class B) AW393
Town and Country Four (SG, D, RC, Trans) WM282
Everybody's Portable (five-valve super-het) WM291
Welcome Portable (6-valve Super-het) WM322
Welcome Portable with Class-B output WM325

AMPLIFIERS (1s. each)

A.W.'s Push-push Amplifier AW376
Universal Push-pull Amplifier AW300
"A.W." Record Player (LF, Push-pull) AW319
Battery-operated Amplifier AW362
Class-B Gramophone Amplifier AW391
Five Q.P.P. Output Circuits WM315

MISCELLANEOUS (1s. each)

"A.W." Trickle Charger AW352
Add-on Band-pass Unit AW359
Short-wave Adaptor for New Century Super AW367
Plug-in Short-wave Adaptor AW382
Voltage Regulator WM287

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

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