

TEN THOUSAND LETTERS!—By Val Gielgud

WHITHER TELEVISION ?

Popular Wireless

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April 7th,
1934.

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PENTODES

TUNING YOUR
SHORT-WAVE
RECEIVER

Etc., etc.

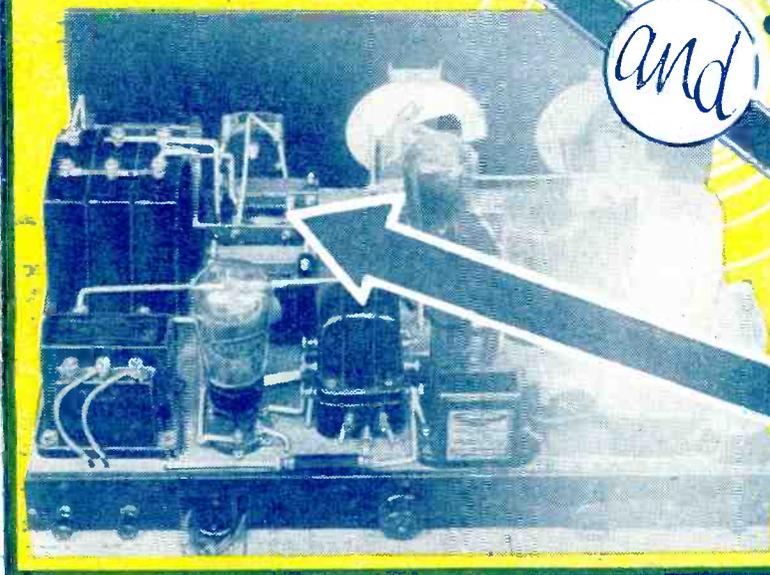
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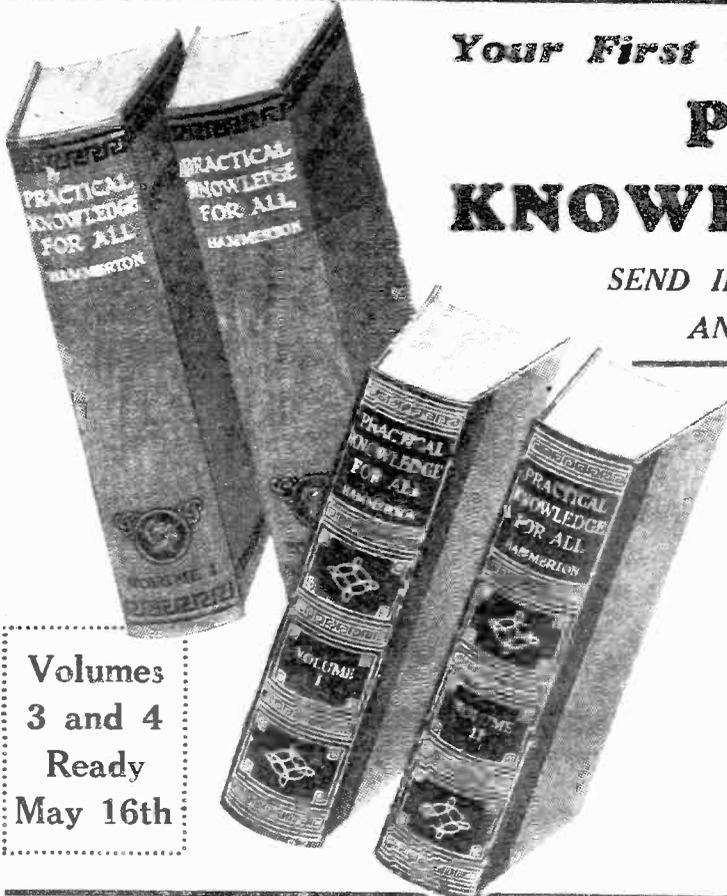
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THE FIRST AND FOREMOST RADIO WEEKLY FOR THE CONSTRUCTOR & AMATEUR EXPERIMENTER

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Technical Editor: G. V. DOWDING, Associate I.E.E.

Assistant Editor: P. ROBERT BIRD.

Managing Editor:
N. F. EDWARDS.

Chief Radio Consultant: P. P. ECKERSLEY.

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Chief of Research: K. D. ROGERS.

**THE TRADE OUTLOOK.
BELGRADE'S HUSTLE.
HAUNTED HOUSES
SHORT MEASURE**

RADIO NOTES & NEWS

**PIPES AND PIPING
HUMMING WIRES
A MONSTROUS STORY
MYSTERY RAYS**

HERE'S a bit of really bright news for a start this week. "The Wireless and Gramophone Trader," which has been taking a census of the radio industry, announces that a million British sets, value some 14 million pounds, were sold last year.

1,000,000 a Year.

IN their anxiety to find ammunition for the lapidation of the B.B.C. some of the critics have recently been brought to dire straits, for they have been reduced to reproducing alleged complaints by the staff about the alleged hard discipline, petty tyrannies and quarter-deck methods of Broadcasting House—in a word, they have produced the Grand Red Herring.

Criticism Can Run Riot.

Personally I doubt whether the internal organisation of the B.B.C. is any more the concern of the public than is that of the Port of London Authority or the South Metropolitan Gas Company, and I deprecate any attempt to link it up with the question of the programmes.

"Kingsthorpe," Willowbank, Uxbridge, Surrey.

Watch for the Marks.

AS a result of a Board of Trade inquiry an Order has been made prohibiting the sale, or exposure for sale, unless bearing an indication of origin, of (a) thermionic valves dissipating a dead loss at the anode not exceeding 50 watts; and (b) rectifying valves not exceeding a capacity of 60 V.A. or passing a current of more than 1 ampere.

The indication of origin must be marked in a contrasting colour on the bulb or cap of each valve, and also printed or stamped on the carton or other container.

A Personal Note.

DR. A. F. PHILIPS, joint founder of Philips Lamps, Ltd., in 1894, was 60 years old on March 14th.

When his firm began it had 42 employees; to-day, all over the world, it has 40,000, and Dr. Philips has controlled the whole business himself since 1922. Nevertheless, he is, like most busy men, able to find time for lots of things outside his main job, such

ON OTHER PAGES:

Practically all the new revenue accruing to the B.B.C. will be spent on programmes

Page 84

This is the first time in broadcasting history that the proposal I am about to make has been seriously put forward

Page 87

A prominent American manufacturer is in a position to supply seven-metre television sets complete for the price of a mains receiver

Page 80

Congratulations to the industry on a record of which they can be proud.

With a million sets in a year, and getting on for 6½ million licences, we may hear a little less about "saturation."

More Jobs for Radio Workers.

IS it not pleasing to know that one of the oldest radio firms in this country, Burndept Ltd., is establishing a new factory which will provide work for about 1,000 people?

The factory, which is at Erith, Kent, and which was formerly a gunworks, has a floor space of 104,000 square feet, and the office and garage belonging to the place have floor space of 21,000 feet. They are going to make dry batteries there, amongst other things.

A Moving Story.

THE British makers of the Belgrade broadcasting station inform me that it was decided to move the station from the centre of the city to Makis, a place 10 kilometres out in the country. On Friday, February 23rd, the programmes ended at midnight, and the engineers then began the work of dismantling. By 9 p.m. on the following Wednesday the station was re-erected and working! Who says that Europeans cannot hustle?

Ghosts Unlimited.

AS a result of his radio talk on "Ghosts and Haunted Houses," Sir E. Bennett, M.P., has received many hundreds of "genuine ghost stories." A very sad illustration of the gullibility and superstition of the public (says Ariel).

The only genuine ghost is the B.B.C.'s "ghost in goloshes"—and even that one has been laid.

However, perhaps Sir E. Bennett will give us a reading from his letters, or, better still, get Bransby Williams to do so next Christmas.

Television Demonstrations.

THE Uxbridge District Branch of the Anglo-American Radio and Television Society informs me that it proposes to give television demonstrations on most Wednesdays, and that everybody is welcome, without charge.

They have been having very successful evenings recently, as I reported some weeks back; but the prize instance of enthusiasm goes to the "fan" who push-biked from Ealing just to see the set. He had no time to see the demonstration!

For details, write to Mr. L. W. Orton,

ON THE AIR THIS WEEK:

Geraldo and his Orchestra (Wednesday, April 4th.—National.)

English to the core, despite a foreign-sounding name and an aptitude for continental music. Rehearses four hours every morning and conducts his band at engagements for the rest of the day. Decided in 1930 to form a permanent tango band in this country. "We like it," said the Savoy Hotel; "come and play for us." Spare-time hobbies? He has no spare-time. Fifty stage appearances a week, broadcasting and hotel work haven't left much time for tidlywinks.

as golf, horsemanship, motoring, art collecting and winter sports.

He has thirteen foreign decorations—such an unlucky number that I hope that someone will at once give him another.

Royalty-Free Records.

AS the natural result of the breakdown in the negotiations between the Cinema Exhibitors' Association and the gramophone record-making companies, the

(Continued on next page.)

LOCATING SEA-SERPENTS BY RADIO

C.E.A. has made arrangements with an old-established music house for the production of non-combine, royalty-free records.

The performance of such records in public will, however, require the licence of the Performing Right Society, if they are works covered by that society.

These records will cost 3s. each, but the requirements of the cinemas are to be satisfied first.

Ariel Gives Short Measure.

TWO beer experts, one from the B.B.C. and another, R. C., of Rugby, tell me that my reference to the old-time members of the Huddersfield Choral Society as being allowed three gills, or three-quarters of a pint, of beer is incorrect, because the North Country gill is equivalent to a Southern half-pint.

Oh, generous Northerners! I congratulate you.

R. C. jumps rather heavily upon me, attributing my ignorance to my Cockneyship. But I am Kentish to the ultimate electron, and no Northerner can bite his thumb at Men of Kent. However, this is a side issue. To our muttons!



A Minor Tragedy.

A MAN I know, not very well to do, had long dreamed of possessing a radio-gramophone. Then, one fine day, his wife had a windfall—a "sweep" prize or matured insurance policy or such-like—and, like a nice girl, decided to share the loot and give her man his radiogram.

So eventually he came home to find the thing all set and ready, with wife in the background sizzling with excitement. Well, he is a sport and a good actor, and so all went well. But, do you know, he told me that everything about that instrument is exactly opposite to what he longed for—colour, design, control and so forth.

And there he is, *stuck with it*, for, according to the man-and-wife game, there never was such a marvellous and charming set!

Pipes, Pipers and Piping.

PIPE-MAJOR WILLIAM ROSS, who was in the programmes recently, learned to play the bagpipes from his father and mother. He piped at, as well as fighting in the orthodox way, the Boers in the South African War, and we won.



He repeated this double-barrelled volleying in the Great War, and we won again. He is now instructor in the school of army

pipers, Edinburgh Castle.

For four successive years he held the title of all-round Piper of Scotland, and was seven times winner of the Championship Gold Clasp at Inverness and eight times

winner of the Lochaber Gold Medal. Man! what a pair of bellows!

By the way, the pipes come into our military history quite a lot—Indian Mutiny, Dargai, Loos, etc.

Telegraph Wires Again.

SOME time ago we had an interesting discussion in these Notes on the subject of the causes of humming by telegraph wires, but we did not clear up the problem conclusively.

Now W. C. L. (Egypt) calls my attention to the following passage from a book entitled "Airsense," by W. O. Manning: "This noise is due entirely to a large number of vortices which are formed by the wire, and which wander off down-wind in exactly the same way as those produced by a stake in a brook wander off down-stream."

But Is There a Wind?

THE author is writing of wires *in a wind*, however. Our problem was to account for the steady, strong hum on a calm day.

He continues: "But they are much more frequent, and, in fact, if one knew the precise musical note given off by the wire and the number of beats per second that this note represented, this number of beats would be equal to the number of vortices given off per second."

The whole thing now resolves itself into the question whether even on the stillest days there is enough wind at the wire's height to account for the hum.

Twenty-four Hours a Day.

I DO not entertain much hope that the 24-hour system will be officially imposed upon this country before the metric system is introduced. Look how long it took us to swallow "daylight saving"!

But I should like to point out that many thousands of us, soldiers who served on the Continent and wireless people both professional and amateur, are fully conversant with the 24-hour method of stating the time—if that is any help to the unfortunate authorities who have to decide the question.

Distinction for a Scout.

ALTHOUGH Paul Siple is not the first boy scout to accompany an antarctic expedition—for that honour fell, I believe, to our own Scout Marr, who was with Shackleton years ago—he is probably the first to broadcast from the antarctic.

In a speech from the expedition's base recently he said that at least twenty-five of his colleagues had been scouts. He was rebroadcast over the vast Columbia network in the U.S.A.—a great occasion for scouts and radio fans.

Did you hear him, and, if so, what were your impressions, please?

The Radio Squad.

FIRST, the Flying Squad; then the dress-suit brigade and now the Radio Squad! For Lord Trenchard, who cannot be accused of not doing things, is setting about the job of building the livest (apologies to the Oxford Dic.) corps of police radio men in creation.

Recruited from the existing ranks, these future terrors to the underworld are to be trained under a late lieutenant-

commander, R.N. After this ordeal they are to be drafted into the Flying Squad, and then—heigh-ho for ker-rime and kilocycles.

Police Wireless.

THE Chief Constable of Brighton declares that the use of pocket radio sets by his boys in blue has had satisfactory results, and that the experience gained indicates a wider sphere of utility for police wireless.



Gloomy news, indeed, for the chevaliers of fortune, who will not now feel safe even in Lewes or on Firle Beacon.

What a pity, however, that we have no details of the coppers' log-books, for I understand that they have done some pretty DX reception. All except one unfortunate man whose position on point duty is such that he is "screened" by the pier.

New A.-A.R. and T. Branch.

THE Anglo-American Radio and Television Society are attempting to form a branch at Heckington, South Lincs. It is proposed to hold meetings regularly and to organise from time to time tours of wireless stations. Full particulars can be obtained from Mr. J. W. P. Richards, The Vicarage, Heckington, Lincs., though inquirers are requested to enclose a stamped and addressed envelope.

A Monstrous Story.

UNLESS my ears deceived me, the B.B.C. announcer who read the item about the "monster" which was seen from the Mauretania during a West Indian cruise said: "The officers focused their binoculars on it and the wireless operator brought his direction finder into action"—or words meaning that.

Well, we can now locate herrings by radio, but the identification of sea-serpents by D.F. is quite a new one on me. Wireless operators are a sober race, especially when on duty, and one supposes that the skipper knew where the ship was at the time, so that the only explanation is that the operator wanted to ascertain their bearing from Loch Ness! Will the B.B.C. kindly confirm this?



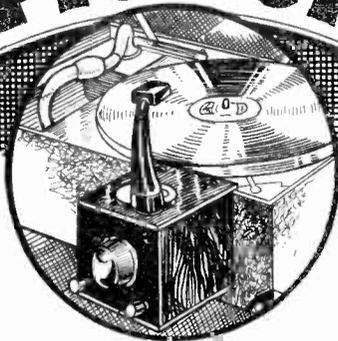
And Yet More Rays.

I HAVE made contact with a story about some newly discovered rays which are capable of producing fatal diseases, such as anthrax. As the heroes of the piece are said to be British I propose to make some inquiries in the proper quarters before I disclose the details of this matter.

I don't like the look of the story, especially in regard to some of the technical details, which seem to have a transatlantic flavour known as near-truth. Watch these columns for more.

ARIEL.

A NOVEL PICK-UP ADAPTOR



Owners of portable gramophones who wish to change over to electrical reproduction are faced with the fact that gramophones of this type do not readily lend themselves to the conversion. This is largely because space considerations do not permit accurate tracking of the pick-up to be achieved.

THE owner of a portable gramophone often wants to use the motor part of it in connection with a pick-up for electrical reproduction. So out he goes to purchase a pick-up. Having got one to suit his pocket and requirements, he returns home in triumph.

Then his troubles begin. A template is often supplied with the pick-up to enable proper tracking to be attained, but he finds he cannot put the pick-up on the motor-board to get proper tracking!

Always the arm is too long and the motor-board is too small. The unit I am about to give constructional details of will overcome this difficulty with any portable gramophone and pick-up.

It has other important advantages besides, the most important of these

READILY DETACHABLE

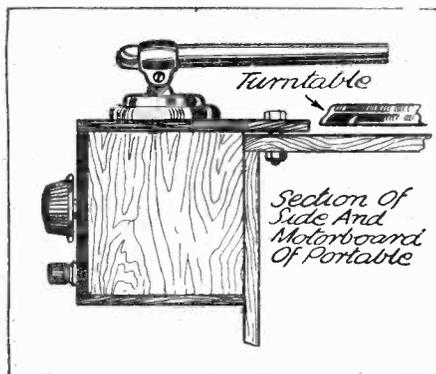


Fig. 1.—The adaptor unit is attached to the gramophone motor-board with the aid of plugs and sockets. The unit has two plugs placed 2 inches apart, and these are inserted into two sockets on the motor-board.

probably being the fact that it does not make the portable gramophone useless as such. The pick-up can be taken off the gramophone in a second or two without tools and can be put back just as quickly when required.

It Does Not Spoil the Portable.

No damage is done to the portable gramophone; in fact, only two small holes have to be drilled in the motor-board, everything else remaining untouched.

The unit is described with an external volume control; but if the pick-up already includes one mounted in the base, this provision can be omitted.

The only parts required besides the volume control are two stout plugs and sockets of the type shown in the drawings, two terminals, a little half-inch-thick wood and a piece of ebonite 3 in. square.

By A. J. POTTS.

Cut two pieces of wood 3 in. square and one $3\frac{1}{2} \times 3$ in. Cut also one piece 5×3 in. for the top.

[The drilling diagram is given on our "Radiotorial" page.] Screw the two side pieces, the top and the ebonite together, as shown, making sure that the pieces are overlapped in the same way as indicated. Do not screw the bottom piece in place permanently yet, or it will make it rather more difficult to wire up. Screw the pick-up in place temporarily on the top piece, as indicated in Fig. 1, placing it fairly close to the ebonite panel end.

Finding the Best Position.

Now take the pick-up and unit and place against the side of the portable so that the inverted "L"-shaped piece rests against the side and motor-board. Figs. 1 and 2 will give a good idea of the position required.

Now slide the unit along the side until proper tracking is attained. The most convenient way to find this position, if you have not got a template, is to insert a needle in the pick-up and adjust the whole so as

TRACKING DETAILS

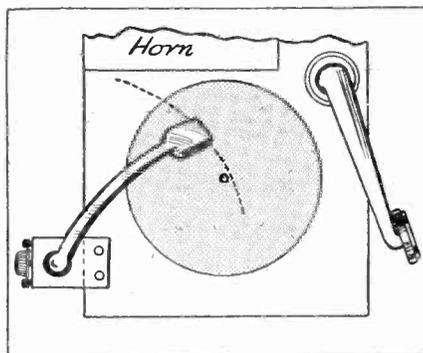


Fig. 2.—The dotted line indicates the correct tracking for the pick-up. The socket holes on the motor-board should not be drilled until the tracking position has been accurately determined.

to bring the needle half an inch or slightly less on the opposite side of the turntable spindle to that which the unit is on.

This will give approximately correct tracking with most types of pick-up, and it will be found that when the pick-up is swung across the record it will follow an arc similar to that shown in Fig. 2. Having got this position, hold the whole in place and mark carefully where the centres of the two holes come on the motor-board

This week we describe a simple and efficient adaptor which provides a ready means of converting any portable gramophone for use with a pick-up. A particularly attractive feature of the unit is that it can be instantly detached should the owner wish to use his gramophone as an acoustic instrument.

Drill these points carefully and insert the two sockets tightly. Now insert the two plugs into the corresponding holes in the top of unit and screw up tight.

The unit will now be found to plug in and to lie snugly and extremely firmly against the side of the portable.

The Final Steps.

Check the tracking, and, if not quite correct now, adjust by moving the base of the pick-up very slightly and rescrawing when properly set. The volume control and the two terminals can now be put in place and the whole wired up.

The volume control is, of course, of the potentiometer type, and its value is always stated by the makers of the pick-up to be used. A view of the inside of the unit is shown in Fig. 3, and the method of wiring will be seen from this figure.

When the wiring is completed test out with a record or two to see if all is in order, and if so screw the bottom in place. No cover is needed over the side opposite the ebonite panel, as this is covered by the side of the gramophone.

As a final hint, remember to fix the unit well clear of the winding handle. It would be very disconcerting to get everything fixed up and adjusted only to find the motor could not be wound up!

[ED. NOTE: The idea of a clip-on pick-up unit was due originally to Messrs. Belling & Lee, Ltd., from whom such a unit in commercial form is available, price 35/- complete.

SIMPLE WIRING

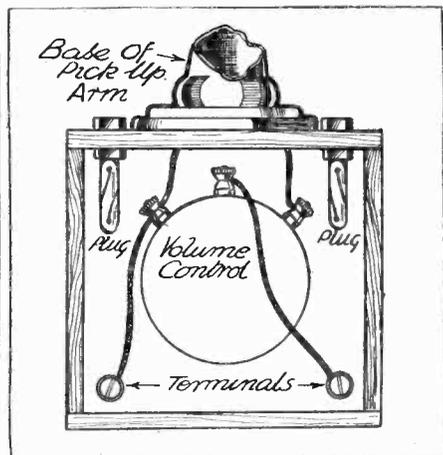


Fig. 3.—The wiring for the pick-up and volume control is quite simple. The two terminals are joined externally to the pick-up terminals on the set or amplifier.



Miss Laurie Devine in the B.B.C. Television Studio.

THE storm in a teacup over the supposed maladministration of British broadcasting has been quite overshadowed by the more important question of Television.

Rumours and denials have been tossed backwards and forwards between the various interests concerned. "Thirty-line television is going on"; "There will be no more television broadcasts"; "America

WHEN TO "LOOK-IN"

The B.B.C. has announced that from April 1st the days and times on which television transmissions will be given from London are:—

TUESDAYS - 11 p.m. (23.00 hours)
THURSDAYS 11 a.m. (11.00 hours)

Each transmission will last for about half an hour.

is planning to capture the British market." These are but a few of the "official statements" which have followed Sir Ambrose Fleming's trenchant attack on the B.B.C. monopoly.

As we told you last week, Sir Ambrose's comments were brief and to the point: "Television has not yet had a chance of proving its utility. The B.B.C.'s attitude is over-cautious and unenterprising," he said.

The B.B.C., while preferring to disregard this challenge, has at the same time replied to at least one of the criticisms. In order that television may be seen by more people, there will in future be a transmission every Thursday morning at 11 a.m. (or 11.00 hours, as we shall soon have to call it!).

An American "Invasion?"

But while this change is, possibly, for the good, it appears that the entertainment value of television is not considered by the B.B.C. of much importance. An official tells us that the new arrangements, while continuing until further notice, will be limited partly by the use made of the transmissions by experimenters and partly by the rate of development of high-definition systems.

In other words, while there will be only an hour a week of 30-line television, even this is liable to stop at any minute.

Just as interesting are the views of the two commercial firms most concerned,

WHITHER TELEVISION?

The presidential address by Sir Ambrose Fleming at the annual meeting of the Television Society (which was reported in POPULAR WIRELESS last week) has had wide repercussions in the world of Television. Here are some facts and opinions on the future of television as broadcast entertainment.

While neither Baird Television, Ltd., nor Electric and Musical Industries, Ltd., will make any official statement regarding Sir Ambrose Fleming's contentions, this is understandable in view of the fact that, until the B.B.C. decides which system it is to use in the future, both firms are more or less pledged to indulge in no publicity.

At the same time, the two firms would welcome the chance for a more unrestrained opportunity to let the public know of the merits of their respective systems.

Nor can we disregard the progress which has been made by A. C. Cossor. Although there is no foundation for a statement made in a certain newspaper that the Cossor system was in process of being tested by the B.B.C., the results which have been achieved in demonstrations of this system are remarkably good and we are sure to hear more about Cossor television in the near future.

But the most startling situation is provided by the United States. The visits of a number of men prominent in the radio entertainment world of America to this country have given rise to a very strong rumour that American interests intend to make a real effort to establish seven-metre television transmissions in Britain.

7-metre Receivers Ready.

The rumour is lent weight by the fact that a prominent American manufacturer is in a position to supply seven-metre television sets complete for the price of an ordinary mains radio receiver.

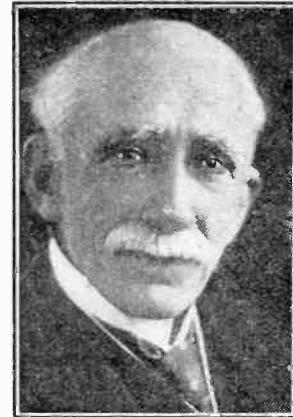
News of this was conveyed to the Radio Manufacturers' Association last week by POPULAR WIRELESS. Although the R.M.A. had had no previous intimation of such a position, they would undoubtedly do all in

their power to uphold any British system of television against a foreign "invasion."

A newspaper report—attributed to E.M.I.—said that the firm's managing director, Mr. Louis Sterling, was bringing a new system back with him from America which would give "flickerless reception, clear speech and sharply defined characters." But this report was vehemently denied to POPULAR WIRELESS by an E.M.I. official.

The Crystal Palace Experiment.

The Baird Company created an innovation in company practice by depositing its chairman at the Crystal Palace and transmitting his figure and speech to a meeting of shareholders in Wardour Street. At the



SIR AMBROSE FLEMING.

same time we were officially told that, while the authority of the B.B.C. to have a monopoly of television was not in dispute, the Baird Company was in a position to give its own television transmissions over an area comprising some

10,000,000 people.

That is the position to-day. Despite Sir Ambrose Fleming's whole-hearted attempt to free the progress of a new technical development from, virtually, a Government department, there is little likelihood of any change being made in the present arrangements.

"Press Button B!"

THIS is the National programme from London. To-night we are broadcasting a concert of chamber music. We are anxious to know what listeners think of this programme, and we should be glad if, at the conclusion of the hour, you will press, and hold pressed, the button on your set indicating whether or not you wish to have more of this music."

Such an announcement is not outside the realms of possibility if a message from Paris is to be believed. Dr. Hopkins, a well-known American inventor, claims to have devised a method by which listeners can "answer back."

Each receiver is fitted with two buttons marked "Yes" and "No," and the broad-

How listeners may one day be able to express their opinions on the programmes directly after a broadcast!

casting station has high-speed equipment for recording automatically the listener's opinion of a question asked.

According to a newspaper report, "a number of individual and independent battery-driven sending stations, all adapted to propagate short-wave wireless energy, flash the results simultaneously upon an electro-magnetic control from a master keyboard."

Readers may draw their own conclusions from this brief summary of the method of operation. Certainly the ability to express extreme displeasure would give an added zest to listening and might lead to some unexpected results in the "fan-mail" department of Broadcasting House.

USING D.C. MAINS

THERE are, no doubt, many readers who, having direct-current mains laid on to their homes, would like to make use of them for driving their radio receivers, but, having heard various exaggerated tales about their being unsafe and not suitable for the purpose, have contented themselves with battery drive.

It Is Extraordinarily Straightforward.

The purpose of this article is to show how easy to build and satisfactory a D.C. set really can be, provided a few simple precautions are taken. A direct-current receiver is extraordinarily straightforward in construction, and is considerably less complicated than its A.C. counterpart.

The main thing to remember when building a set of this type is that the receiver is connected *direct* to the mains and not isolated by a transformer, as is the case with one of the A.C. variety. It is necessary to bear this point in mind, because it is common practice to earth one side of the supply at the generating station, and it would never do to

There is no good reason for the lingering prejudice against using D.C. mains for radio, and this easy-to-understand article explains why. A few common-sense rules have to be followed, as with any other type of set, and then the D.C. mains are an almost perfect means of ensuring an ample and constant supply of power.

shown in Fig. 1. Without the condenser, connecting an earth to the set would have the disastrous result referred to, but in the

itself and placed near the earth terminal, so that the earth proper will be joined to one side and all the points in the receiver that normally go to earth connected to the other terminal.

The above is precaution number one, and is the most important safeguard to be taken in all D.C. receivers. If a D.C. mains unit is employed with an ordinary battery receiver it is usual for this condenser to be included in the unit. It will then, of course, be necessary for the earth to pass through the eliminator first.

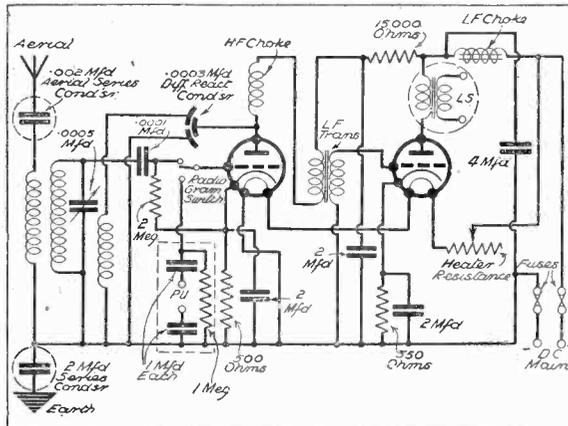
Those Aerial "Shocks."

The next important point to watch is to see that another condenser is included in the aerial lead. Although the omission of this component will not result in any such spectacular occurrence as shorted mains, it is quite possible that it would be the cause of undesirable shocks being obtained from the aerial if any person happened to touch it.

The why and wherefore of this disturbing fact is not difficult to understand, and if you have a look at

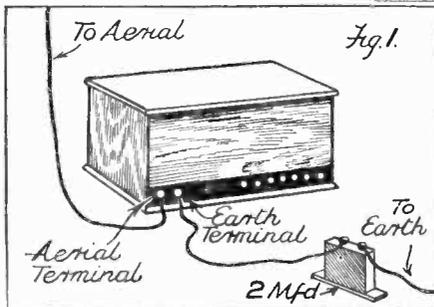
POINTS TO WATCH

In the typical circuit diagram to the right, dotted circles have been drawn round the points in a D.C. set that may need special attention. Although a triode output valve is shown, the points emphasised are equally important when a pentode is employed, and practical hints on operation and upkeep for either type of set are given in the accompanying article.



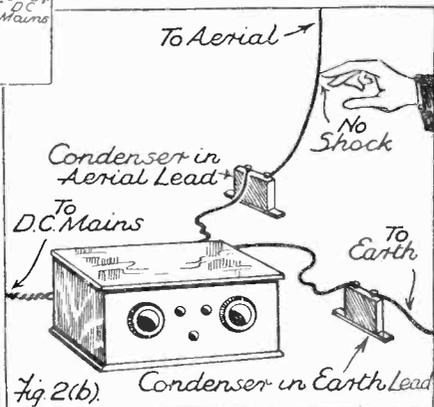
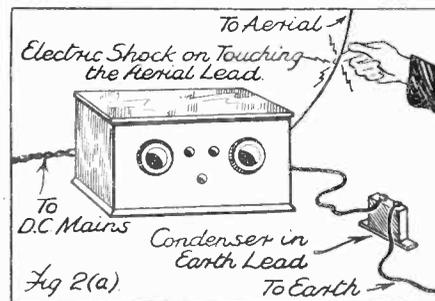
A SIMPLE REMEDY

to prevent a "tingle" from the aerial is the condenser shown below.



The sketch above shows the simple precaution that must be taken with all D.C. sets—the insertion of a large condenser in the earth lead. In practice it is generally inside the set itself or in the associated mains unit.

Some Useful Hints on—
**THE EARTH-LEAD CIRCUITS—
PREVENTION OF "TINGLING"—
PICK-UP CONNECTIONS—LOUD-
SPEAKER WIRING—POWER TAKEN
FROM MAINS—WHAT CONDENSERS
TO USE
ETC., ETC., ETC.**



To the left is illustrated an effect commonly experienced when the positive D.C. line is earthed by the supply company. It is cured as illustrated above.

join an earth wire up to the receiver if the earthed main happened to be the positive!

The reason for this is, of course, obvious, for the earth terminal on the set is normally connected to H.T. negative, and as the positive main would be earthed at the station the result would be to short the mains. And I feel sure readers will agree that this is not a very advisable thing to do.

As it happens, it is very easy to get over this difficulty by inserting a large fixed condenser in the earth lead to the set, as is

arrangement illustrated the large condenser (generally about two microfarads) acts as a block to the supply, but at the same time does not resist the passage of H.F. currents.

The Insulation Must be Good.

This condenser should be of good insulation and capable of withstanding the full voltage of the mains for an indefinite period. It should be included in the set

Fig. 2 (a) and Fig. 2 (b) it should be quite clear. In the first instance, the circuit is completed through the person touching the aerial wire, who therefore receives a shock; but in the second sketch he or she is saved from this unpleasant experience by the condenser.

Many receivers already have such a condenser in circuit for varying the selectivity, when it is, naturally, of the small variable or semi-variable type. In cases such as this there is no need to worry about any further precaution in this direction;

(Continued on next page.)

but when the aerial comes direct to the top of the coil a condenser of fairly large capacity should be employed, so as not to upset the characteristics of the aerial circuit too much: .002 mfd. is a good value.

There now remain two more places in the set that need attention, these being the pick-up connections and the method of joining up the loudspeaker. If it is not intended to use a pick-up, only the loudspeaker will have to be watched.

"Isolating" the Pick-up.

Dealing with the pick-up connections first, a pair of fixed 1-mfd. condensers are inserted in the leads, and, so that the grid of the valve shall not be "up in the air," a high resistance of about 1-megohm leak is joined between them on the receiver side.

Now, when dealing with the loudspeaker there are two methods of isolating it: one by means of an output transformer and the other with a choke-filter arrangement using two condensers instead of the usual one. Figs. 4 (a) and 4 (b) show the two schemes.

As a rule, it can be taken that the transformer is usually the most satisfactory, for if it is of the variable-ratio type it allows the speaker to be matched up to the output valve fairly easily and lacks the disadvantage of the two condensers in series, which must be of fairly large capacity if they are

FOR THE L.S. LEADS

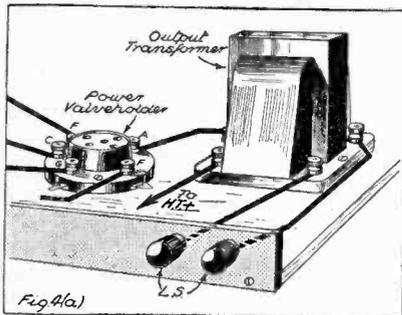


Fig 4(a)
If an output transformer is employed the plate current of the output valve is restricted to the primary, so long loudspeaker wiring can be taken from the secondary without any possibility of trouble from mains shocks.

MR. VAL GIELGUD has set us all thinking. That in itself is a good thing. By his act he has made dramatic critics of us all. If he will allow himself to be influenced by the public's opinion something may be evolved that will be generally more acceptable and settle the drama's place in broadcasting once and for all.

I wonder whether Mr. Gielgud came across the remarks of a certain adjudicator at a recent drama festival. This is what the adjudicator said: "Acting is nothing more than mesmerism. An actor has to convince the audience that he means what he says. Acting can only be done with an audience and an actor. There is no such thing as acting on the films. It is impossible to act without an audience, because there is no mesmerism."

A Very Decided Statement.

"There is no such thing as acting on the films!" Well, that's straight from the shoulder, if you like! What about the radio? I wish this adjudicator had thought to mention acting before the mike. Although he didn't, I'm inclined to think that if he were tackled on the point he would classify radio drama with the films.

I am with him to a certain extent. I have repeatedly argued in these notes that an audience is indispensable to variety and music hall. For the latest

USING D.C. MAINS

(Continued from previous page.)

not going to cut down the low notes. If really good reproduction is desired they should be at least 8 mfd. each, or in any case not less than 4 mfd.

The same remarks do not apply to the pick-up condensers, however, for it is not uncommon to use capacities as low as 1 mfd. for this job.

The only other point in which a D.C. receiver differs from one of the normal type is in the method of connecting the filaments. With A.C. it is possible to step down the voltage by means of a transformer and so save wasted watts; but with D.C. the voltage must be broken down with a resistance.

The larger the current through the resistance the more energy is lost, and this is why high-voltage low-current valves are usually employed in sets working from direct-current mains.

One rather surprising fact about a D.C. set is that, no matter whether it be a little two-valver or a big six- or seven-valve superhet, the power taken from the mains is almost exactly the same; that is, provided the same types of valves are employed.

Very Economical to Run.

It simply means that in the larger set more watts are made use of in the valves and less wasted in the resistance than in the smaller receiver, where the mains voltage has to be broken down to just sufficient for the two valves in series.

The total consumption of the average D.C. mains receiver, working from a 200/250-volt supply, is in the region of 50 watts, which is not at all bad when it is considered that, even in a very large set, well over half of this is lost in the resistance.

On the previous page you will see a complete D.C. set in diagram form. It is a two-valver using 16-volt 25-amp. valves, and it can be relied upon to give very good

programme value. If desired the last valve can be replaced with one of the pentode type, in which case the correct ratio output transformer would have to be used and the auxiliary grid connected to H.T. positive.

Guarding Against Hum.

You will notice that one side of the heater of the detector valve is joined to H.T. negative; this is done to reduce the likelihood of trouble from hum being experienced. No matter whether the set be a two-valver or one of a larger type, it is always a safeguard against hum to start the earthed side of the heater circuit with the detector.

Dotted lines have been placed round the parts in the circuit where special precautions have to be taken, and which are mentioned in this article. If you trace out the circuit carefully it will help you to understand why they are necessary.

Before closing there is one other point that should be covered, and this concerns the cabinet for the receiver. It should enclose the receiver completely, and the lid should not be opened without first withdrawing the mains plug, for, unless the operator is standing on some good insulating material, it is possible to obtain a shock from almost any point inside the set. F. B.

EASY PROTECTION

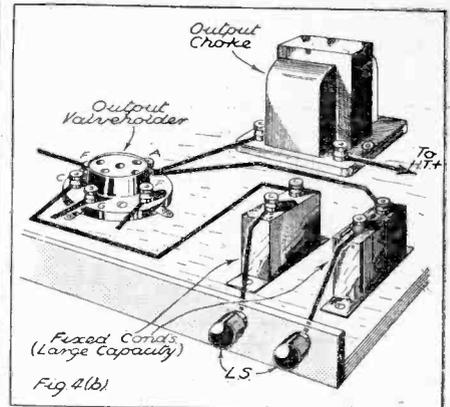


Fig 4(b)
In this choke-filter arrangement the condensers isolate the loudspeaker from the H.T.

THE LISTENER'S NOTEBOOK

An impartial commentary on the programmes, and some frank opinions on the recent methods of presentation and the success—or otherwise—of microphone personalities of the moment.

example in support of this take the bill in which Will Hay and his Scholars figured. Barring Olympia, this performance is the nearest approach to the real music hall or variety show ever put on the wireless. Will Hay, and Mabel Constanduros before him, were quite inspired by the audience. The way the audience egged them on and the way they responded were really marvellous. The atmosphere was complete.

Did You Hear Him?

I don't know whether it was by accident or design, but *someone* seemed nearer the microphone than the rest. His laughter which was restrained but none the less genuine for that, made a sort of link between listeners and the audience there present. There was never a suggestion of the cold shoulder that so many listeners generally complain of. We were all one, both inside and

outside St. George's Hall, and all victims of Will Hay's mesmerism.

But to return to radio drama. How could an audience improve it? I believe it could improve the playlet if only it could be induced to come and see more than one of them. But I'm afraid it couldn't. As regards the big play, excellent as it is at present, an audience, I am sure, would make it better still. I think it would make pretty much the same difference as there is between a full-dress rehearsal and a pukka performance of a stage play.

That Lack of Inspiration.

Miss Beatrice Lillie is reported to have said the other day, in answer to the question, "What is the greatest source of inspiration?" "My audience; I just can't help feeling spontaneous on the stage, and even if I feel

miserable beforehand, one flicker of response from my audience and I feel fit for anything."

But the wireless actor or actress never gets that one flicker of response. I would like to hear an expression of opinion from one of them on the matter.

Some Excellent Effects.

I am afraid I am too prone to compare broadcast drama with the stage. I've never felt that the former has eclipsed the latter, except when there has been something in it that is impossible to do in a stage production. In other words, when a clever use of effects has made a broadcast play a unique thing. That Italian farce, "The Hero," for instance, had little merit. The plot was negligible and the dialogue wasn't much better. Though the acting was generally good, particularly that of the hero himself, the play would have been a flop on the stage. As a radio play, however, it was saved by the excellence of some of the sound settings. The cello in the bank, the fire, the fire-bells, the aeroplane and the chorums of the Dynamite Club were wonderfully well done.

Mr. Lance Sieveking was responsible for these, and, provided he never becomes childish, I think he is moving along the right lines. Radio drama must have characteristics that differentiate it from the stage proper. If it

(Continued on page 97.)

TEN THOUSAND LETTERS!

by VAL GIELGUD

THE morning after the broadcast production of "Quarrel Island" I approached my office in a state of considerable trepidation. I had, you may remember, asked listeners to let me have their candid opinions on the subject of broadcast plays. What should I find?

I confess that I hadn't the slightest idea. But with five years of radio dramatic production behind me I couldn't help wondering whether I might not discover at any rate a vigorous demand for my own resignation, or—even worse—no response to my appeal whatsoever except for the five charming postcards from five people whom I know listen to every play that is ever sent out over the air.

I had hoped that it would not be as bad as all that. It wasn't. Within twenty-four hours there were over a thousand letters and postcards accumulating in trays. Within three days there were ten thousand accumulating in sacks.

They are still coming in, and I am still doing my best to read them with the attention that they deserve.

Constructive Suggestions.

My principal feeling, apart from a slightly bewildered satisfaction, is one of extreme gratitude—gratitude, in the first place, for the confirmation of my belief that there really is a big audience for the broadcast play; gratitude, in the second place, for a definite majority opinion. To judge from the letters I have read, that our dramatic policy is neither insane, ludicrous nor generally unacceptable; gratitude, in the third place, because my correspondents have not only said that they liked plays and that they are apparently prepared to look forward to plays in the future, but because the average letter has not been a single sentence, but three or four pages long.

It is not an exaggeration to say that I have received several thousand short essays on broadcast plays, and

that they have included a large number of admirable suggestions and have enormously stimulated the activities of this department by starting various trains of thought.

Perhaps you will say that it isn't fair to draw any definite conclusions even from several thousand letters of this kind. To that I would reply that I took the opportunity of making my appeal when, presumably, the largest number of the radio play audience would be likely to listen.

From Every Walk of Life.

I think, therefore, I am justified in drawing the conclusion that the people who replied are representative of the main body of broadcast play listeners. And though,

A week or so ago the B.B.C.'s Drama Director—Mr. Val Gielgud—appealed to listeners to write and tell him what they thought of radio plays, what kind of productions they wanted and what they would like to avoid.

In this article Mr. Gielgud himself tells you about the amazing results of this appeal.

much as I should like to, I don't dare to follow the conclusion of the Editor of "The Era" that my audience must be three million and a half. I believe that his figure is by no means so fantastic as a good many of our critics would have us think.

Who have written these letters? Almost everybody. Brigadier-generals have written from Bath and foremen have written from factories. I have received a startling impression of a cross-section of life all over England during this last week. A school-boy of sixteen wrote on behalf of his school; one workman wrote on behalf of two hundred and fifty of his mates. Letters like these stand out in one's recollection. And at least sixty per cent start like this:

"My wife and I have just been sitting by the fire listening to your play"—and then they go on to say what they think about our work. Sentimentality and romanticism are out of fashion in these days, but I doubt if these days are the better for it, and to me the romantically sentimental quality of the impression conveyed by these hundreds of letters, coming from every kind of fireside, has been almost overwhelming.

It may be true, as some critics say, that one of the disadvantages of broadcasting is its inevitable inhuman detachment. To this I would retort that, personally, I feel most sincerely that I have just recently established not only a contact with my audience, but a very human and personal contact into the bargain.

But what have they said, all these letters? What have they asked for? I have not yet had time to make a properly detailed analysis. It is only possible now to give the general impression.

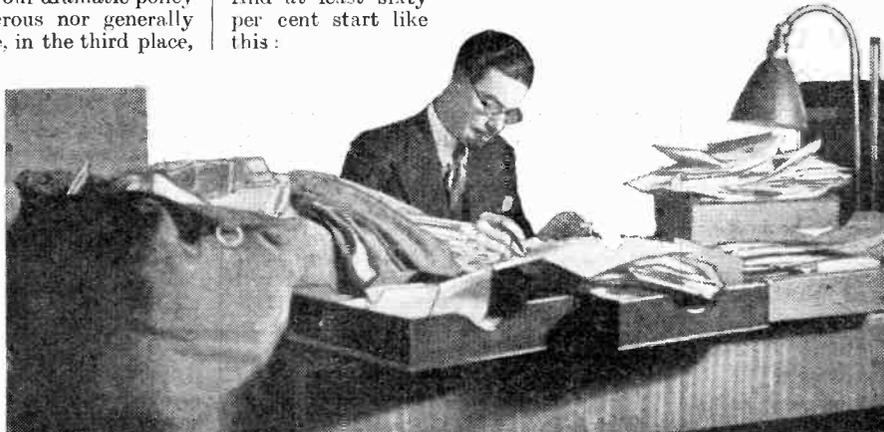
Approving Historical Drama.

But several points have definitely emerged. First of all, broadcast plays are listened to and are appreciated. Secondly, our new "line"—if I may be forgiven the expression—in historical and actuality drama has received emphatic endorsement. Thirdly, the established dramatists—Galsworthy, Shakespeare, Ibsen, Eden Philpotts—are at present preferred to the young brigade who are experimenting in the pure form of the broadcast play.

Of these experimenters only Mr. du Garde Peach and Mr. Philip Wade seem to have achieved the approval of the majority—though the works of the pioneers like Mr. Guthrie and Mr. Sieveking have provoked exactly those violent pros and cons which all good pioneers expect.

There is a strong tendency to demand more comedy and to deplore the preponderance of the tragic in our work. With this point I sympathise; but I would point out that the remedy lies rather with the authors than with us. I am afraid that comedy cannot be created out of the air!

The recently established intervals during the action of
(Continued on page 97.)



The B.B.C.'s Drama Director dealing with part of his vast post.

IT is now definite that practically all the new revenue accruing to the B.B.C. will be spent on programmes and the balance on engineering expenses. There are indications that expenditure on staff and organisation is stabilising.

The B.B.C. would be wise to give more detailed information of its budget. Members of Parliament in particular would be more confident if they were given the information to enable them to make independent analyses of the B.B.C. balance sheet and statement of accounts.

Sir John Hits Out.

Since he accepted the invitation of the Committee of Conservative M.P.'s to defend the B.B.C. constitution and policy, Sir John Reith has departed from his policy of silence in the face of hostility. And it is characteristic that when he does make a change of this kind he goes all out on it.

I understand that he will make several important public pronouncements during April.

Oliver Baldwin's Contract.

Mr. Oliver Baldwin will continue as B.B.C. film critic until the end of the June quarter. The B.B.C. did not allow Mr. Baldwin's public attack to interfere with the existing arrangement.

The film critic for next autumn has not yet been selected; but I hear rumours that Mr. George Atkinson and Mr. Sydney Moseley are in the running.

Summer Plans.

It will be good news that the B.B.C. plans for the summer foreshadow much more seasonable programme arrangements than ever before. There is to be a general lightening: less talks and much more popular music and entertainment.

The Outdoor Listener.

Special thought is being given to the needs of those listeners who will be taking their sets outside for summer occasions.

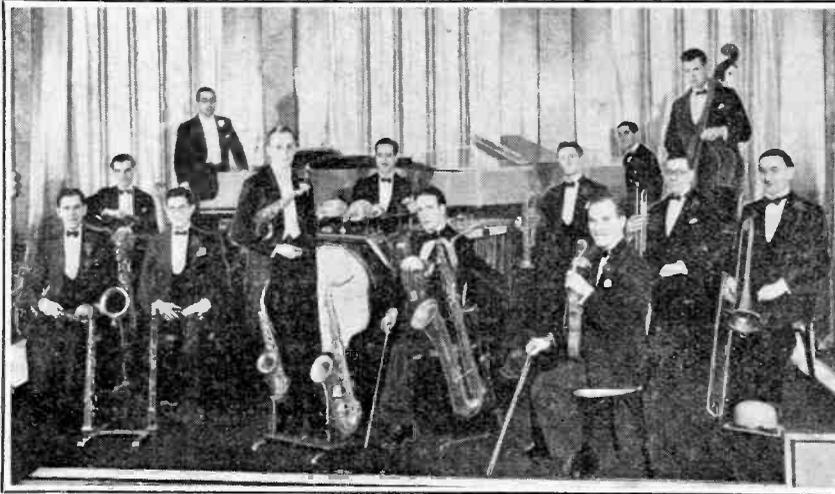
This will probably mean that light entertainment and dance music will be given at more universally popular times than during the winter months.

Television Pressure.

The B.B.C. is being subjected to much outside pressure in order to secure a reversal of the decision to reduce the number of 30-line television transmissions. I can say on the best authority that this pressure is being successfully resisted, and the new decision will stand.

"Ether Echo" Experiments.

Professor Appleton, the eminent radio scientist, is co-operating with other authorities abroad and with the B.B.C. in a



Carroll Gibbons and Howard Jacobs with the Savoy Hotel Orpheans.

MONEY FOR PROGRAMMES

Latest news from "The Big House" about broadcasting and broadcasters.

series of experiments in the detection and measurement of "ether echoes"—that is, the reflection of signals from remote strata far beyond the Heaviside or Appleton Layers. Important results are expected.

A Better Empire Service.

Captain Cecil Graves, the Empire Service Director of the B.B.C., has now received authority to go ahead with a scheme calculated greatly to improve the quality and variety of the short-wave offerings to the Empire. He is being guided a good deal by the advice of Mr. Malcolm Frost, just back from North America.

Tauber to Broadcast.

Here is an advance announcement that the great Richard Tauber is to take part in the studio performances of "Frederica" for National and Regional listeners on Monday and Tuesday, April 23rd and 24th respectively. He will sing in German, but will use English for the dialogue.

St. George's Day.

St. George's Day and Shakespeare's birthday are always important events in broadcasting. Among the items which listeners will hear this year is a relay of Sir Austen Chamberlain's speech at the annual banquet of the Royal Society of St. George from the Connaught Rooms on Monday, April 23rd.

On the following day Val Gielgud will produce Clemence Dane's great classic play, "Will Shakespeare," in honour of the dramatist's birthday.

Relays from Cornwall.

It may be just a little early to itemise summer outside broadcasts, but the B.B.C.

is compelled to plan so far ahead that no harm will be done in mentioning that this year listeners can look forward to hearing a number of relays from Cornwall. These will originate, of course, as part of the West Regional programmes, but there is every possibility of some of them being included in the National and other Regional programmes.

Seaside Resorts.

Relays will also be taken from North Wales seaside resorts, and there will be regular broadcasts of humorous and light entertainments as well as a fair sprinkling of concerts by Welsh bands and choirs.

Another "Divertisement."

Martyn Webster has another "Divertisement" programme on the stocks for Tuesday, April 10th. It will open with a relay from the Regal at Handsworth, where Wilfred Southworth will be giving his first broadcast, which is to consist of his own arrangement of Gershwin's "Rhapsody in Blue" for organ and piano. The pianist will be Jack Hill, a young artiste who has already given several studio recitals.

"Income Tax."

"Cavalcade of Love" should be equally entertaining as showing an elopement in 1894, in 1924 and 1934, and there is also a duologue called "Income Tax" by Herbert C. Sargent.

The interludes between the items will be filled by the Hawaiian Islanders and Harold Pollard (entertainer).

Donald Calthrop Again.

It seems a long time since Donald Calthrop took part in a broadcast programme, but that is hardly to be wondered at since he has been so busy making films.

On Saturday, April 7th, Donald is to play in "Old Yesterday," a romance in one act, which will be part of the St. George's Hall music-hall programme, in which Alexander and Mose are also appearing. Donald Calthrop was once dramatic producer to the B.B.C. for several weeks.

"Move On, Gipsy."

Lonely camp fires and adventures by the roadside and many other things that occur in the course of a year in a typical gipsy's life will be traced in music and speech during the North Regional programme on Tuesday, April 10th. The programme has been arranged by Ruth King, and is entitled "Move On, Gipsy."

In addition to music by Hungarian and Russian composers and literary material by Borrow and Starkie, it will include a description of the gipsy settlement which still exists at Yetholm, where a large community has always lived in huts and where is also the headquarters of the Gipsy King.

O.H.M.



ON THE SHORT-WAVES

OUR SPECIAL SECTION FOR SHORT-WAVE ENTHUSIASTS
 Conducted by **W.L.S.**

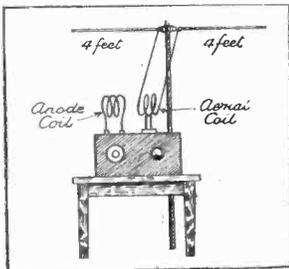
ALTHOUGH there is quite a number of people who have been working on 5-metre reception and transmission for several years, last summer saw the first real enthusiasm among the great band of short-wave listeners for this fascinating part in our spectrum.

"Five" was always regarded as something rather uncanny, requiring expensive and complicated gear and a vast store of technical knowledge.

The coming of the simple super-regenerative receiver and the knowledge that there were certain definite transmissions to listen for roused the public interest in the ultra-short waves, with the result that our epoch-making tests from the Crystal Palace were a huge success.

I am constantly being asked what we all propose to do about it *this* summer. Unfortunately, I have to make the usual non-

A USEFUL STAND



This miniature table for the S.W. receiver is what W. L. S. calls his patent "dumb-waiter."

committal reply, but I have an idea that quite a lot of interesting developments may be expected.

Although I know that many will violently disagree with me, I do think that it is going to be sheer

waste of time to try to break any more "DX" records. We have shown that 5 metres will cover 200 miles on low power, but we probably couldn't repeat it on six successive days if we tried for years.

It is Wonderfully Simple.

What, then, is the object of trying to get farther? What we want is to develop the wavelength over ranges which can be reliably covered.

We must not lose sight of the fact that the chief usefulness of "five" is the beautiful simplicity, and therefore portability, of the apparatus. One can almost go hiking with a 5-metre transmitter and receiver, and the owner of a small car can carry quite a young broadcasting station about with him. The two sketches on this page both

deal with the "portable" aspect of the ultra-short waves.

The first shows my own patent "dumb-waiter" scheme for a transmitter and receiver out on field work. A little table with collapsible legs and castors is all that

already built complete mobile stations, and my own is nearly finished. We are hoping to hold a series of week-end field-days, choosing suitable sites in hilly country.

While there would be no chance of our signals being heard in towns with badly screened aerials, the thought that a score or more of people were all sitting about on hill-tops ready to listen at a predetermined time would be no end of encouragement.

As I write these notes, with a thunderstorm passing overhead and a charged aerial sparking happily away on the other side of the room, the mere

thought of field-days makes mesher; but when our summer arrives there is no more pleasant way of combining one's favourite hobby with a week-end of fresh air than a field-day.

I hope that any amateur transmitters who read this page will send me any suggestions or offers of help. I'm all ready to do my bit (chiefly with a portable transmitter) and several of the "South London Gang" are as keen as mustard. All that we want now is a little co-operation.

During the next few weeks I hope to deal with matters connected with the ultra-short waves, including the design of a good 5-metre receiver. I may as well say at the outset that I haven't yet evolved anything much better than the one that was described so fully last year.

List of Names to be Compiled.

I must confess to a strong partiality for the superhet, but it's quite useless for portable work unless one has a car, and even then it's not too convenient.

If you are the least bit interested in the plans for the coming summer, please sit down *right now* and tell me so. I will keep a record of all names received, and the readers concerned will be notified of any interesting developments.

FIVE METRES THIS SUMMER

Five-metre reception, which first became popular last year, is bound to receive considerable attention this summer, and all those attracted by this band will be interested in the suggestion contained in these notes on the subject.

is required; and if one doesn't care what other people think the homely perambulator is excellent!

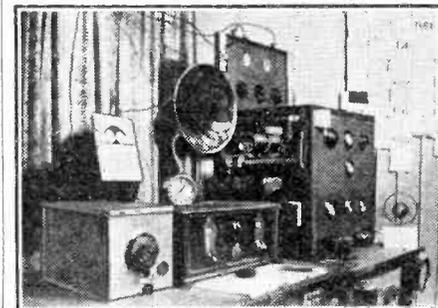
The second sketch shows a typical transmitting aerial mounted on a small car. The gear is on the rear seat; the aerial runs from the "fishing-rod" to the front end of the sunshine roof; and from that point a feeder, or pair of feeders, slopes down inside the car.

Will You Help Us?

I used a scheme similar to this in Yorkshire last year, but our results have already been told in detail.

What I should like for the coming summer, above all things, is this: I want a register of the names of readers who are

FROM SOUTH AFRICA

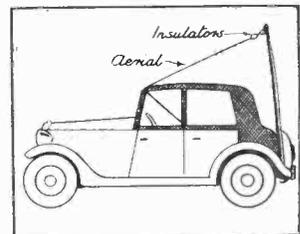


This photograph shows Mr. R. Keir's station, ZS 6 Y, in the Transvaal. It is frequently heard in this country on 21 metres.

prepared to collaborate in any kind of outdoor 5-metre work, together with some idea as to their resources for setting up field receiving stations.

Several of my transmitting friends have

FOR CAR USERS



A car with a sliding roof is ideal for fixing up a portable transmitting station.

On the Short Waves.—Page 2.

TUNING Your Short-Wave Receiver

Do you have any difficulty in tuning-in short-wave stations? If so, you will find these notes on operation and the handling of controls a great aid to obtaining the best results from your receiver.

THERE is nothing like first-hand experience for teaching one a lesson. I write this with feeling, for during the past fortnight I have acted as doctor to quite a few cases of short-wave troubles and have learned from them quite a considerable amount.

Perhaps I may be pardoned for confessing that I imagined, until recently, that my own short-wave experience had brought me in contact with most of the worries that are likely to beset the beginner. After all, I have been working at them in some shape or form since *before* they were really discovered. But I freely admit that the last fortnight's experiences have been an eye-opener to me.

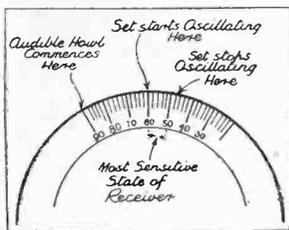
He Was Completely Lost.

I hadn't the slightest idea how completely lost, how absolutely *fogged* the short-wave novice can be when he takes over his first set. The short waves seem to bear so very little resemblance to the rest of radio.

It is out of pure compassion, therefore, that I am trying to put myself in the position of the novice handling his first short-wave set and to anticipate a few of the troubles with which he will meet.

One gentleman of my acquaintance, Mr.

REACTION OVERLAP



If oscillation stops at a different point from that at which it starts, as indicated here, overlap exists and you must endeavour to remove this.

A., had an absolutely perfect set in front of him. Everything about it was good—sensitivity, selectivity, reaction control—no hand capacity, no threshold howl; in fact, the sort of set that most short-wave folk dream about as an ideal. And could he get anything out of it? No, not he!

Let us examine *his* particular snags. First of all he hadn't the remotest idea of what "delicate touch" meant. He simply couldn't touch his tuning dial without jerking it violently through four or five degrees.

As always, I asked *him* to operate the set while I listened; and there was our old friend, "ham-handed Henry," of Writtle days, back in the flesh again. He swished and he swooped, and covered four or five

perfectly good signals all at once, finally turning to me and saying: "There you are, old man; you can't hold anything."

I wasn't annoyed with him; his trouble was so pathetically genuine. And it was so difficult to explain to him tactfully that he hadn't the remotest idea of operating a set. Cutting a long story short, I took over the dials and produced station after station with the air of a conjurer producing rabbits, watching his incredulous expression grow more intense until I thought the strain must be too great.

He has now cultivated a steady hand and a quality of patience that was not there before, and all is well. You will note that this particular "Short-Wave Trouble" had nothing whatever to do with the set. It all boils down to the fact that short waves are different from anything else in radio and need different treatment.

SIT AT EASE



Comfort for short-wave listening is very important, and sometimes the accessibility of the controls may be improved by raising the set on some books.

Let us examine this business in detail. First, the reaction control, which is the most critical and most troublesome feature of a good many sets, be they short-wavers or not. The first thing that one *must* do is to find the point at which the set goes into oscillation and have a jolly good look at it. Does it just go over with that nice reassuring hiss? Or does it howl or bark at you? We will assume, for now, that it "hisses" in the most well-mannered way, because this article isn't concerned with technical troubles.

Now, incredible as it may seem, quite intelligent people that I have met tell me that they don't think a set is oscillating unless they hear squeals and cat-calls.

A Fierce Reaction Howl.

So what do they do? Why, they go on increasing reaction until the set bursts into one of those devastating L.F. howls, and then try to tune in a station.

Let us get this quite right. As you increase reaction listen carefully. When you come to a place at which, with the slightest suspicion of a "pop," the set starts hissing very gently, then you have reached the setting at which to search for stations. The reaction control should *always* be held as near this setting as possible. Certainly it should never be moved beyond this.

Now for the operation of tuning. With the set just oscillating, and one hand on or near the reaction control, rotate the tuning

knob slowly and steadily. If you can read Morse you will probably find a C.W. signal of some sort on almost every degree.

If you are after telephony, carry on with the search until you come to a carrier-wave that is continuous—i.e. unbroken by dots and dashes, whether slow or fast.

Bringing in Telephony.

Then, instantly, reduce the setting of the reaction control, so that the set is just *under*, instead of just *above*, the oscillation point. The actual movement on the rim of the reaction knob will probably be only about a thirty-secondth of an inch, so don't be clumsy. A mere touch, one way or the other, on the tuning dial will now be necessary to bring in the station.

When you are more experienced this will become one simple and continuous operation instead of a series of small jerks.

A TESTER MADE FROM AN OLD VALVE SOCKET

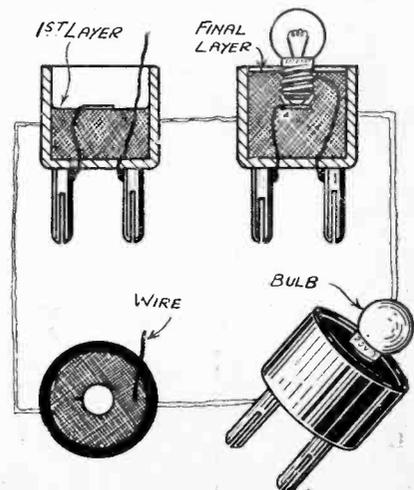
Details of a useful little gadget.

OLD valve sockets can be used for testing by converting them in the following manner: Take two holders and remove the pins not required in each case. You will now have two plugs which can be inserted in the set across L.T. or other points as required.

Solder lengths of wire to each metal plug, cut one off to about half the depth of the ebonite shell, and solder a tin contact to the end. Half fill the holder with melted pitch (or paraffin wax will be easier), leaving the contact exposed on the surface. Place a small bulb in position with the contact touching, and run more paraffin wax up to the level of the screwed part of the small bulb.

Forming a Thread in the Wax.

The other wire (which should be flexible) should have been placed so that the end will be embedded in the thread made by the wax around the bulb. When dry the bulb can be unscrewed (the bulb should be an old one for preference, as the new one can take its place). The contacts can be scraped clean, and with two of these sockets many tests can be performed, using a small pocket battery. **W. G.**



The four stages in the construction of the simple tester which is described above.



The quest for "perfect" reception must necessarily be bound up very closely with the method of transmission. Our Chief Radio Consultant suggests a comparatively simple method of avoiding sideband interference without altering the present wavelength separations. But he is afraid that this, like other really progressive schemes, will not be brought into practice by European broadcasters!

I HAVE written two articles on a subject. This is the third on that same subject.

The articles were introduced by the question: "I want a receiver, regardless of cost, to give me perfection. What should I do?" It was not put quite like that—but that's a good enough précis.

I seem throughout the series of articles to have avoided the answer and talked mostly about the conditions of transmission. But this is logical. You do not design motor-cars regardless of road conditions; you do not design domestic electrical apparatus without a concern for the dimensions and environments of an average home.

A Strong "Local" Field over Britain.

The conditions of transmission determine absolutely the prevailing ideology of receiver design. When broadcasting began, and I had established a strong "local" field all over Britain, and before Europe had copied my ideas, and when distant stations were weak, the common receiver had hardly any "tuning" at all.

Then the Regional Scheme demanded some selectivity. Now the raising of station power all over Europe has brought the problems of selectivity to a paramount importance.

I have shown you how the problem to get selectivity and quality is solved, to the extent which the limitations imposed by the futilities of transmission allow it to be, by having a receiver which accepts the carrier and one set of sidebands of the wanted station and completely rejects all other frequencies. The ideal receiver is one with a narrow movable window (the sides of which extend downwards into hundreds of decibels!), but just wide enough to see all that is worth seeing.

And I have shown you that it is easier to construct the "perfect receiver" if you use the superheterodyne principle. You can, by using the beat principle, design this desirable narrow window—this flat-topped band-pass filter—for a fixed invariable frequency.

Lastly, I ask you to recollect that, whatever is done, it is fundamentally impossible, in the present conditions of transmission, to

get perfection, because stations inevitably splash over into each other's territory—the upper frequency sidebands of one are on the same frequency as the lower frequency sidebands of the other.

Once more I have clearly shown this phenomenon in the picture in Fig. 1. Here you see the picture of the state of affairs where the fields of two stations are equal. They each invade each other's frequency territory.

If you are compelled to accept the bands of frequencies between the carrier of the wanted station and its sidebands, some of these sidebands must be cut off, because interfered-with quality will be lost.

Now, what I am going to say has import-

They always do, given a proper demand for their solution.

What are the disadvantages? First, that a receiver, now designed to embrace carrier and two sets of sidebands, would get half the strength of signal and the same amount of background noise.

Solution—the superheterodyne receiver. Difficulty—this is more expensive than the other type. Answer—not necessarily, and when technique is studied.

For instance, when I introduced long-wave broadcasting they said: "But this will make the receiver very much more costly." It did at first, but now European receivers are not more expensive than Australian, Canadian or American receivers where

long-wave broadcasting does not exist. In certain instances the contrary is the case.

Another argument is that it would be a costly matter to equip every European station with the necessary filters to "cut off" completely one set of sidebands.

That is true: it might, at a station like Brookmans Park, cost of the order of a thousand pounds to do one transmitter; but even if we say it's going to cost European transmission a quarter of a million pounds, one must recollect that perhaps twenty million people listen to broadcasting in Europe, and the capital cost of the change, per listener, does not come to more than a few pence. And the gain would, in a few years, be tremendous.

Reasons for Turning It Down.

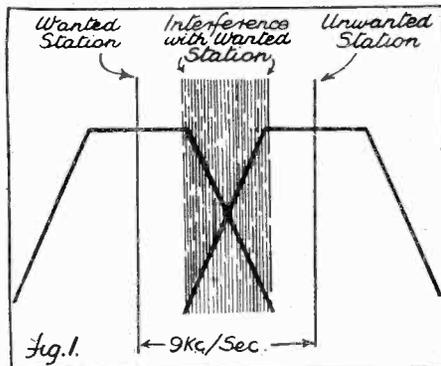
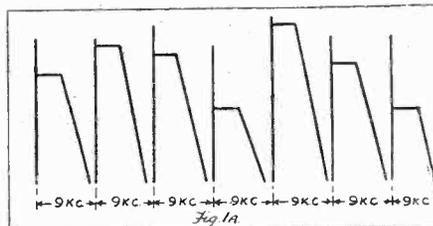
Of one thing you may rest assured: that if and when the proposal is made "officially" there will be plenty of reasons for turning it down.

I said the proposal was important. It is, even though no one will officially take much notice of it. It is important because, if adopted, it would eventually greatly ameliorate the listeners' conditions of reception. It would allow one to design a receiver which gave very good quality, even though the transmitters were only separated by 9 k.c./sec.

It would, it is true, cause dislocation. It would, so far as we can see at present, force us to use a particular principle of reception. But why not—if, in the end, it is a better principle?

THE PRESENT SYSTEM

In the diagram below you can see how two stations, each radiating a carrier, and two sidebands, interfere with one another over the shaded area.



AS IT MIGHT BE

Above is an illustration of what would be achieved with single sideband transmission. The present 9-kc. separation would be sufficient to obviate all sideband interference by even the most powerful stations. Although the cost of installing the necessary apparatus at the transmitting end would not be prohibitive, listeners would be limited to one type of receiver.

ance. This is the first time in broadcasting history—so far as I know—that the proposal I am about to make has been seriously put forward.

Suppose that the authorities were persuaded to send out only one set of sidebands plus carrier. This arrangement would ensure that the "spectra" of broadcasting stations would never overlap.

The rest of the problem lies with the receiver. I am very well aware that a great many problems remain to be solved, but they concern reception. And, in my mind, and taking the broad view, the problems would eventually get solved.



One of the Wearite screened coils which have made the new "P.W." set possible.

The Need For Selectivity—

Why POPULAR WIRELESS has designed "The New Everybody's Three."

UNDER the Lucerne Plan the majority of countries in Europe decided—on paper—that wavelength wandering of their broadcasting stations should cease. In practice plenty of frequency wobbling is still taking place, and heterodynes are by no means unknown.

Selectivity, and more selectivity, is still the cry of listeners, not only because they want to get foreign programmes, but because they need razor-sharp tuning to pick many of the British stations out of the welter of wavelengths.

Lucerne Plan Requirements.

The fact that the Lucerne Plan decrees very accurate frequency adherence by the stations that come under it also necessitates radio receivers that will be capable of very fine tuning, for the separation of the various stations is very small, and any spread of the receiver tuning is bound to result in "muddy" reception, even if

actual heterodyning interference is not present.

The problem of clean tuning is aggravated by the increase in power of numbers of foreign broadcasters, so that the unhappy owner of a non-selective set is always hard put to it to pick out any programme, other than his close local, absolutely clear of interference.

No Interaction.

To provide really sharp frequency selection in simple sets, some new screened coils have been placed on the market by Wearite, and these are used in "The New Everybody's Three," to be described in next week's POPULAR WIRELESS.

It is a simple three-valve set possessing a degree of selectivity that is astounding, especially when one considers that the coils that give it such razor tuning cost a matter of a mere 5s. each.

The coils are air-spaced and enclosed in a very strong metal screen, which completely precludes any possibility of interaction between them—a state of affairs that would immediately ruin the high degree of selectivity achieved by the set.

AS announced last week, Mullards have discarded the old-established method of valve mounting in their latest range, in favour of a fresh method. This consists of valve bases with studs instead of pins, fitting into holders with spring side contacts instead of sockets.

A more astounding change is the separation of the grid connection from the others in the same manner as has been popular in America for many years. The grid connection is made to the top of the valve—the position so familiar as that of the anode of the S.G. valve.

The new valves comprise a large section of a universal range for D.C. or A.C. operation, and include a "fixed" H.F. pentode (S.P.13); a multi-mu H.F. pentode (V.P.13A); an octode frequency changer (F.C.13); a double diode (2 D.13); an output pentode (Pen. 26); and a half-wave rectifier (U.R.1).

With the exception of the Pen. 26, which has a 26-volt heater, and the rectifier, which needs 20 volts, all the valves have 13-volt heaters. This brings them under the suitable-for-car-radio category. They all take 2 amp. and are indirectly heated.

It will be noted that the diode is a simple rectifier and not of the multiple type with triode, tetrode or pentode incorporated. The reason is that Mullards are reported to be definitely against the principle of multiple-function valves in this series, apart from the frequency changer.

The output pentode has an anode dissipation of eight watts and a mutual conductance of 3.4 ma/v. The rectifier gives 75 milliamps at 230 volts R.M.S.

on the anode. The valves, including the diode, are designed for 200-volt anode potential, with the exception of the pentodes, which will take 250 volts.

The H.F., octode and diode valves are metallised with the metallising connected to a separate contact on the base.

Another no-pin range—of two types, so far—has been brought out by Marconi in the L11 and H11 midget valves. These tiny amplifiers are for police sets, deaf-aid amplifiers and other receivers that have to be very small in dimensions.

The valves have contacts similar to the valves just discussed, but only four of them, as they are battery triodes. The filament

THE NEW PINLESS VALVES

Details of the latest universal mains types.



The new Mullard 2D.13.

voltage is 1 and the current 1 amp. The anode potential is 100.

In the case of the L11, the impedance is 12,500 ohms and the amplification factor is 5, while the H11 gives an amplification factor of 15 with an impedance of 30,000 ohms.

Some idea of the size of the valves may be obtained from the fact that, except for the width of the base, which is just too great, you can easily get one into an ordinary match-box. The exact measurements are height 60 m.m. and the external width of the valve-holder into which the base fits is only 26 m.m.

SIR JOHN AND HIS CRITICS

The Director-General scores a victory in the House of Commons.

THE much-publicised battle between Sir John Reith and a gathering of M.P.s. concerning the administration of the B.B.C. seems to have ended in complete victory for Sir John.

Much of the criticism was disposed of in a very short time, while the suggestion that Broadcasting House was seething with discontent at the rigorous, almost military, discipline enforced was negated by the production by Sir John of the memorial signed by 800 members of the staff indignantly repudiating any such suggestion.

Whatever the reason for the hostile campaign that has been carried out, and which the Director-General of the B.B.C. so ably swept aside, there seems little, if any, real foundation for it.

The suggestion that a "specialist" should be at the head of affairs in Portland Place is a ridiculous one. There are specialists looking after the various departments of the B.B.C.—dramatic art, variety, television and so forth—and this is right. But how could one specialist, or even two, look after the whole administration of the Corporation?

Position of the Expert.

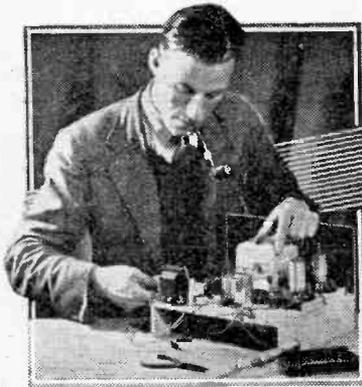
A variety king would be hopeless in financial matters, while a dramatist at the head of affairs would seriously upset the equilibrium of, say, the children's hour people or the light variety and dance band organisers.

What is required is a chief who is a student of psychology: someone who is used to and expert in the handling of men and women; someone who will weigh up suggestions and make decisions covering the naturally vast scope that a concern like the B.B.C. must cover. And that person is there now.

Sir John Reith and his colleagues at the helm of British Broadcasting have excellent advisers on technical matters covering the whole scope of the B.B.C., and have proved themselves remarkably amenable to expert advice.

The accusation that the B.B.C. is too inflexible is not well levelled. For a concern of its size it is reasonably flexible, and the reins of administration have been held in sensitive though strong hands.

In our opinion the anti-B.B.C. campaign, which Sir John Reith countered so well, deserves no credit.



The CONTRAPHASE 4

THE many special features of this design entail one minor problem in presenting it to our readers. The difficulty is to know how best to utilise the space at our disposal for describing it!

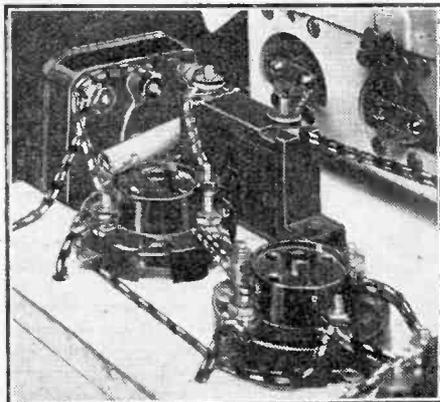
The fact that the set is a four-valver, which automatically converts itself into a "three" when adjusted for local-station reception, obviously calls for comment, because it is such an important point to those for whom running economy is a first necessity.

Further, the circuit is so unusual and pleasing that we are tempted to enlarge upon that aspect of the design: for its advantages are such that they need only to be detailed to achieve instant popularity amongst the discriminating.

Perfection of Quality.

In addition, we have to deal with the Class B output stage, giving the set that adequacy of power and perfection of quality which are still popularly associated only with mains-driven apparatus. (Many battery owners are naturally still somewhat incredulous about this new development, hardly realising how they are now free to obtain "mains quality," so we would like to explain how this is done in the Contra-phase Four.)

AN ECONOMY DRIVER



And finally there is the question of construction and of how best to operate the set, so that every builder of the design shall get with it the amazingly good results that we ourselves obtained with the original model.

In last week's article we could touch only briefly upon these subjects. But fortunately the construction is such a straightforward and simple job of work that little need be said about that aspect of the question.

Capable of working a large moving-coil loudspeaker at "mains" strength and quality, this special "P.W." design is nevertheless extremely economical to run. Class B output and an economy driver stage are automatically worked either from the detector alone or from an S.G. det. combination, the special Contra-phase control thus giving the set a most useful flexibility.

By the "P.W." RESEARCH DEPARTMENT.

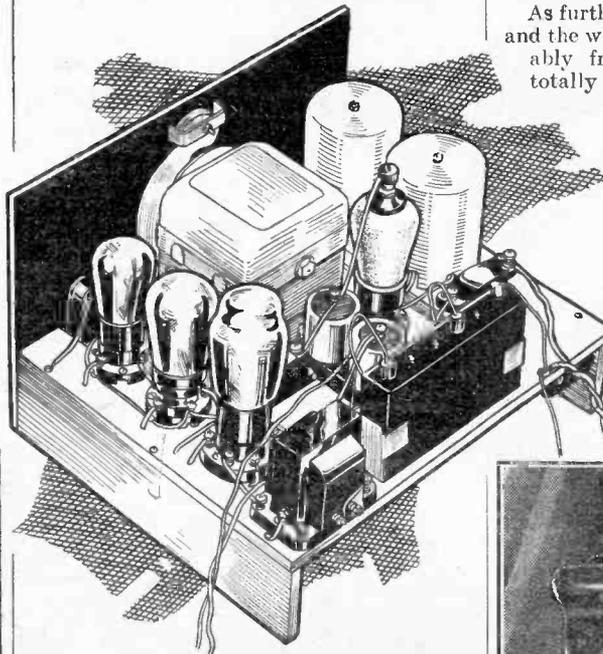
The diagrams of the above-baseboard and the below-baseboard wiring, already given, showed exactly where the components were placed relative to one another and how they were wired.

Most of our readers will have acquired such skill in set construction that everything will be perfectly clear to them. But the comparatively inexperienced may like to be reminded that each diagram carries a scale, and this enables any required measurement to be made without difficulty if a small rule is constructed to the scale and used to measure the diagrams.

Free From Complications.

As further photographs appear this week and the whole construction is really remarkably free from complications, even a totally inexperienced set builder need have no hesitation in undertaking the Contra-phase Four, provided he sticks to the components, etc., recommended.

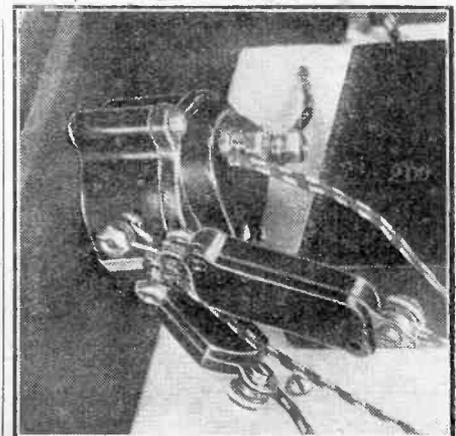
The operation of the set, however, and the bagging of the countless programmes which it is capable of providing, necessarily call for further explanation, because the set is so fundamentally different. Its very simplicity is somewhat disconcerting!



The Contra-phase simply bristles with interesting points, as the photographs of its construction indicate. For example (left), the driver valve, which plugs into the nearer valve-holder, has a special economiser circuit to reduce H.T. running costs.

The photograph to the right shows the all-important Contra-phase control, which shuts off the S.G.'s, H.T. and L.T. when they are not required. Above is a general impression of the set by our artist.

THE S.G. CONTROL



ACCESSORIES

- LOUDSPEAKER: W.B. Celestion, Magnavox, Rola, B.T.H., Epoch, Marconiphone, R. & A. H.M.V.
- BATTERIES: H.T. 120 volts.: Siemens, Lissen, Ever Ready, Pertrix, Ediswan, Drydex, Marconiphone, Grosvenor, Hellesens, or Block H.T. accumulators.
- G.B. 9 volts: Drydex, Siemens, Lissen, Ever Ready, Pertrix, Ediswan, Marconiphone, Grosvenor, Hellesens.
- L.T. 2 volts: Block, Lissen, Pertrix, Ediswan, Exide, Oldham, G.E.C.

Actually it is uncommonly easy to handle, and you will very quickly find out for yourself how responsive each control is and how beautifully the set "answers the helm," as it were.

But, to begin with, you must have a clear idea of exactly what is the function of each control knob. So we will consider them in turn and in detail.

(Continued on next page.)

THE CONTRA-PHASE 4

(Continued from previous page.)

Right in the centre of the panel is the single tuning control which operates the two-gang "0005." When the set is operating as a four-valver both the 0005-mfd. sections are in use. But when it is converted automatically into a three-valve receiver, by switching out the high-frequency amplifying stage (VI), only the nearer-panel section of the condenser is active.

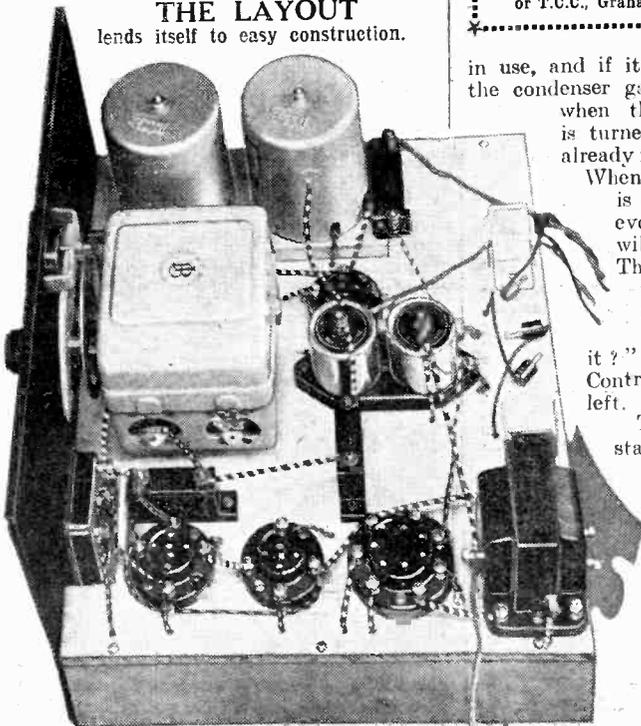
The tuning is carried out exactly the same in both instances. But we mention this automatic cut-out of half the condenser because it explains why adjustments of the trimmer, provided at the back of the condenser assembly, can only be effective when the set is "four-valving."

Changing from Two to Three Valves.

This change-over from three to four valves, and vice versa, as well as the control of volume, are all embodied in the adjusting knob immediately below the tuning control. It is marked "Volume Control and On-Off Switch" on the panel diagram, but, for simplicity's sake, we will now christen it the Contra-phase control.

The whole operation of the Contraphase principle depends upon the action of this volume control, so it plays a very important part in the set's working. All that we need notice about it at the moment, however, is that we shall call it henceforward the Contra-phase control; and it not only governs volume, but, in addition, it controls the automatic change-over from three to four valves, because it also switches the S.G. valve on or off.

THE LAYOUT lends itself to easy construction.



Clips for the G.B. battery are fixed to the baseboard.

Apart from the tuning and Contraphase controls, there are just the two others on the panel. These are reaction (to the right) and (to the left) the set's on-off switch, which is of the combination type, permitting the wave-changing to be carried out as well.

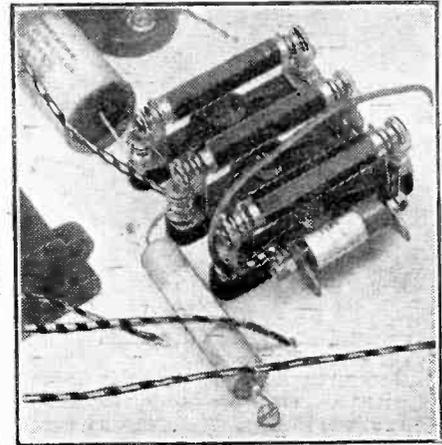
All we need say about this latter control is that it is an ingenious and trouble-free component which combines the duties of the ordinary on-off switch and wave-change switch in the one instrument. Reaction, too, can be dismissed in a few words, it being a straightforward application of the usual differential principle.

The Condenser Trimming.

Now to consider the Contra-phase control. When this is turned full round in a clockwise direction it connects the aerial to the screened-grid valve's input.

In this position the set works as a four-valver and the volume is at a maximum. Both halves of the tuning condenser are

FOR SAVING H.T.



The "Westector" flexes the driver-valve's output to meet the strength of reception required. It is wired alongside one of the resistances.

COMPONENTS FOR THE CONTRA-PHASE

- | | |
|--|---|
| 1 J. B. Unitune 2-gang 0005-mfd. tuning condenser. | 1 Dubilier 0001-mfd. fixed condenser, type 670. |
| 1 Lissen 2-gang coil unit with on-off switch, type L.N.5161. | 1 Dubilier 00005-mfd. fixed condenser, type 665, or T.C.C. |
| 3 W.B. small-type 4-pin valve holders, or Telsen, Benjamin, Lissen. | 1 Graham Farish 100,000-ohm 1½-watt type Ohmite resistance in horizontal holder. |
| 1 W.B. 7-pin valve holder, or Benjamin, Telsen, Lissen. | 1 Graham Farish 50,000-ohm 1½-watt type Ohmite resistance in horizontal holder. |
| 1 Telsen screened binocular H.F. choke, or Graham Farish. | 1 Graham Farish 200,000-ohm 1½-watt type Ohmite resistance in horizontal holder. |
| 1 Graham Farish screened H.F. choke, type H.M.S., or Bulgin, Telsen, Wearfe. | 1 Erie 30,000-ohm 1-watt type resistance with wire ends or terminals, or Dubilier, Graham Farish, Bulgin, Varley. |
| 1 Telsen 0003-mfd. differential reaction condenser, or Graham Farish, B.R.G., Polar. | 1 Lissen 2-meg. grid leak with wire ends, or Varley, Bulgin, Erie, Dubilier. |
| 1 R.I. Hypermite L.F. transformer, or Varley, Lissen. | 1 Westinghouse "Westector," type W.4. |
| 1 Igranite Class B driver transformer, or Varley, Ferranti, Lissen, R.I., B.R.G. | 1 Bulgin 50,000-ohm potentiometer with on-off switch, type V.S.36. |
| 1 B.R.G. Class B output choke, or Ferranti, R.I. | 1 pair Bulgin grid-bias battery clips, type No. 1. |
| 1 T.C.C. 2-mfd. fixed condenser, type 50, or Graham Farish. | 1 Peto-Scott panel, 12 in. × 8 in., or Goltone, Permeol. |
| 1 Dubilier 5-mfd. fixed condenser, type 4466, or T.C.C. | 1 Peto-Scott Metaplex chassis, 12 in. × 10 in. with 2½-in. runners. |
| 2 T.C.C. 1-mfd. fixed condensers, type 250, or Dubilier. | 1 Bulgin twin-plug strip, type P.30A.E. |
| 1 Dubilier 0002-mfd. fixed condenser, type 620, or T.C.C., Lissen, Graham Farish. | 2 Clix accumulator spades, or Belling Lee, Bulgin, Ealex. |
| 1 Dubilier 0001-mfd. fixed condenser, type 620, or T.C.C., Graham Farish, Lissen. | 5 Belling-Lee wander-plugs, or Clix, Bulgin, Ealex. |
| | 1 Belling-Lee fuse type wander-plug. |
| | 1 Belling-Lee anode connector, or Clix. |
| | Flex, screws, etc. (Peto-Scott). |

in use, and if it is necessary to "trim" the condenser ganging this can be done when the Contra-phase control is turned fully to the right, as already mentioned.

When properly trimmed the set is extremely sensitive, and even the very distant stations will come in at fine volume. The local station, however, will then be overwhelmingly strong.

"What's to do about it?" Simply this: Turn the Contra-phase control full left.

This will reduce the local station to the required lower volume. At the same

time, and quite automatically, it will switch out the S.G. valve and make the necessary change-over to the aerial connection to convert the set into a three-valver.

Intermediate Volume Levels.

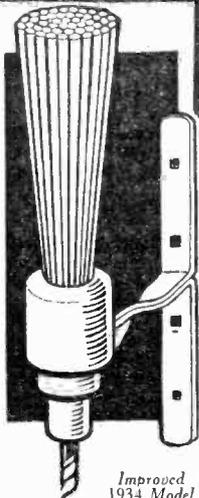
As a matter of fact, you could, if you liked, take the H.T. + 1 lead right out of the battery without making the slightest difference to reception when the set is operating in this manner (with the Contra-phase control full left), for only the detector, driver and Class B valves are then operative.

In the intermediate positions of the Contra-phase control the S.G. valve is on, but intermediate volume levels are obtainable, thus enabling the set to cope with any desired strength of reception.

ALL ABOUT THE FOUR VALVES

Make	S.G.	Detector	Driver	Class B Output
Cossor ..	220S.G.	210H.F.	220P.A.	—
Mullard ..	P.M.12A.	P.M.1H.L.	P.M.2A.	—
Mazda ..	S.G.215	H.L.2	P.220	—
Marconi ..	S.22	H.L.2	L.P.2	B.21
Osram ..	S.22	H.L.2	L.P.2	B.21
Hivac ..	S.G.220	H.210	—	—
Tungsram	S.220	H.R.210	—	—
Dario ..	T.B.422	T.B.282	T.B.122	—

SCRAP THOSE "DRUNKEN" POLES!
NO-MAST
THE WORLD'S BEST
AERIAL
REQUIRES NO POLE



Improved 1934 Model

Only outdoor aerials give the best results. Follow the example of leading Radio experts and B.B.C. officials and install the "No-Mast" Aerial, which costs much less to buy and erect than the unsightly, troublesome pole aerial. The "No-Mast" Aerial is scientifically made, and will definitely improve range, volume and selectivity. A boon to flat-dwellers, enabling them to have an efficient outdoor aerial.

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Please send to my address:

1. ONE NO-MAST AERIAL (P.O. for 10/6 enclosed.)
2. DESCRIPTIVE FOLDER (Strike out item not required.)

NAME

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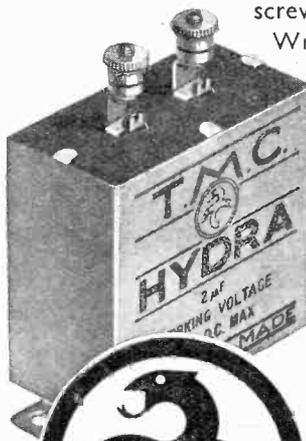


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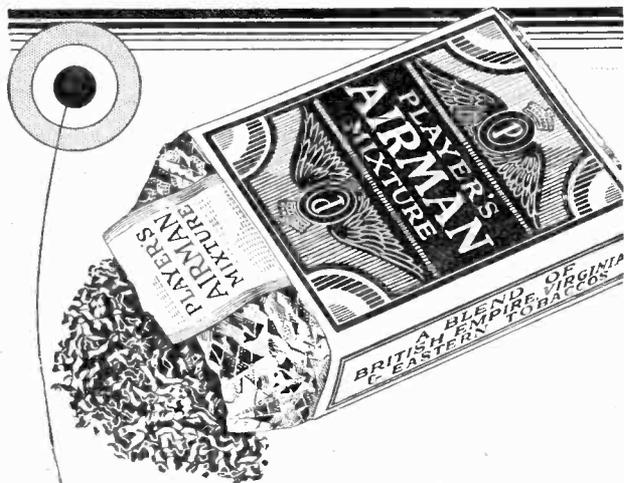
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TESTED AND FOUND

Being Leaves from the Technical Editor's Notebook

THE "NO-MAST" AERIAL

It can be stated as a general rule that the most efficient aerial is one that is erected out of doors. And presumably this is widely known, for wherever there are a number of gardens to be seen there are all kinds of radio antenna to disfigure the scene.

Short masts, tall masts, thin masts, thick masts, and nearly all of them bent in the middle or leaning over!

And yet there is a quite inexpensive alternative which is neat and perfectly unobtrusive. I refer to the "No-Mast" Patent Aerial sold by Central Equipment, Ltd., 188, London Road, Liverpool.

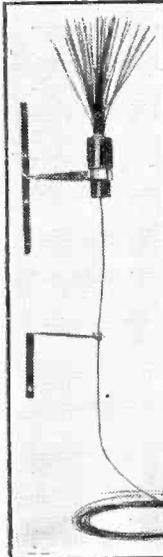
It comprises a bracket fitting for fixing to the side of a chimney stack or to a wall. A substantial insulator carries a group of thick conductors. It is not necessary that these should be sprayed out, as shown in our photo, for the results differ very slightly in that condition from when they are allowed to remain tidily bunched.

They were separated in our model during our experiments and allowed to stay like that when the photo was taken in order to illustrate the more clearly the construction of the apparatus.

We conducted our tests on a comparative basis, and the "No-Mast" was tested both indoors and outdoors against ordinary indoor and outdoor aerials. In each case the "No-Mast" showed up very well indeed. And at this juncture it may be as well to remind you that there are patent aerials and patent aerials.

You must not confuse this "No-Mast" arrangement with those aerial devices which dispense entirely with any ordinary antenna and for which all kinds of extravagant claims are made.

Note the simple fixing of this efficient outdoor aerial. Two brackets only to fit.



The "No-Mast" definitely has an excellent "pick-up," and many who already have outdoor aerials should be able to turn to it with real advantage.

CLIX NINE-PIN VALVE HOLDERS

Eight years ago or so no valve had more than four pins. Then came the S.G. and others demanding five. Last year double-diode triodes and double-diode pentodes blossomed forth with seven pins. This year the number has been raised to nine!

And here let us hope it ends. You wouldn't have to take me back very many years to make me say that a nine-pin valve and a nine-pin valve holder could only result in very serious trouble.

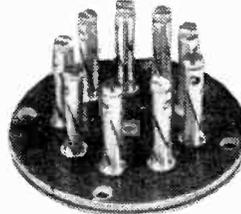
But the modern valve is made within precision limits, and the spacing and pattern of the pins on the one does not vary a hairbreadth from any other. That is, among the well-known makes.

And there are valve holders to match them. The new nine pins are already catered for by Messrs. Lectrolinx Ltd., 79a, Rochester Row, London, S.W.1, and very well catered for, too.

Their "Clix" nine-pin valve holder is of the chassis-mounting type. Efficient contact is assured at each pin and the insertion and removal of the valve made smooth and easy by the adoption of a patent method of maintaining resilience in and at each pin. And to obtain such a completely successful result with nine pins is an achievement.

Despite the necessarily close grouping of the pins, the inter-pin capacity is quite negligible. Indeed, its low-loss character shows up many a four-pin holder!

There are terminals for the wiring, and these take the form of milled and slotted screws.



The necessarily close grouping of the pins in the Clix nine-pin valve holder has not given rise to any appreciable capacity. Wiring can be carried out quickly by means of the terminals provided.

PIFCO'S "ROTAMETER"

Meters are quite essential to the proper maintenance of a radio set, and the constructor, or even listener, who attempts to dispense with them works in the dark.

Obviously, H.T. and L.T. batteries require periodical testing in order to check their conditions, and it is vital that a G.B. battery should be tested at regular intervals, otherwise there may be an undue expenditure of H.T. or, perhaps, a more or less serious emission load on a valve that could do it irreparable harm.

Mains sets also demand "metering" if they are to be kept up to scratch. And in this case H.T. currents should be checked at intervals. In the case of definite faults arising, meters are indispensable. And often with their aid faults can quickly be found and expensive servicing and long programme delays avoided.

Very expensive instruments having laboratory degrees of precision are not required. On the other hand, moderate accuracy and complete reliability are essential.

In my opinion, these vital requirements are perfectly met by the new Pifco "Rotameter." This



Jottings of Interest to Buyers.

By G. T. KELSEY.

IT'S a very far cry from the first Cossor "Melody Maker," with its bulky solenoidal coil (remember it?), to the one which has just been produced. But in the years which have elapsed since that old favourite first made its appearance the fame and prestige of Cossor's famous "Melody Maker" series of constructor kits have become world-wide, and it is a safe conjecture that the latest one, to be known as the Model 340, is destined to be a winner, too.

Cossor's are always so very thorough about everything they tackle. I speak from experience, for my associations with this

costs only 29s. 6d., complete with substantial leads, and yet it is eight meters in one.

The one compact device provides the following ranges:

(1) 0-8 volts for L.T. voltage tests. (2) 0-30 volts for testing grid-bias batteries. An extremely useful range this, and one that seldom figures on multi-range instruments. I presume we are usually supposed either to test the battery in sections (very tedious) or to rely on the H.T. range (and seriously restrict the checking). Pifco are to be complimented on this innovation alone, for G.B. testing is, as I have already indicated, probably the most important test of all.

(3) 0-250 volts for H.T. tests. (4) This is another original and most valuable voltage range by which the small battery enclosed within the instrument can be tested at any time merely by turning the range-control knob.

It has always seemed to me a weak point in the ordinary multi-range instrument that its own battery has to be taken out and tested.

(5) 0-20 milliamperes for individual valve tests, etc. (6) 0-100 m/a. for testing total H.T.s. (7) 0-250 m/a. ditto. (8) This is a useful 4,000 ohm filament, resistance and general continuity test range.

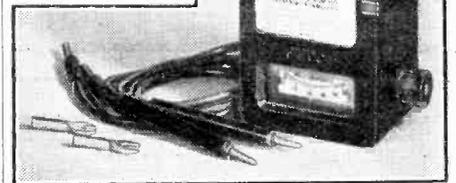
Now, you do not have to dig out all these ranges from one scale having on it a multiplicity of figures. The little knob on the side which enables you to switch from one range to another also completely changes the dial.

So really this wonderful "Rotameter" is the perfect electrical chameleon. When, for example, you turn the knob to "30 volts" the instrument is then, from all outward appearances, as well as in its internal arrangements, a 30-volt voltmeter, and it could not possibly be confused with anything else.

Likewise, if the knob is turned to "20 m/a.," you then have a milliammeter reading to 20 milliamperes, not an obvious adaptation.

The "Rotameter" incorporates a fuse as a safeguard against careless handling, and it is beautifully

"Eight meters in one" is the apt description which the Technical Editor gives to this new testing instrument.



made. Its needle gives a dead-beat action and close response on all its ranges.

All who are interested—and I believe that must be every owner of radio equipment—should at least write to the makers, Provincial Incandescent Fittings Co., Ltd. of Pifco House, High Street, Manchester, for "Rotameter" literature.

enterprising radio firm go back many years, and I recall with pleasure several happy hours spent within the precincts of their vast technical laboratories. They always used to remind me of a sort of technician's conception of Paradise, and whenever I got inside I used to experience the greatest difficulty in dragging myself away. That was seven or eight years ago, and bearing in mind the tremendous strides that have been made since then, I am afraid that if I went into their labs, to-day I should find so much to interest me that I should never want to come out!

The Latest Melody Maker.

It is my recollection of the many "rabbits" that have been brought out of the Cossor laboratory "hat" that gives me the confidence to speak so very highly of this their latest effort, for it was in these same labs. that the latest "Melody Maker" was born. It's true that I have not yet had an opportunity of testing it; but, knowing Cossor's products, I have no fear of the issue.

This latest model, which is for battery operation, is similar in general appearance

(Continued on page 98.)

The WAVELENGTH PROBLEM

in TELEVISION

by G.P. Kendall B.Sc.



THERE would seem to be a good deal of misapprehension about the real meaning of the wavelength problem in television, and this is only natural if one goes by the "explanations" in the daily Press, from which it would appear that certain special waves have been found to give *inherently better results*, for some mysterious reason not specified!

It is decidedly important to get to the bottom of the question if one hopes to understand future developments, so I propose to go into it with some thoroughness this week.

The general principles are not at all difficult to follow, because there is a perfectly logical basis for the whole thing: it is nothing to do with certain special waves possessing strange properties which cause them to carry the picture better than others!

Not Merely Due to Wavelength.

I must make this very clear, and I think the following practical illustration will help. Suppose that the apparatus now used by the B.B.C. for the normal television service were to be connected up to a short-wave transmitter instead of one working on the broadcast band, so that the picture was radiated on, say, ten metres.

Should we get any better results at the receiving end? Most certainly we should not, and we should find it difficult to prevent them from being slightly worse, as a consequence of the greater difficulty of making correct adjustments in the receiver.

Of course, I am assuming here that the modulation circuits of the short-wave transmitter would be similar to those of the ordinary broadcast-wave station.

The whole point is simply this: on any given wavelength there is a practical limit to the fineness of picture detail which it is feasible to transmit, and this limit gets wider and wider as the wavelength grows shorter. Consequently, on a really short wave it is possible to use television apparatus designed to take advantage of the fact, the real difference thus being more in the television gear than the radio.

A Matter of Detail.

Let us see if we can get a clear idea as to how this comes about. It is all based on the fact that the fineness of detail in the picture settles the range of frequencies which the radio transmitter is called upon to handle.

If we want very good detail our transmitter must deal with extremely high frequencies, and that is where the difficulty comes in on the ordinary broadcast wave-band.

On these waves stations may not transmit frequencies higher than 9,000 cycles per second, lest they cause interference with others on near-by waves. This state of

affairs is really a consequence of the chronic overcrowding on these waves, for if we could devote almost the whole range to one television transmitter the ban could be lifted, and although there would be certain practical difficulties it would be possible to transmit pictures in much finer detail.

On the short waves conditions are very different, for here we are dealing with

Short waves have been hailed as a heal-all for television troubles, but this article contains a timely warning on the subject. It also explains exactly why ultra-short waves have been favoured by televisionaries—a topic of special interest in view of the B.B.C.'s recent experiments from the aerials on Broadcasting House, London.

enormously high frequencies, and a range up to even 50,000 cycles in the modulation frequency represents only a very small percentage difference in the frequency of the carrier-wave. Just what this means in terms of practical tuning problems we shall see as we go farther into the question.

To get a preliminary idea let us see what the modulation frequency is in terms of the

carrier frequency if the wavelength is ten metres: this wave is equivalent to a frequency of 30,000,000 cycles per second, and a modulation frequency of 50,000 is only about .166 per cent of this figure!

Now let us see what amount of "spread" we should get in this case. It will be enough for our purpose if we calculate it in just one direction, so let us see how far *downwards* the interference will spread.

Plenty of Room for Stations.

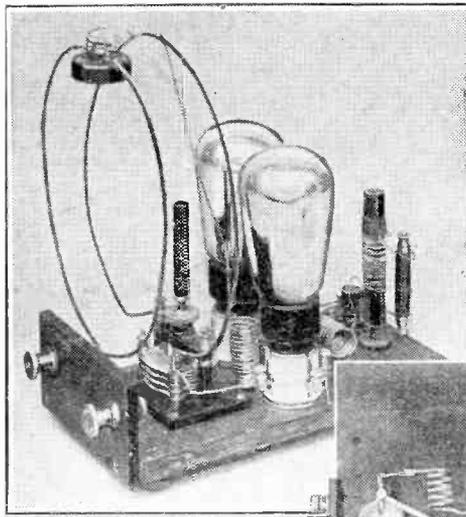
On working it out we find that it extends as far as a wavelength of 9.983 metres, so it is evident that quite a number of high-quality television transmissions could be accommodated between, say, 7 and 10 metres.

The actual results which can be obtained with a frequency range extending up to 50,000 would be decidedly good. Just how good they would be is very difficult to explain in words; but we shall get some idea if we remember that this is more than five times the modulation range permissible with the present transmission, so that theoretically we should expect accurate reproduction of details at least five times as fine as those we now see.

The figure of 50,000 for the limit of modulation frequency is just one which I have taken for purposes of explanation, by the way. Even higher frequencies than this have been used in short-wave experiments, both in this country and abroad.

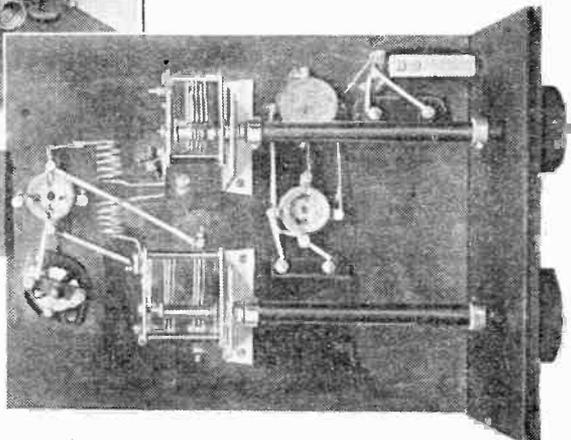
Probably we shall get a clearer conception of the improvement possible on short waves if we think in terms of the greater number of scanning lines which could be used. This, of course, is the factor which settles the range of the modulation frequencies, a high scanning frequency calling for a proportionately wide range.

(Continued on page 98.)



THOSE ULTRA-SHORTS

These photos of apparatus used on the ultra-short wavelengths show that it differs widely from ordinary receiving gear, as Mr. Kendall points out, especially the very long extension handles in the receiver (to the right), these being necessary to minimise hand-capacity effects.



OSCILLATOR.

Apparatus for producing oscillations. Similarly, an oscillator valve is a valve employed for the purpose of producing continuous oscillations.

PARASITICS.

A term often applied to atmospherics, but also used as an abbreviation of "Parasitic Oscillations" (Parasitics).

Parasitic oscillations are spurious oscillations generated in an amplifier. They used to be frequently encountered in neutralised circuits, and are now sometimes evinced in Class B amplifiers.

The usual cure is to introduce series resistance in order to damp them down.

PEAK VOLTAGE.

The maximum voltage reached by an alternating current.

It is vital that any components used in a circuit in which there is an alternating current should be designed to withstand the peak and not just the average value.

Although A.C. mains may be rated at, say, 250 volts, at every half-cycle the voltage will rise to approximately 357 volts, and it is this voltage which represents the "working" voltage a condenser, for example, should be able to stand up against.

TONE CORRECTION

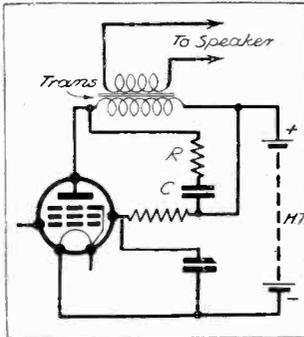


Fig. 1.—This diagram is identical with Fig. 3, except that a tone corrector (consisting of a resistance R and condenser C in series) is joined across the primary of the output transformer.

To estimate a peak voltage, divide the effective (R.M.S.) voltage by seven and multiply this result by ten.

PENTODE.

This is a valve in which there are three grids, in addition to the anode and filament. The diagram of Fig. 2 illustrates the positions occupied in the valve by these various electrodes.

As will be observed, the grid nearest the filament is the control grid, and the task this performs is similar to the grid in a three-electrode valve, i.e. to enable the input energy to control the electron stream and so cause anode-current fluctuations.

The screen grid comes next, and this is given a positive

All About Pentodes

Continuing our special series for beginners, pentodes, peak voltages, parasitics and permeability are among the radio terms clearly explained

by G. V. Dowding
Associate I.E.E.

potential slightly less than that of the anode.

The purpose of this scheme is to enable a higher external resistance to be employed (anode impedance), across which greater voltages are developed and thus a higher amplification obtained.

In the case of the ordinary triode a limiting factor on amplification is the variation of effective voltage on the anode due to voltages set up across the anode impedance—the windings of a loudspeaker, for example. The anode current is stabilised by the screen grid, which in effect provides a filipp for the electrons on their way to the anode.

In the H.F. pentode the screen grid also has the job of reducing the anode-grid capacity.

The third grid is known as the suppressor grid, and is placed between the screen grid and anode. It is joined internally to the filament or cathode.

Secondary Emission.

The suppressor grid eliminates secondary emission effects. Secondary emission is caused by the electrons from the filament striking the anode, from the metal of which electrons are released by the collision.

These electrons would, were the suppressor grid not there,

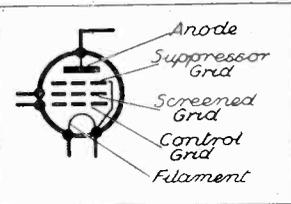


Fig. 2.—Showing the three grids of a pentode and how they are arranged inside the bulb.

pede to any extent the electrons arriving from the filament, for these are given fresh impetus by the screen grid.

The L.F. pentode which is used in the output stage of a set needs special "matching." The transformer or choke suitable for the anode circuit of an ordinary power valve has not a sufficiently high impedance.

As the screen grid operates at a slightly lower voltage than the anode it can be connected to the H.T. by a small dropping resistance, see Fig. 3 and Fig. 4. A fixed condenser is needed to "decouple" this electrode.

High-Note Response.

Pentodes tend to give prominent treatment to the high notes. This is sometimes an advantage, and provides compensation for high-note reduction due to peak tuning, reaction, etc.

If, however, the high-note, exaggeration is still too great a simple tone corrector will equalise the response. For instance, a resistance and condenser in series can be joined across the anode choke or the primary of the transformer, if one is used. (Fig. 1).

Average values for these are 101 mfd. and 15,000 ohms.

The H.F. type of pentode is made in variable-mu form. That is, its control grid is so fashioned that varying a negative grid bias on it varies the amplifying power of the valve.

FULLY DECOUPLED

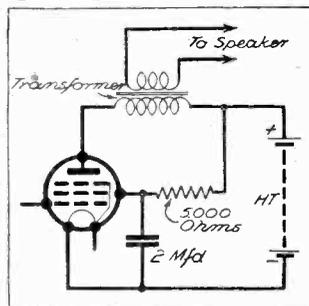


Fig. 2.—In this case the voltage from the maximum tapping of the H.T. battery is taken to the screened grid through a 5,000-ohm dropping resistance, a 2-mfd. condenser being used for decoupling.

around the circuit comprising the screen-grid H.T. battery and filament. This must be added to the anode current, for it often amounts to three or four milliamperes.

PERMANENT MAGNET.

A magnet which retains its magnetism for an indefinite time after being initially magnetised. Steel in one form or another is employed for permanent magnets, and in moving-coil loudspeakers special cobalt steels are generally used.

A great amount of research has been applied to the development of these cobalt steels for the magnetic systems of loudspeakers, the object being to obtain the greatest magnetic intensity with a given mass of metal.

PERMEABILITY.

The conductivity of a material to magnetic lines of force. It can be compared with conductance in current electricity. Air and other substances that are electrical

A LOWER VOLTAGE

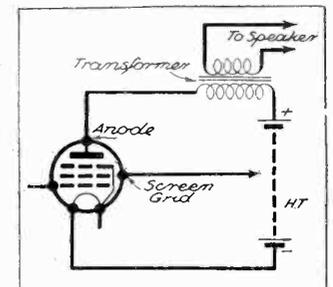


Fig. 4.—The screened grid is given a positive potential slightly less than that of the anode.

insulators have a permeability of unity.

Permeability is an important factor in the design of L.F. chokes and transformers. Obviously the greater the permeability of the core of for example, an L.F. transformer the greater will be the concentration of the lines of force, with a consequently greater inductance for a given number of turns of wire.

PHOTO-ELECTRIC CELL.

A kind of valve for transforming light into electrical current. It consists of a glass bulb from which the air has been extracted (and which sometimes is filled with an inert gas) and a cathode and anode.

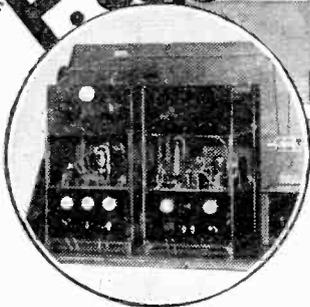
The cathode is the active electrode, and is usually of silver or copper coated with a thin film of caesium or rubidium. When light falls on the cathode, electrons are released from it and thus current flows.

Photo-electric cells have many applications. They are used in television, talking pictures, alarms, indicators and in many different scientific instruments.

Another use for the H.F. pentode is as a combined oscillator and detector (mixer) in a super-heterodyne circuit.

When gauging the H.T. current taken by any pentode it should be remembered that a certain amount of current flows

"P.W.'s" Show Station



In 1932, visitors to the "Popular Wireless" stand at Radiolympia examined with immense interest the complete short-wave transmitting and receiving station which was on view. This station now has a permanent home at the Science Museum in London as typical of modern amateur broadcasting.

IN the Nov. 18th, 1933 issue of POPULAR WIRELESS there was described "An All-band Short-wave Receiver" which formed part of a complete amateur transmitting station lent to the Science Museum in London by POPULAR WIRELESS. In the article it was mentioned that it might be possible later to give a full description of the station.

Readers who visited the 1932 Radio Exhibition at Olympia will no doubt remember seeing the outfit on the "P.W." stand, and it was on account of the large amount of interest which it attracted that it was eventually decided to lend it to the Science Museum at South Kensington.

A Crystal Controlled Transmitter.

In the accompanying photograph you see the station as it appears in the Museum. It was specially taken by the authorities so that readers could see it as it appears "in real life." As I mentioned just now, the outfit is a complete transmitting and receiving station. It is designed for operation on the 150-170-metre amateur band, and the transmitter, which is crystal controlled, can be set to work anywhere within this band by the use of a suitable crystal. The receiver is rather more flexible, for it covers all wavelengths between 16 and 200 metres. Altogether, an equipment that would delight the heart of many short-wave enthusiasts.

The transmitter comprises the two units, or frames, on the extreme left of the picture. The one nearer the end of the desk contains the crystal-controlled oscillator and radio-frequency power amplifier, while the other houses the modulator section.

The crystal oscillator works at the fundamental frequency, and the crystal that was actually used in the transmitter is ground for 170 metres. The valve, which is of the small-power type—with an indirectly-heated filament—has about 200 volts on the anode.

The H.F. Amplifier.

The power input to this valve is of the order of 5-6 watts, and its anode current is read on the right-hand meter of the three. In order to increase the power output of the transmitter the oscillator is followed by a radio-frequency power amplifier. This valve is also of the ordinary power type, but is, of course, somewhat larger than the crystal-controlled oscillator.

The input to this valve is normally of the order of 10 watts, but if necessary it can be pushed up to about double this figure. The anode voltage is rather low for transmitting purposes, being in the neighbourhood of 250 volts, but this is necessitated in order to get the right ratio of anode current to

anode voltage for optimum results on telephony.

The tuning controls are located on the upper panel, as is also the aerial current ammeter. Note the tuning coil in the upper part of the frame.

When it is desired to use the transmitter for telephony it is necessary to modulate the carrier-wave. This is done with the aid of the unit contained in the second frame. It is really a large low-frequency power amplifier, capable of considerable output. This amplifier consists of a first and second stage of L.F. amplification, and finally a large-power valve which, instead of supplying a loudspeaker, feeds into the transmitter proper and so modulates the carrier-wave.

Interesting Modulator Section.

The modulator section of a transmitter is in many respects very interesting, for it has to be capable of handling a large amount of power and is nearly always larger than the transmitter itself. In order to modulate fully a 10-watt carrier it is desirable to

page, the power unit for the modulator is located behind the bottom panel. It consists of a 550-0-550-volt transformer with two half-wave rectifying valves. The left-hand meter on the panel indicates the anode current taken by the modulator valve, while the other one shows the amount of current taken by the microphone.

Microphone or Pick-up.

The input of the modulator can be changed over to either microphone or pick-up by means of a switch below the right-hand meter. The volume control is situated in the centre of the middle of the panel, while two switches below are used to turn on the high- and low-tension supplies respectively.

The electric turntable and pick-up can be seen on the extreme right, with the microphone slightly to the left. Behind the microphone is the main switchboard, from which the various parts of the apparatus can be controlled.

Another interesting feature of the station is the electric clock. This is of the synchronous type, and in these days of time-controlled supplies these clocks can be relied upon to keep excellent time.

Simple Receiver.

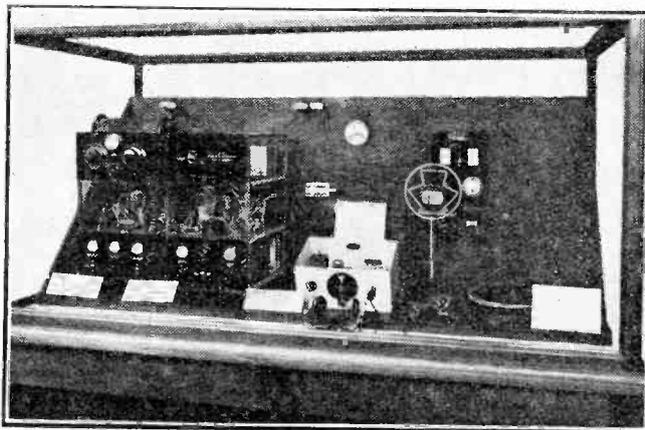
The receiver has already been described, but for those who did not read the article it is a simple two-valve affair employing a detector and one stage of low-frequency amplification. The various wavebands are covered by means of interchangeable coils, and the whole set is contained in a specially designed metal cabinet.

Parallel-fed transformer coupling is utilised, and a jack is provided to take the plug attached to the telephone leads and to switch the set on.

All those readers who are interested should make a point of going along to the Science Museum to see the station. It is situated in the main hall of the Wireless Section, together with a number of other interesting exhibits, and if at any time you have an afternoon to spare you could have a very interesting few hours making a tour of inspection.

F. B.

AS IT LOOKS TO VISITORS



Here is the complete station as assembled at the Museum in its glass case. The various portions of the apparatus are described on this page.

have a valve in the modulator section capable of supplying at least 5 watts of undistorted power, which would mean, normally, a dissipation of something like 25 watts.

The one being described, however, is somewhat larger than this. The valve will supply 20 watts of undistorted power, sufficient to modulate a 20-watt carrier-wave. This leaves plenty of power in hand, but does not require an exceptionally high anode voltage.

Returning to the photograph on this

RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article.

All Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

All inquiries concerning advertising rates, etc., to be addressed to the Advertisement Offices, John Carpenter House, John Carpenter Street, London, E.C.4.

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and appliances described may be the subjects of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so.

QUESTIONS AND ANSWERS

TWO DIAL TUNING.

A. E. E. (Chester-le-Street).—"The old set had just the two dials, tuning and reaction. And I had got thoroughly used to handling these, so I never lacked a good supply of foreigners when I got down to it.

"I do not keep a regular log of programmes received, like some people, but I will swear I must have had over fifty different stations—at various times, of course, not all in one sitting.

"Now the trouble is that the new set has three dials—1st tuning, 2nd tuning and reaction. But I have still only got two hands. So I get a bit tied up with it.

"The instructions say, 'Keep the two tuning dials in step, and reaction will seldom be necessary.' All very fine, but what exactly is this 'in-step' business?

"And then, again, small knobs don't help. They evidently think the reaction won't be used much, as they have given me a dial on it which is only about one-third of the size of the tuning knobs. Wouldn't it be better to have a bigger one fitted?

"My feeling is that the set is a far better one than the old one, but I don't seem to be working it right. The quality is just grand. And what foreigners I do manage to get come in with as much of a thump as North Regional or National. But there are too many tuning knobs for my liking.

"So if you can put me wise like when I first had the other one I reckon I shall be the envy of the neighbours yet."

There is a world of difference between handling one of the single-tuned-circuit receivers (like your old set) and one which has two separate tuning dials as well as reaction. And this difference lies in the relative importance of the reaction control.

We are speaking, of course, of long-distance reception particularly; and it is safe to say that thousands of two-tuning-circuit sets fail to give the good results of which they are capable because their owners fail to tune them properly.

With any set which does not employ an S.G. valve the great idea is to tune with one hand and keep the reaction closely supporting the tuning with the other hand. That was what you did with the old set.

But when there is an S.G. stage between the aerial and detector the two tuning dials are the important ones, and the reaction has to take a back seat.

Instead of having to nurse the set and keep its reaction close to the oscillation point, the great thing is to get both tuning dials correctly set. Most of the time the reaction can be left at minimum.

So to search for distant stations with a set of your present type you should operate normally with one hand on each tuning dial. Whilst the first condenser reading is slowly increased with the left hand, the right hand turns the second tuning condenser backwards and forwards a little at successive dial positions; this keeps the second dial-reading at somewhere about the same value as the first dial-reading.

But whereas the first (left) hand turns continuously upwards, the second (right) hand is more active, and keeps dodging back and forward a little way to make sure nothing has been missed; though its general tendency is to keep pace with the left-hand

dial as this progresses from the bottom to the top of the range. (Or vice versa, if you are tuning down, from top to bottom of the dial.)

(If that seems a bit complicated, read it again with the set in front of you. It is really simple enough, but naturally there is much more difficulty in setting it out word by word than in actually doing it.)

As soon as an unfamiliar station is heard the left-hand dial settles on the position where the programme was picked up, and stays there. The right-hand dial hovers, as usual, for a moment on the similar and adjacent-dial readings, until the two dial-readings "come into step." There will be no doubt about it when this happens, because at just that one particular adjustment a very marked increase in volume is noticeable.

Having got the two tuning dials in step in this way, you can then bring up the strength still farther by reaction if this is necessary. But you will find that very often the mere act of getting the tuning dials in step is quite sufficient, reaction being a sort of luxury you can keep in the background.



SCREENED H.F. LEADS

FOR BETTER RADIO

To ensure stability and freedom from feed-back it is often essential to use screened wire for certain leads, and metal-covered

wire of the type shown is frequently employed for the purpose.

For this covering to act efficiently as a screen it should be earthed; so, when cutting the lead, it may be advisable not to cut the covering also, but to use this as the earthing connection and join it to the nearest earthed point, as shown.

The best way is to get the hang of the thing without touching reaction at all at first, and only bring this into play when you are satisfied that both your tuning dials are correctly set. You will be surprised at what a set, properly handled in this way, can do to the foreigners.

As regards the small size of the reaction dial—well, you can now see why the manufacturers generally fail to give this a big adjusting knob. It is hardly necessary.

But if you are going in for a lot of long-distance reception there is some advantage in easier reaction control, and a bigger knob is certainly a help.

Before you make the change, however, try out the foregoing method of tuning. You may decide that it gives you all you want without bothering about the very fine adjustment of reaction.

A MYSTERY LONG-WAVER ?

We have received several inquiries on the above subject, of which the following extract from a letter from Mr. H. M. Wood, of "Clyde," 83, Junction Road, Andover, is typical.

So far we have been unable to trace the transmission definitely, but perhaps some of our readers will recognise it.

In his letter to the Editor, Mr. Wood says: "I was searching the long waveband at about 8.15 p.m. on Friday, March 9th, when, at about 850-900 metres (the tuning of this station was so flat that it is difficult to give its wavelength accurately). I heard a man's voice in German. After a short time a woman spoke to him, he answered, and another man also appeared to be joining in the conversation. These were obviously not all in the same room, but were communicating with each other telephonically. During lulls in the conversation queer sounds similar to the dialling of a number on an automatic telephone could be heard.

"Frequently the name 'Bremen' could be heard, though whether this referred to the ship of that name or not I could not say.

"The quality was poor and fading was bad, but the signals occasionally came in very loudly.

"It appeared to be two-way telephony on a single wavelength, as occasionally one voice appeared to fade more than the others.

"I should be extremely obliged to anybody who may be able to give me any information, and it may also interest other readers to see if they can find this.

"(May I, in writing, express my appreciation of the 'Manual of Modern Radio,' a truly useful and well-written book?)"

SIMPLE H.F. DECOUPLING.

C. M. W. (Leicester).—"I think it (the 'National Eckerley Three') is going to prove a 'wow,' but at the moment I am troubled by a sort of whistle, which may be due to my having altered the layout slightly.

"I am using KGO and KGR coils, but the L.F. layout is exactly as described, so I cannot see why I should get an L.F. howl."

In certain circumstances it may be found that the set, when using KGO and KGR coils, gives indications of what appears to be L.F. instability, i.e. a high-pitched howl.

This trouble can easily be remedied by decoupling the anode circuit of the H.F. valve. For this you require an additional 5,000-ohms resistance complete with holder, which may be a Graham Farish Ohmite, Ferranti Synthetic or similar.

This should be mounted on the underside of the chassis.

The wiring should then be as follows, 2 of the KGR coil connected to one terminal of the .25-mfd. fixed condenser and also to one terminal of the additional 5,000-ohms fixed resistance.

The other terminal of the .25-mfd. fixed condenser remains connected to the metallised chassis. The remaining terminal of the additional 5,000-ohms resistance should be connected to the terminal (nearer panel) of the original 5,000-ohms resistance.

It should be noted that the lead which previously connected the terminal of the original 5,000-ohms resistance (terminal nearer panel) to 2 on the KGR coil should be removed.

FITTING A VARIABLE-MU S.G. VALVE BIAS CONTROL.

R. E. (Fazeley).—"I thought that my old S.G. had found the secret of perpetual life, but at last I have seen signs of senility, the milliammeter proving that anode current is now below par when all the voltages are correct. So I am going to scrap the valve and get a V.S.G. in place of it.

"Over a year ago I had the change-over all schemed out, and I kept by me a 50,000-ohms potentiometer, ready for use. But that old valve has held on to life so long that I have lost the diagram of connections!

"Will you therefore check up this arrangement, which looks O.K. to me? But I may have remembered something wrongly or forgotten something.

"At present the lead from the aerial coil unit and fixed vanes of first condenser goes direct to the G terminal of the S.G. holder. I propose to break this lead and put in a .0003-mfd. (tubular) condenser.

"Then, from that side of the new condenser which will be joined to the G terminal, I propose to run a very short lead to one side of a (Continued on next page.)

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

grid-leak clip, in which is placed a 1.0 meg. leak. The other end of this clip is very close to the volume control, to enable another short lead to run from it to the slider terminal on the volume control.

"This leaves the two outer terminals of the control to be dealt with, and one I am sure goes to the negative plug for the S.G.'s grid-bias battery. But the other (+) lead from this battery I am not quite sure about, as I think it did not go to the L.T.—on account of a 3-point switch (on-off) being advised.

"Also where does the H.T. neg. lead go? And the other lead from the 50,000-ohms potentiometer? (The present (2-point) L.T. on-off is in the L.T. positive lead.)"

If a 3-point on-off switch is used—and it is certainly an advantage, as it prevents the possibility of wrong connections allowing the battery to run down when the variable-mu valve is unused—the + lead from the variable-mu's grid-bias battery should be taken to one of the points on the on-off switch; this same point also being connected to the negative of the H.T. battery, which is thus disconnected from the L.T. when the switch is in the "off" position.

The other two points on the on-off switch are then used as before, one of them going only to the L.T. battery — and the other to the negative side of the various valve holders, etc.

And, finally, the remaining outer terminal of the 50,000-ohms potentiometer should be joined to the negative filament wiring of the S.G. valve, which will make your proposed connections O.K.

SHUNT-FEEDING THE LOUDSPEAKER'S TRANSFORMER.

W. N. (Cardiff).—"Left over from one of my earlier adventures in wireless I had an output transformer which I used successfully with my first loud-speaker. It was in good condition when I discarded it, and still appears to be perfect mechanically.

"The reason I put it aside was that with a super-power type of valve it seemed to overload, though it was all right on a smaller valve.

"Recently, as an experiment, I tried out the old loudspeaker again as an addition to the M.C. speaker arrangement now in regular use, which operates from a tapped choke in a pentode's plate circuit. This has two 2-mfd. condensers, one in each lead from the M.C. speaker to the tapped choke.

"It occurred to me that if I joined up the primary of the old transformer between earth and the loudspeaker side of the 2-mfd. condenser which is connected to the plate of the pentode, I could utilise this condenser as a filter condenser.

"It works fine, and I get far better volume on the old speaker than I was ever able to get before.

"Would the better results be caused by my present connections diverting the plate current from the primary of the old transformer, whereas before the current was passed through it?"

Yes, this would certainly tend to improve results, but other factors may be helping as well, as there is a wide difference in your operating conditions now that a pentode is used as an output valve.

CRYSTAL SET THAT WORKS LOUD-SPEAKER.

In response to many inquiries we would advise readers that so far we are unable to supply particulars of the crystal set to which reference was made in "Radiatorial" of our

March 17th number. It will be remembered we published a request from a South African reader of "P.W." who addressed to another reader—F. W. W. of Woodford Green—for details of the circuit he uses.

Up to the time of writing F. W. W. has not replied to us, but he may have done so direct to Cape Town (as the address of our South African correspondent was given in full). If we receive the details we shall be pleased to give them for the benefit of all interested readers.

THE LISTENER'S NOTEBOOK

(Continued from page 82.)

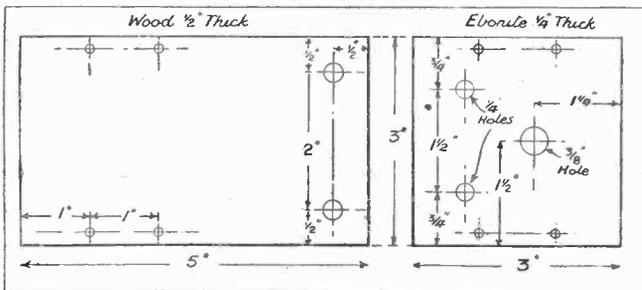
fails to have these, then we shall continue to compare it with the stage play to its own detriment.

A newcomer to me in variety is Bern Eeks. I like his act, because I can honestly laugh at him. A crazy comic with more than a spice of originality is our Bern.

Mr. Beverley Nichols may sound a little monotonous on the air, but he fairly makes you sit up and take notice. It was something of a novelty to hear a layman talk at length on such a topic as the need for more church-going. He spoke on other things as well, and in everything he said there was food for thought. He seemed to anticipate a certain amount of opposition to his remarks, but I wouldn't be surprised if actually he was generally well received.

Two outside broadcasts, both of a sporting nature, in one afternoon, make us forget our groans against the B.B.C. And when they are well done, as the Boat Race and the International Rugger match were, we want to shout, "For They Are Jolly Good Fellows," and forget the censorship. C. B.

A NOVEL PICK-UP ADAPTOR



This shows how to drill the wooden top and the small ebonite panel of the novel Pick-up Adaptor which is described on page 79 this week. The panel holds the volume control and terminals.

TEN THOUSAND LETTERS!

(Continued from page 83.)

plays seem to meet with approval, and I have been particularly gratified to find my own contention that "effects" should be used as sparingly as possible is also the opinion of the greater number of my correspondents.

To sum up from the particular point of view of the Drama Department, this experiment of making contact with our unseen audience has been a startling success. Whether it is possible to extend such an experiment to other fields of broadcasting is quite another story.

The audience for radio plays is, to some extent, a specialised audience and is likely to remain so; but to all those who have co-operated so gallantly in making that experiment a success I should like once more to express my thankfulness. The feeling of working in an unresponsive void has been finally and triumphantly dispelled.

PILOT

AUTHOR

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P. W. 7/4/34

THE LINK BETWEEN

(Continued from page 92.)

to these of the 1933-34 team. It has variable-mu screened grid and detector stages with a Cosor 220P in the output position. I believe I am correct in saying that this particular output valve is capable of giving an output adequate in all respects for normal domestic requirements.

It is supplied with a fine modern cabinet, and, in addition to the salient feature of economy in operation, the design permits of the use of a gramophone pick-up. The price, which includes cabinet, loud-speaker and, of course, the set, is £5 7s. 6d., and convenient hire-purchase terms are available.

Full details of this fine kit are available, free of charge, to "P.W." readers through the medium of our postcard literature service. Just send the usual postcard to me at Tallis House, and I shall be pleased to make the necessary arrangements. (No. 80)

Ekco to the Fore Again.

So many new sets have been released by the commercial-set manufacturers generally during the last month or two that I begin to wonder how long it will be before my friends, the listening public, become thoroughly "spoilt for choice," to use a North Countryism.

The trouble is that all these new sets reach such a high standard of performance that it becomes increasingly difficult to single out any particular one on the score of merit alone. Prices, too, are all highly competitive.

Even so, there is always room for something new when Ekco is behind it, for this enterprising firm seems to have acquired the happy knack of providing just that touch of distinction. Remember that remarkable tuning dial of theirs, and subsequently the outstanding black and chromium effort?

That they worthily uphold their traditions in the design of the model that has just been released is obvious even from my cursory examination of the technical specification and a photograph. It's an all-electric radiogram with practically every modern refinement, and it is to sell at the extremely modest price of 21 guineas, complete.

The new Ekco radiogram is housed in a most attractive cabinet, which is modern without having too much of the futuristic touch about it.

Readers will, no doubt, be interested to learn that "P.W." has made special arrangements for a complete test report to appear in this journal at an early date.

Here and There.

Microphones at prices to suit all are featured in a catalogue which is available free on request to all "P.W." readers. Address your applications to Messrs. Electradix Radios, Electradix House, 218, Upper Thames Street, London, E.C.4, and it will help if you mention POPULAR WIRELESS.

OUR POSTCARD SERVICE

Application for trade literature mentioned in these columns can be made through "P.W." by quoting the reference number given at the end of the paragraph. Just send a postcard to G. T. Kelsey, at Tallis House, Tallis Street, E.C.4. Any literature described during the past four weeks may be applied for in this way — just quote the number or numbers.

I am always glad to be able to pass on news of price reductions. I learn with interest that the Drydex battery type H.2000 has recently been reduced from 10s. 6d. to 7s. 6d. Stuff to give 'em!

Another commendable move in the war on "man-made static." Messrs. Ward & Goldstone have recently marketed a new device known as a "Statoformer" which has every appearance of being a great step forward. Users of "Statoformers" can avail themselves of the services of a special department which has been established by W. & G. to deal with all aspects of the interference problem. An ambitious effort on which I congratulate them.

Substantial price reductions are the chief features of a new catalogue of accumulators and dry batteries which has just been released by the Fuller Accumulator Co. (1926), Ltd. It is available free for the asking through the medium of our postcard literature service. (No. 81)

THE WAVELENGTH PROBLEM IN TELEVISION

(Continued from page 93.)

The picture which we now see is scanned in only 30 lines, and the process is repeated but $12\frac{1}{2}$ times per second. On a wave of 7 metres successful tests have been made under laboratory conditions in Germany with a picture of 120 lines and a picture frequency of 25 per second!

This last point is an important one, for, although the higher picture frequency does not affect the amount of detail, it does remove the flicker seen at the $12\frac{1}{2}$ rate and eliminates jumpiness from the motion of rapidly moving objects in the picture.

Tests have been made in England at 180 lines, and the picture rate has varied from $12\frac{1}{2}$ to 25. Experiments on similar numbers of scanning lines are still proceeding in this country, and I even hear rumours of some extremely hush-hush work on much higher frequencies still.

Whether these extremely high rates of scanning are justified in the present state of development of receiving gear is perhaps a little doubtful, but it all indicates the direction in which television research is moving, and it was to enable the reader to follow this research with understanding that I have written this article.

AN INTERESTING DEMONSTRATION

Last year the historic "Popular Wireless" ultra-short-wave tests proved the value of the Crystal Palace Tower as a transmitting site. Since then continuous research has been carried out there by Baird Television Ltd., resulting in the success described below.

I WAS recently afforded an opportunity of seeing a demonstration of the results which can be obtained from the high-definition television transmissions now being made from the Crystal Palace by the Baird organisation, and those results interested me so much that I think some account of them should be given to the readers of "P.W."

The transmissions use a wave of 6 metres for the picture and another of $6\frac{1}{2}$ metres for speech and music, and the demonstration took place at the Gaumont-British premises in Wardour Street, where radio conditions might be expected to be extremely bad.

Nevertheless, the first thing which struck me was the real excellence of the sound transmission. The signal was absolutely steady, there was very little extraneous noise and the actual reproduction was remarkably good.

The picture was reproduced by means of a new giant-size cathode-ray tube, which is apparently free from the unnatural coloration which was so noticeable in the earlier types. In front of the tube a large lens was placed, giving the effect of a picture about a foot across, so that it could be seen by nearly fifty people.

The fineness of detail seen in the picture was truly remarkable, the faint-line pattern on a performer's soft collar being clearly visible, for example. In general quality the effect was very similar to that of a photograph of the soft-gradation type, and it was pleasant to note how the familiar flicker had almost completely vanished as a result of the increased picture frequency of 25 per second.

A Problem for Designers.

The picture is scanned in no less than 180 horizontal lines, and this, in conjunction with the high-picture frequency, involves modulation frequencies up to a million cycles per second. Truly a problem for the designer of amplifiers!

The general amount of detail struck me as completely acceptable, and such criticisms as I should offer would be based only on the rather unnatural effect of the almost direct frontal lighting employed on the faces of those at the transmitter, the presence of faint dark lines across the picture at times and a curious "waving-in-the-breeze" effect seen quite often in any well-defined lines near the edges of the picture.

G. P. K.

THE "VOL-PEN" TWO-VALVER

Another reader pays tribute to the excellence of "P.W." design.

The Editor, "POPULAR WIRELESS."

Dear Sir,—I have taken "P.W." for several years and have built many of the sets described, but I feel I must write and thank you for the "Vol-Pen" 2 in No. 602, which I completed a week ago.

Last summer I built a really good mains unit, and have been using a directly-heated mains pentode with an ordinary battery set. This was a bit complicated, and when I saw the "Vol-Pen" 2 described I decided to go all-mains, and I am very pleased with the result. At first I got rather a large hum from the detector (the set is dead quiet on gramophone), but by altering the circuit connections of the L.F. transformer according to Fig. 258 in the "Manual of Modern Radio" I have reduced it to almost nothing.

I can get at least a dozen continental stations at more than comfortable strength, while the volume from the North Regional and National can be tremendous without any distortion being present.

Yours faithfully,

L. R. LACEY.

357, Prescott Road,
St. Helens, Lancs.



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TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio.

By Dr. J. H. T. ROBERTS, F.Inst.P.

Removing a Broken Needle.

WITH reference to the curious fault I mentioned in these notes last week, many of you may have wondered how we removed the broken needle from the pick-up. It was at once evident that this offending piece of broken steel needle was not going to come out by just shaking the pick-up, because, of course, there was a very strong magnetic attraction to keep it there.

Well, we all scratched our heads and eventually decided that we would never get it out unless we could remove it from the influence of the permanent magnet of the pick-up. Fortunately, the pick-up was of a type in which the coil assembly could be fairly easily removed, and when we got this away from the magnet we were able to knock out the offending piece of steel needle quite easily. It turned out to be a broken piece about $\frac{3}{16}$ inch long, so you can guess that it was stopping the needles from going in quite a bit, and that was what accounted for the "reedy" tone.

When the pick-up was all assembled together again it gave perfect reproduction without a trace of the previous rattle.

Repairing Pick-up Coils.

Incidentally, in the process of shifting the coil we managed to break one of the fine wire leads and had quite a nice little job soldering it on again. In case you ever have the misfortune to break one of the leads inside the pick-up I should mention that this wire is often of as fine a gauge as 48, and as it is enamelled you have to remove the enamel before you can solder the wire to a thicker lead.

It is little use trying to scrape off the enamel with a penknife, because, in the first place, you can scarcely see the wire, and, in the second place, you are practically certain to sever it with the blade. About the only thing to do is to lay it on a piece of wood and then rub it longitudinally with very fine sandpaper, the finer the better.

In this way you can get the enamel off, and when you look at the wire in a certain light you will see the glint of the copper. It should then be very carefully wound several times around the thicker lead so that it cannot come away, and then soldered with a fairly hot iron, which must, by the way, be very clean.

Reaction Peculiarities.

I do not know whether you have noticed that with a set employing reaction you will sometimes find that a station which is brought in with a good deal of reaction does not remain so steady in volume as one which requires little or no reaction.

The reason for this is that the detector does not give an output signal strength proportional to that supplied to it; in fact, the strength of the output is more nearly proportional to the square of the input. You will easily see, then, that if the input is doubled the output becomes four times as great; if the input is trebled the

output is nine times, and so on. I do not say that it is in this exact ratio, but it is generally in a greater ratio than merely proportional.

You will see from this that if a station is tuned in and a good deal of reaction is used in the process, then a slight variation in the strength of the incoming signal on the aerial will produce a relatively large variation in the volume of the output; whereas in the case of another station which is tuned in without any reaction at all the variation of the volume will be more nearly proportional to the variation of the incoming signal. In other words, the use of reaction makes the volume proportional to a higher power of the input.

This is only one of various reasons why you should always tune in a station with as little reliance upon reaction as possible.

The Uniformity of Metal Valves.

The new metal valves which are now firmly establishing themselves in popular favour have advantages apart from the mere advantages of their construction.

One of these, which I do not think has been sufficiently emphasised, is the uniformity that they tend to give as compared with ordinary glass valves. You know that in designing a set the designer has to bear in mind the variation which will be met with by the use in the set of different valves, these variations amounting to as much as 10 or even 20 per cent.

If he designs the set for what you might call the minimum efficiency of the valves, then when somebody goes and uses a set of selected, very efficient valves, the receiver will probably become unstable, all of which is very difficult and very confusing for the designer.

Bringing Standardisation Much Nearer.

If, on the other hand, valves could be made so nearly uniform that the variations in their efficiency and characteristics amounted to only a very few per cent, then the designer could go all out and give you practically the full efficiency of the circuit, whatever it might be, knowing that on the one hand you would not be likely to run into instability by a set of super-efficient valves, and on the other hand that you would not be disappointed by happening to get a set of poor ones.

Valve manufacturers have done wonders in the last two or three years to make their valves more uniform, but this is still one of the difficult points about valve manufacture, and it seems to me that the new metal valves bring this standardisation very much nearer.

Quiescent Push-Pull.

A lot of people do not know that although it is desirable to have special components for quiescent push-pull amplification, or push-push, as it is sometimes called, nevertheless you can often get quite good results with ordinary push-pull components. Naturally, you cannot expect to get quite the same results as if you use the proper components,

(Continued on next page.)



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TECHNICAL NOTES

(Continued from previous page.)

but, as I say, you may with care get a good approximation.

For one thing, you will bear in mind that the input transformer for push-push may have a ratio of as much as 8 to 1, or even more, whilst the ordinary push-pull input transformer has a ratio of perhaps only 2½ or 3 to 1. Another point is that the chokes and transformers used for push-pull output are usually intended for ordinary three-electrode valves, and this rather precludes you from using pentodes with them. But if you use, say, small power valves you will quite likely get reasonably good results, provided that you can go to a voltage of 120 or more on the anodes, whilst the grid bias is adjusted so as to bring the current down to a couple of milliamps each.

Push-Pull Components.

As you know, the essential principle of the quiescent push-pull is to make the anode current vary with the strength of the incoming signal, so that, when there is no signal coming in, the anode current is not more than perhaps 4 milliamps for the two valves, whilst, when the signals start coming in, the anode current jumps about accordingly.

Using a Meter in the Anode Circuit.

Incidentally, if you use a milliammeter in the plate circuit you will get some very interesting results, and you will have to put out of your head any idea of judging distortion by the kicking of the milliammeter needle, as you do in the ordinary way. If you judged by the needle only you would get the impression that the reproduction must be truly appalling; but, as I say, the behaviour of the anode current with this push-push arrangement is totally different from that with the ordinary circuit, and the "carrying on" of the needle of the milliammeter in the anode circuit gives totally different indications in the two cases.

Choosing a Set.

I am always being asked about the choice of a radio set. I expect a good many of you have the same experience, so I'm sure you will sympathise with me when I say that there are few questions more awkward to answer. So much depends on so many different things.

First of all you ask: "Do you want only B.B.C. stations or are you anxious to receive a lot of foreigners as well?" Probably this brings the admission: "I really don't know. I'd like to get anything that's good." Rarely do you meet anyone who knows just what is wanted. It is all left so delightfully to you.

The question of battery or mains operation is usually fairly straightforward, because anybody who has electric light knows that it is much more convenient to use it instead of batteries. (Incidentally, I know a lot of people who have electric light and still use batteries—and without a trickle-charger at that.)

The Question of Quality and Volume.

Then you come to the point about quality and volume. Theoretically, everyone desires

quality rather than quantity, but give them quality *without* quantity and they'll pump for quantity every time.

The choice of a loudspeaker opens up a vast field for speculation. "I'd like one of those with a nice mellow tone." Unfortunately, what you think a nice mellow tone and what somebody else thinks it is are often two very different things.

The most you can do is to give an account of the merits and capabilities of the different types of receivers, and then leave the choice to the other side.

In this catalogue of points you must not forget price, size, portability, ease of working, mains or battery operation, sensitivity and selectivity, aerial and earth requirements, number of valves and question of maintenance, volume, tone control and so on.

Portability.

With regard to portability, you should bear in mind that if a set is going to be really portable—I don't mean semi-portable or transportable—it must economise in size and weight of components. With coils, transformers and so on, since these have

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been so much improved of late, this is not a serious matter.

But when it comes to batteries and loudspeakers—I am assuming batteries, if it is a really portable set—then the cutting down of size may well cramp its style a bit.

The Loudspeaker Problem.

As regards the loudspeaker, most people will favour a good moving-coil type. Personally, I have a preference for the moving coil with separately excited field winding, and in a commercially built all-mains set this will generally be provided for.

But if you are making up a set yourself you may not want to be troubled with provision for the field current, in which case you can choose one of the excellent permanent-magnet moving-coil speakers on the market. Some people have a fancy for moving-iron speakers and there is a great deal to be said for these.

They have been so very much improved of late that I know a number of people who will back their fancy in this direction even against a good moving-coil speaker. Certainly a good inductor or balanced-armature speaker is preferable to an indifferent moving coil.

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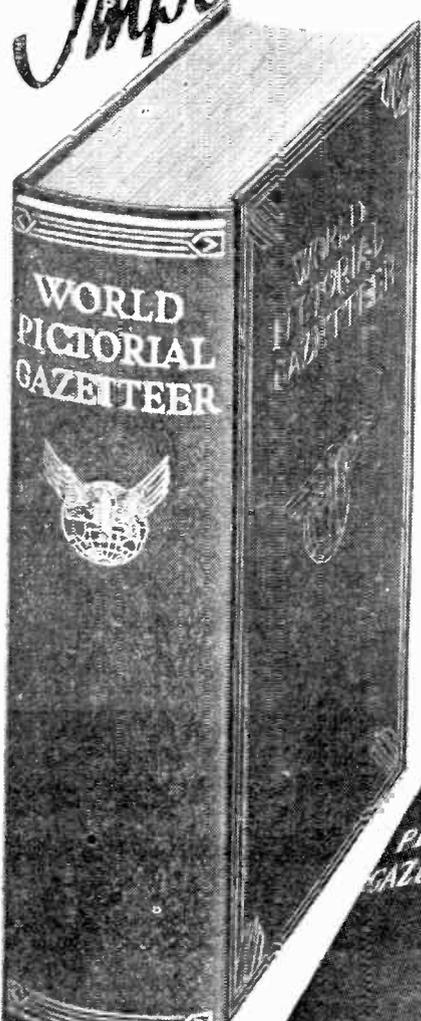
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