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WIRELESS & TELEVISION REVIEW

VOL 3 NO 17
APRIL
1936

EVERY MONTH

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BROADCASTING IN WAR-TIME

An exclusive contribution giving some behind-the-scenes facts about what would happen to broadcasting if we were involved in another war.

THIS YEAR'S S.T.100

John Scott-Taggart gives some further information about his modern reflex receiver.

ETHER TESTS OF ALL-WAVE SETS

Practical trials of three modern receivers. Of special interest to those contemplating the purchase of a new instrument.

BUILDING A RADIOGRAM CHASSIS

Full details for the construction of a compact unit for incorporation in any cabinet design.

This Month

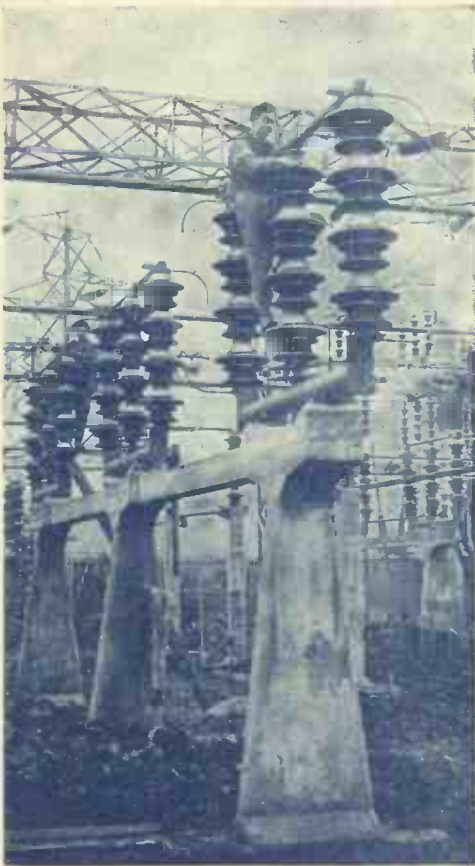
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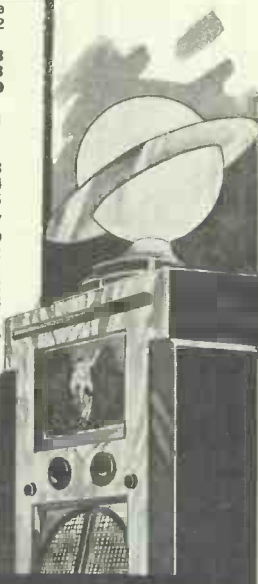
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As some of the arrangements and specialties described in this journal may be the subjects of Letters Patent the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

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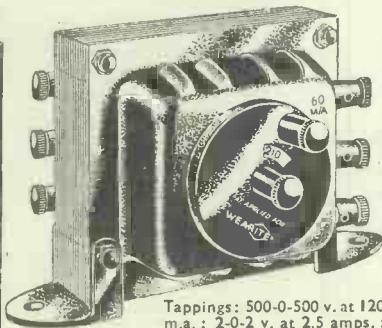
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WIRELESS *and* TELEVISION REVIEW

Editor: G. V. DOWDING

Assistant Editor: A. S. CLARK

Our Series of Competitions for All Readers

THERE are silver cigarette-cases and silver cigarette-cases! Two may look just the same, and they may both be just as genuinely real silver. But there can be a difference.

One may be merely a thin shell of metal, liable to dent at the slightest fall. It feels like a feather in the hand, and it snaps with a tinny click that many a half-crown imitation could put to shame.

The other? Well, you know the difference directly you pick it up. To start with it feels heavy in the hand. It shuts with an aristocratic snap, and its solidity renders it serviceable throughout a lifetime.

"But what the dickens," you ask, "has this got to do with radio?" I'll tell you.

The second type of case is like the one we are offering as the first prize in our simple competition on page 270. But that is not even half the story.

A Splendid Prize to be Won

The intrinsic value of such a case is high, but its real worth can be much higher than the cash valuation.

This is true of our prize offer, for the case is to be inscribed and to carry the autograph of a famous orchestra leader. It would be highly prized by any listener.

But this is not all of the first prize. There is a library of records for the winner, also, and records for the runners-up as well.

The competition is unique, and we know all readers will welcome it. So come along, you competition fiends and you record enthusiasts. Now's your chance.

Just one other point, though. At first thought you might expect to see the result published in our next number. So that you will not feel let down, I'll tell you right away that this is impossible.

This April number will be on sale until the last day of the month—April 30th—and in fairness to those who happen to buy their copy late, we must keep the competition open. The next number, published on May 1st, has to go to press a week or so before, naturally. Hence the impossibility.

The winners will not be kept waiting, however. They will be informed of the result a few days after the compe-

tion closes, and full details of the result will be published in the June number. But there's something you will get in the next number—another of these unique competitions. Mind you don't miss it.

In more ways than one, this month's number is something of a record issue. In view of the competition, the special articles on the use of pick-up terminals are most appropriate.

Fit a Pick-Up to Your Set

And the radiogram chassis design will be studied with interest by all. It is a departure which will prove of value to many.

Some would have us believe that there has been a big fall in the popularity of record reproduction. There is nothing to substantiate this.

But, at the same time, we do feel that there are a large number of users of receivers who are missing something because they are unaware of the ease with which advantage may be taken of the pick-up terminals on their receivers. To these we commend the articles on the subject featured in this number.

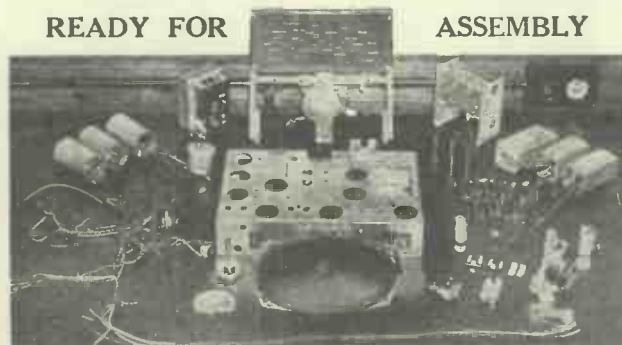
And now, just a word in your ear about future numbers of WIRELESS. It is always our aim to give readers just what they want, and if we receive a number of requests for some particular article or type of feature, we are not satisfied until we have got it.

Good Things for the Future

We are at present planning a number of good things for the future which have started as requests from readers. I can't say much about them at present, except to drop the hint that they are not unconnected with short waves and with television.

But you can take it from me, future numbers will be more than ever worth watching; and if there is anything you, personally, would like to see in the paper, don't forget to drop a line. Then there's that ten shillings offered on page 320 for a general interest letter. Any radio subject is suitable—some reception experience, programme opinion, practical idea, or other topic that occurs to you.

A.S.C.



Components of one of the H.M.V. 13-guinea "Station Selector Ray" receivers, ready for assembly. Note the grouped leads prepared to exactly the right lengths.

SOME MORE RADIO STAMPS



INTERESTING FACTS FEATURED

Last month we showed some stamps bearing a special interest to radio enthusiasts because of their associated themes.

These stamps produced so much interest among readers that we are printing some more specimens this month. From top to bottom, the stamps illustrated are as follows:

LEFT. Introduced to commemorate the tenth anniversary of Czechoslovakia, this stamp shows the Central Post Office building with its huge aerial above.

Cabot Tower in Newfoundland was where Marconi's first wireless signals were received across the Atlantic.

A recent Italian stamp which carries a picture of Galvani, the pioneer electricity experimenter.

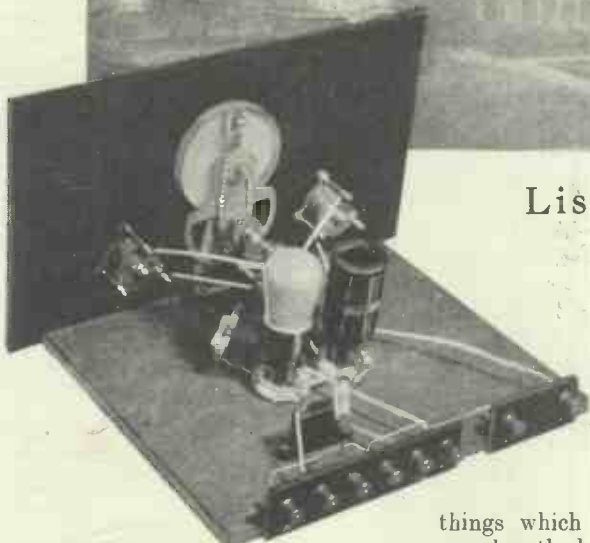
CENTRE. One of the first stamps to be issued carrying a picture of an aerial.

A Russian stamp commemorative of the wonderful rescue of the Tscheluskin crew. The picture shows their radio station on the ice.

RIGHT. Another Italian commemorative stamp. This time of the centenary of the death of Volta.

The two-cent stamp Newfoundland shows the record-breaking S.S. Caribou with its aerial.

A Russian stamp illustrating how radio exists even in the remote villages.



Listen to ALEXANDRA PALACE on this ULTRA-SHORT-WAVE ADAPTOR

Soon after this issue appears in print it is to be hoped that experimental television transmissions will be taking place from Alexandra Palace. I have been deluged with enquiries during the last few weeks, concerning the type of receiver necessary to pick up the accompanying "sound" transmission, which, it is hoped, will have quite a programme-value of its own.

Easily Received

Londoners will find that the television transmissions may be received on quite simple gear, and this adaptor has been designed expressly for those who want to listen to the sound transmissions.

Fortunately for all of us, the ultra-short waves have come to life recently, and there are many other interesting

things which can also be heard on wavelengths between 5 and 15 metres.

These are all equally within the reach of the owner of such an adaptor as this. There are the 5- and 10-metre amateur bands; a broadcasting station at Rochester, New York (W 8 X A I), sending out regular transmissions on 9.5 metres; and pretty well all the police stations and "speed-cop" cars in the U.S.A., between 9 and 10 metres.

So you will realise that, quite apart from the novelty of the television programmes, you will be able to find

A simple design for attaching to the pick-up terminals of any receiver. It will receive any transmissions on the 5-14-metre band, and is designed and described

By W. L. S.

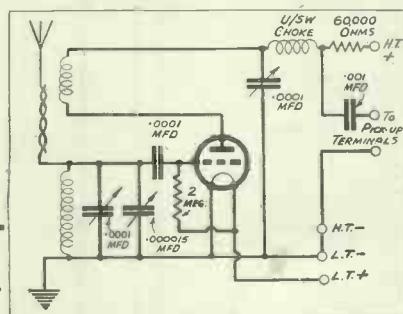
Many other services will be making use of these wavelengths during the next few years, and a receiver like this will be of the greatest value. All the tales that you have heard about "hair-breadth" tuning and inability to hold a station have probably emanated from people who haven't the slightest idea how to build a receiver for the job.

Will Fit Any Set

The simple adaptor described in this article has been specially designed for ease of operation coupled with simplicity of construction. If you have a broadcast receiver (mains or battery-operated) that is equipped with a pair of pick-up terminals, this adaptor is all that you need to make yourself thoroughly at home on the ultra-short waves.

It has been designed for battery operation on account of the complications that arise when one has to make allowances for all the different types of receiver to which it might be coupled. A superhet converter would have been just as simple to construct, but certain broadcast receivers would not be so suitable for such a unit as others.

CIRCUIT DETAILS

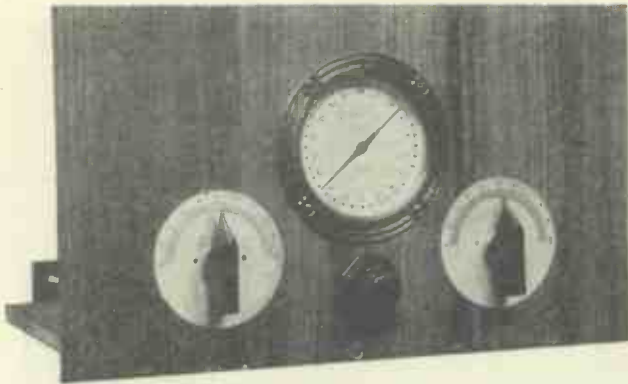


Note the twisted-wire aerial coupling and the parallel tuning condensers.

quite a lot to interest you, and even if you have never tackled short-wave reception in any form you stand a good chance of being bitten by that particularly virulent insect known as the "short-wave bug."

WHAT YOU NEED

- 1 Wooden panel, 14 in. x 8 in. x 1/8 in. (Peto-Scott).
- 1 Baseboard, 12 in. x 10 in. (Peto-Scott).
- 2 Four-pin valve holders (B.T.S.).
- 1 Airplane dial, two-speed model (Jackson Bros.).
- 2 Microcondensers, .0001 (Eddystone Cat. 900).
- 2 Pointer knobs and dials (Eddystone Cat. 1027).
- 1 Adjustable insulated bracket (Eddystone Cat. 1007).
- 1 Ultra-short-wave H.F. choke (Eddystone Cat. 1011).
- 2 4-pin coil formers (B.T.S.).
- 1 Midget condenser, .000015-mfd. (Jackson Bros.).
- 1 Fixed condenser, .001 (T.C.C.), Type 34
- 1 Fixed condenser, .0001 (T.C.C.), Type 34
- 1 2-megohm grid leak (Erie 1-watt).
- 1 60,000-ohm resistance (Erie 1-watt).
- 1 6-terminal strip and one 2-terminal strip
- Tinned copper wire, Systoflex, etc.
- 1 Valve (210 H.F. Cossor).
- 1 2-volt accumulator (Exide).
- 1 60-volt H.T. battery (Marconiophone).



The clock-tuning dial and the two aluminium scales give the adaptor a "modern" appearance.

This may be regarded just as a simple ultra-short-wave single-valver, which may be coupled to the L.F. side of your broadcast receiver, and thereafter used as a real loudspeaker set for the ultra-short waves.

Band-spread Condenser

The circuit diagram is the best explanation of the whole scheme. It is just a conventional detector circuit, with series-fed H.T. and capacity-controlled reaction. The aerial is coupled by means of a small fixed condenser composed of two lengths of systoflex-covered wire twisted together.

Band-spreading is used to make for very easy tuning, and the band-spreading condenser, although very small, is equipped with a two-speed

slow-motion dial that reduces the business of tuning in a station to something really approaching the "child's play" stage. This small condenser is in parallel with the main tuning condenser of .0001 capacity, but the latter is equipped with a plain pointer-knob and dial, and is simply set to one particular spot and left alone while all searching is performed on the band-spreader. Reaction is similarly controlled by a .0001 condenser, again with plain knob and dial. Actually the reaction is not as "touchy" as one would expect it to be, and does not have to be chased all round the dial as the tuning is varied. An occasional light touch in one direction or the other is quite sufficient—as, indeed, it always should be on any set worth handling at all.

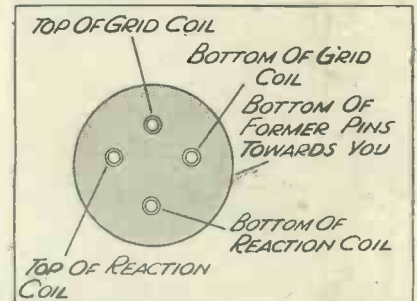
From the photographs and the wiring diagram you will see that the layout is extraordinarily simple and makes for very short and direct wiring. The valve holder and the coil holder are placed alongside each other. The lead from the anode terminal of the

former to the appropriate terminal on the latter is only about two inches long, and the grid condenser itself forms the bridge between the two grid terminals.

No Metal Foil Used

The band-spread condenser is connected as directly as possible across the terminals of the grid coil, and two direct leads go off to the "tank" condenser in parallel with it. Since the latter will rarely be used in the "zero" position, the capacity between these

COIL CONNECTIONS—



Details of how the ends of the coil windings are joined to the pins on the coil base.

two leads is not an important matter.

No metallising or metal foil has been used at all, short and direct wiring being relied upon to give the maximum of efficiency. This apparently retrograde step was entirely justified by results, the set being absolutely free from hand-capacity and instability of all kinds.

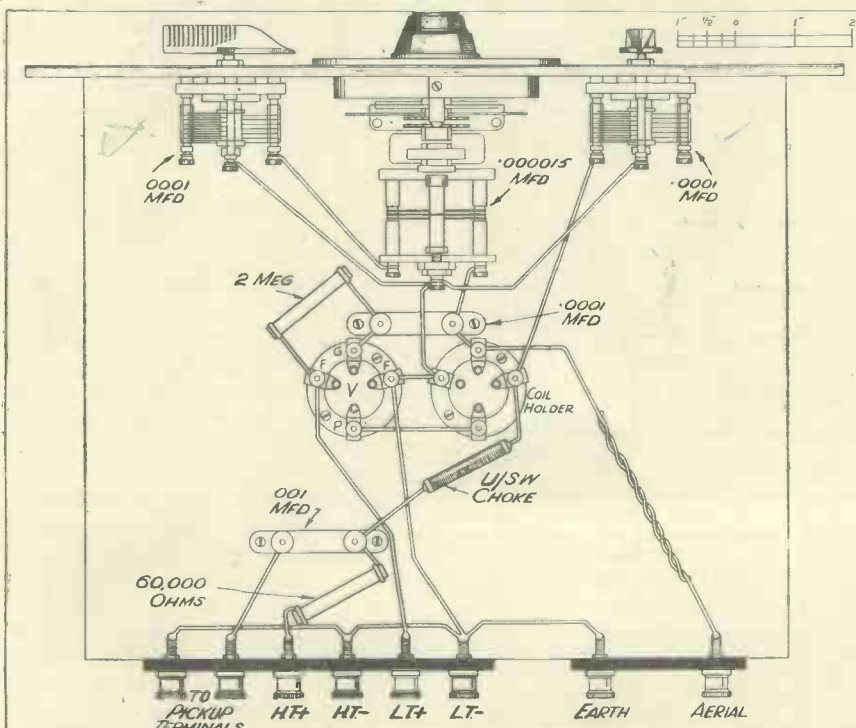
A 60,000-ohm resistance has been placed in the anode circuit, and a coupling condenser of .001 is inserted in the lead to one of the "output" terminals. The other goes to the "earth" line—L.T. negative and H.T. negative. For this reason it is as well to use only one earth connection—either on the broadcast receiver or on the adaptor—in case of possible short-circuits caused by the fact that a different point may be earthed on the broadcast set.

The L.T. Control

This remark, however, does not apply if entirely separate batteries are used for the adaptor. No L.T. switch has been provided, however, and when it is being coupled to a battery-operated broadcast receiver the best plan is to take two flex leads from the L.T. terminals on the adaptor, and couple them to the two filament terminals of one of the valve holders in the broadcast set. The L.T. switch on the latter will then control the valve in the adaptor.

If the broadcast set has no pickup terminals, the adaptor may be coupled to it by some other means; but I

CAREFULLY-PLANNED LAYOUT GIVES EFFICIENCY



The layout is a very important part of a design for ultra-short waves, and therefore no deviation from the above plan should be made.

expect many readers will be using a biggish mains-operated broadcast set, which will almost certainly have pick-up terminals. In this case a two-volt accumulator and a 60-volt H.T. battery will be used for the adaptor only, and an external L.T. switch should be provided.

The coils for covering the ultra-short wavebands are home made, and the pin connections used are the same as those of the standard set of Eddy-stone coils, so that this adaptor may

provided on the former. The reaction coil starts in the next slot to the end of the grid winding.

Few Turns

The smaller of the coils required has $1\frac{1}{4}$ turns in the grid winding and $1\frac{1}{2}$ for reaction. The larger has exactly 2 turns for each. These cover wavelength ranges of roughly 5-10 and 8-14 metres.

As an actual example of the way in which the bands turn out, I may mention this: Insert the larger coil. Set the left-hand variable condenser to about 50 divisions. The 10-metre band will then spread from about 60 to 140 degrees on the slow-motion dial of the band-spreader.

You must not expect to hear much on the 5-metre band unless you are within fairly easy range of some amateur transmitters using that wave. Even then, if they use the unstable type of transmitter that was common last year, you will find them fairly difficult to tune-in until you stop the receiver oscillating.

By this I mean that you must not expect to hear a pure, steady carrier-

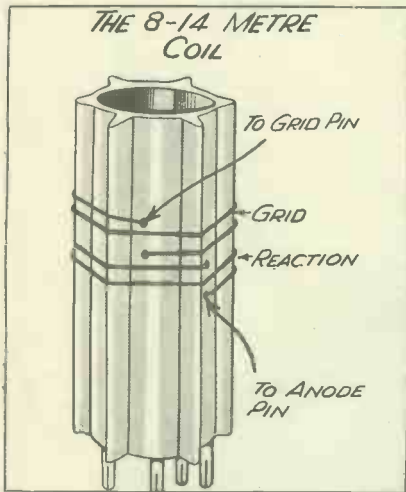
wave. Some of them sound almost like wobbly raw A.C., but, strangely enough, intelligible speech may be got out of them by slackening off reaction.

American Broadcasting

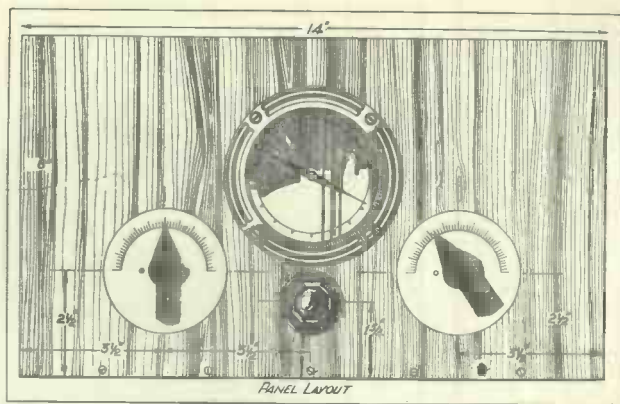
The television "sound" transmission, on about 8 metres, will, of course, be put out on a stable transmitter of relatively high power, and should be tuned-in just like a broadcast station. W 8 X A I on 9.5 metres is extremely strong on occasions, so it seems possible that we shall shortly be hearing television transmissions from the U.S.A.

(Please turn to page 321.)

—AND WINDINGS



The larger of the coils is illustrated here, but the direction of winding is the same in both cases.



Dimensions for the hole positions are given in this diagram of the panel.

also be used as an ordinary short-wave set if you so desire.

Slotted formers are used, and the following are the pin connections: the top of the grid coil, which is the upper winding, is taken to the "grid" pin. The bottom of the grid coil goes to the right-hand filament pin, looking at the bottom of the coil-former with the grid pin uppermost.

The bottom of the reaction coil—the lower winding—goes to the "anode" pin, and the top to the left-hand filament pin. You may regard it as one long coil across the grid and anode pins, with a break in the middle, the broken ends going to the two filament pins.

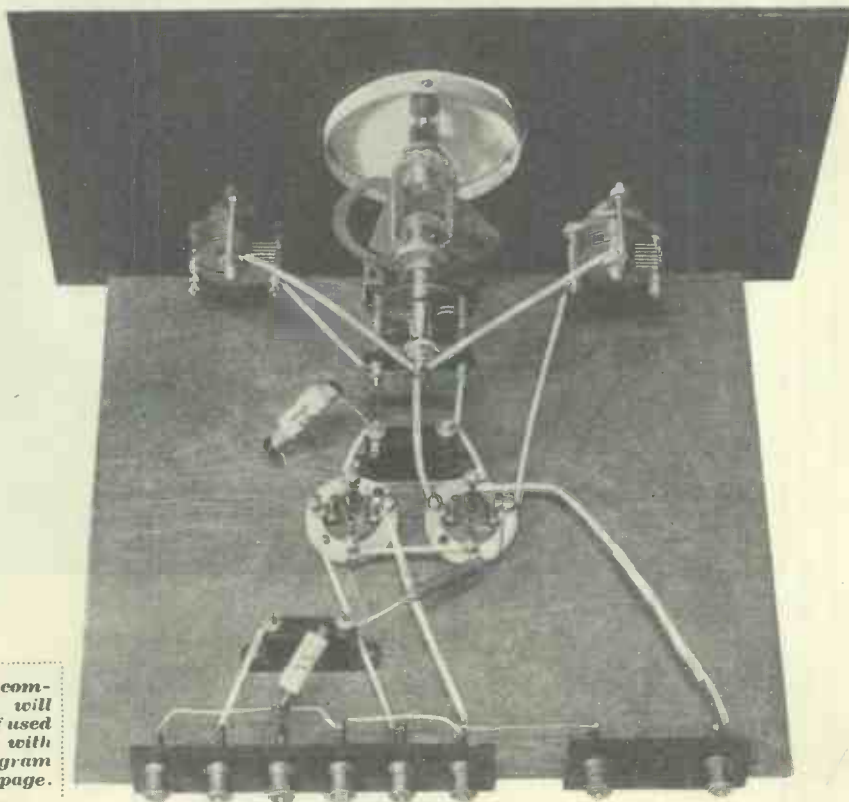
The Four Pins

Be quite clear about this. Look at the bottom of your coil-former, with the pins sticking out towards you. Call the grid pin "north." Then the grid winding is across north and east, and the reaction winding across west and south.

"Twenty-four" enamelled wire is used, and wound into the slots

This view of the completed receiver will be very helpful if used in conjunction with the wiring diagram on the opposite page.

A PHOTOGRAPHIC GUIDE TO CONSTRUCTION





Mantovani with his famous fiddle, which is over 200 years old and was once the property of a Russian princess.

MANTOVANI—

Musician and Magician

VERSATILE—unusual—entirely pleasing! That is how I would sum up Mantovani and his Tipica Orchestra.

And even then I should not have done him justice. Indeed, it is really impossible to convey in a few words the magic of this master musician, the ever-changing light and shade, the varying colour, the amazing variety of style, the depth of expression, the always tuneful rendering.

Ah! Tuneful rendering! There you have the secret—perhaps I should say one of the secrets—of his success. No matter whether he is playing popular, classical or dance music, he *must* have melody. No symphonic discords, no trumpet blares for him.

A Band Without Brass

As a matter of fact there is no brass in Mantovani's band. And it is there that the subtle, appealing difference comes in. If you turned on your radio and heard a dance band playing, it would take you some time to make up your mind who it was, unless it happened to be Mantovani with his Tipica orchestra, and then you would know immediately.

But let me tell you something about this young artist who works magic with violins, violoncellos, bass fiddles guitars, piano, piano-accordion, drums, etc.: He is thirty years old, and to his friends—amongst whom must be numbered everyone who knows him personally—he is "Monty."

Historic Violin

He has music in his blood, for his father was an orchestra leader who played under Toscanini, Mascagni, Richter and other world-famous conductors. Young "Monty" "coveted" his father's violin, which was a gift from a Russian princess who did not like the tone of the one his father was using.

"You can have it when you can play the Paganini Concerto perfectly," his father said.

A more difficult task would have been hard to find, but the age of eighteen found "Monty" playing this very piece in a recital at the Queen's Hall and on his father's fiddle. Since then the violin has been his most cherished possession, and it is the instrument he uses when you hear him broadcast or see him on the stage. The fiddle, a Testori, is 200 years old and worth hundreds of pounds.

He was still eighteen when he obtained his first important engagement—charge of the Salon Orchestra at the Metropole Hotel. It was also while here that he first broadcast—nine years or so ago—during the lunch-time programmes.

While engaged at the Metropole he gave recitals of classical music at the Wigmore, Grotrian and Queen's Halls,

and treasures a keepsake of this period in the form of a note from Sir Thomas Beecham bearing the words, "Bravo, well played."

Conductor and Composer

His departure from the Metropole saw the birth of the now famous Tipica Orchestra. He played with his orchestra at the Monseigneur for four years.

Since then he has been at the Café de Paris, The Hollywood Club and San Marco Restaurant where his was the only string band playing dance numbers.

Mantovani knows every side of music; apart from being a great violinist and conductor, he is also a composer and arranger and it is interesting to know how he got the idea of making a speciality of dance music without brass. It was during a stage show.

As usual he played a wide variety of classical, popular, and dance numbers. After playing a rather quick foxtrot—of the type usually termed "a hot number"—with his usual melodious arrangement, the applause was so terrific that he realised he was able to give an audience something unusual, something different, which would yet be welcomed with warm appreciation.

So we find him broadcasting dance programmes with the same polished style as his straight performances. After all, the real meaning of "Tipica" is "versatile," and every member of Mantovani's orchestra can play two or three instruments.

A closer, but just as correct, interpretation of "Tipica" is "typically."

And that is how Mantovani would play any number with his orchestra—typically of the country and settings associated with the tune.

But whether you like him most on the radio, on the stage or on one of the numerous records he has made, I know you would like him in person. Dark, and of medium build, he has a charming personality which makes you feel at home after a few seconds, and after a few minutes you feel you have known him for years.

Of course he is absorbed in his music, but he *has* other interests. Oh yes, there's pretty Winifred Moss—or rather there was—she's now Mrs. Mantovani. They fell in love at first sight! Then there's Kenneth, who burbles "Daddad" when "Monty" comes into the room.

His hobbies are gardening, motoring and billiards. And at billiards he is one of the best in his profession.

And that is Mantovani, the magic musician, who is so reminiscent in his air of efficiency of the late De Groot. **A.S.C.**

THE BROADCAST TIPICA ORCHESTRA



A picture of Mantovani with the orchestra he uses for broadcasting. There are seventeen, including himself, in his stage combination.

...THE FIRST OF A SERIES OF GREAT COMPETITIONS...

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**MANTOVANI Autographs
Records for Readers**

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SIMPLE "WIRELESS" COMPETITION



<p>1st Prize Inscribed Silver Cigarette Case 20 Autographed 10-in. Records and Large Signed Portrait</p>	<p>2nd Prize 10 Autographed 10-in. Records and Large Signed Photograph</p>	<p>3rd Prize 5 Autographed 10-in. Records Plus Signed Portrait</p>
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Consolation Prizes—12 Handsome Presentation Portraits

The name of Mantovani is familiar to every listener—who hasn't enjoyed his Tipica Orchestra with its melodious rendering? And who would not like to possess a library of recordings by this unique combination and its famous conductor and violinist? That is just the opportunity we give every reader of *WIRELESS AND TELEVISION REVIEW* in the first of a unique series of free competitions. Pause awhile at this page with its **HITHERTO UNEQUALLED PRIZES!** Look at that first prize! A valuable silver cigarette case engraved with the winner's and Mantovani's names; twenty different 10-inch **COLUMBIA RECORDS** made by Mantovani—40 numbers—and **EACH RECORD PERSONALLY AUTOGRAPHED BY MANTOVANI**, and a fine personal portrait just like that reproduced on page 268 autographed most appropriately "Tipica-ly Yours, Mantovani." Then look at those second and third prizes, and consolation prizes. The records are all different, and, like the photographs, all autographed. But that is not all! There is

AN AUTOGRAPHED PORTRAIT FOR EVERY ENTRANT

who cares to send 1½d. stamp for postage with his coupon. He will then receive—irrespective of whether he wins a prize or not—an autographed postcard-size photo similar to that reproduced at the top of this page. The autographing is not printed; each photo will be **PERSONALLY AND INDIVIDUALLY SIGNED.** And now for

WHAT YOU HAVE TO DO in this simple competition, which will be personally judged by Mantovani himself! Below you will find a list, with details, of 25 numbers recorded by Mantovani; from these you just have to select **EIGHT** to make up a well-balanced 30-minute broadcast programme. Simply insert the **NUMBERS** of the tunes you choose, and **IN THE ORDER YOU WOULD HAVE THEM BROADCAST** in the eight little squares in the coupon here. The Closing Date for the Competition is **THURSDAY, 30th April, 1936.**

Remember, in making your selections, that programme-making is not a haphazard business at all. There is an art in choosing items which shall be good as a set, including, that is, popular and melodious "numbers," which contrast well—and, of course, others to provide a good opening and a good finish to the programme.

Having made **YOUR** programme, fill in the coupon, add your name and address in block capitals and post it in an envelope to: Mantovani Programme, *WIRELESS AND TELEVISION REVIEW*, 1, Tallis House, John Carpenter Street, London, E.C.4 (Comp.).

The First Prize will be awarded for what is adjudged the best all-round programme—balance, variety, arrangement, and so forth all being taken into account—and the other prizes in order of merit. Every entry must be **IN INK** on a coupon cut from *WIRELESS AND TELEVISION REVIEW*, and only one attempt is allowed to each reader. The decision of Mantovani, in conjunction with the Editor, will be final and legally binding in all matters concerning this competition, and no correspondence whatever can be entered into. No responsibility will be taken for loss in the post or otherwise. No employee of the Amalgamated Press Ltd. may compete.

**CHOOSE YOUR PRO-
GRAMME FROM THESE
NUMBERS:**



A photo of the silver case presented with the first prize.

List of Columbia Records by Mantovani and his Tipica Orchestra.

1. Moonlight Dancing and You. (Quick Waltz.)
2. For You, Madonna. (Slow Foxtrot.)
3. Maracas. (Rumba.)
4. Caramba. (Paso Doble.)
5. Go Into Your Dance. (Quickstep.)
6. Piccolino. (Quickstep.)
7. Wyoming in the Gloaming. (Slow Foxtrot.)
8. Fold Your Wings. (Waltz.)
9. Love is Like a Cigarette. (Slow Foxtrot.)
10. Red Sails in the Sunset. (Slow Foxtrot.)
11. Moon-Spun Dreams. (Slow Foxtrot.)
12. Nothing Lives Longer Than Love. (Waltz.)
13. Gypsy Violin. (Traditional Gipsy Melody Waltz.)
14. Street in Old Seville. (Tango.)
15. Quatre Besos. (Argentine Tango.)

"WIRELESS" MANTOVANI COMPETITION

NAME.....

ADDRESS.....

INSERT RECORD NUMBERS:

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DO YOU WANT A FREE AUTOGRAPHED PORTRAIT? YES NO
(if so, 1½d. stamp must be pinned to this form).

- | | |
|---|---|
| <ol style="list-style-type: none"> 16. Cuban Moonlight. (Rhumba.) 17. Sorrento by the Sea. (Tango.) 18. In a Viennese Beer Garden. (Traditional Viennese melodies.) 19. Midnight in Paris. (Six-Eight.) 20. Let's Fall in Love For the Last Time. (Waltz.) | <ol style="list-style-type: none"> 21. Love's Serenade. (Slow Foxtrot.) 22. Just a Corner in Paradise. (Slow Foxtrot.) 23. Thanks a Million. (Foxtrot.) 24. I'm Yours for To-night. (Rhumba.) 25. Lehar Melodies. (Selection of famous Lehar songs.) |
|---|---|

BROADCASTING IN WAR- TIME



The Italian station at Trieste. Italy has what are termed "non-listening zones" in certain parts, where licences are issued to only "reliable" people who will not tune-in to a certain prohibited foreign station.

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wearing veils of mourning for husbands who have died within the week. This is not happening in China or in South America, but close to us here in Europe.

I am not writing about some future and improbable matter. If the secrets of War Offices in Europe were open to us we would find much of what follows confirmed. Perhaps not in detail but in principle.

Forbidden Transmissions

Now let me refer to measures which have been taken in various countries to prevent listeners from hearing the "other man's point of view." In Czechoslovakia it is strictly prohibitive for the owner of a radio receiving set to invite friends into his house to listen to more or less political broadcasts of non-Czech stations. If he opens a window when he is listening himself and thus makes it possible for the people in the street to hear, his set may be confiscated.

Italy has what are termed non-listening zones in Istria, a part of the country where the broadcasts of Ljubljana might be received on simple receiving sets. Licences are only issued to "reliable" members of the population. I have chosen these two examples by intent. Italy is autocratically ruled, Czechoslovakia a democratic republic.

International Jamming

Since the beginning of broadcasting there has perpetually been talk of "jamming." Personally, I think that this method is only resorted to occasionally and locally. For instance, I know of a State in Eastern Europe and of another in East Central Europe which have systematically

NOBODY can deny the importance of broadcasting as a means of world-wide information. It could also be very valuable in bringing together nations which know little of each other. Unfortunately, the political aims of governments even in times of peace are in many cases set against the possible influencing of their nationals by broadcasts from foreign stations. In various parts of Europe measures have already been taken to this effect.

Sometimes we are told that broadcasting has brought nations closer together and that no people will fight against another nation whose voice it can hear on its own loud-speakers. This may or may not be the case, but we must realise one thing, and the sooner we realise it the better: *There will be no broadcasting in war-time!*

Propagandists of peace firmly believe, so I am told, that by means of broadcasting they will be able to appeal to combatants. These people seem to forget one thing. In the 20th century we are still fighting wars and we fight them for righteous causes. The other man—the enemy—does the same. His point of view is diametrically opposed.

Peace Laws Invalid

If war were fought across the green baize table of a debating club broadcasting would certainly be an ideal method for the presentation to the

masses of the arguments in favour of war which are put up by both sides.

But, unfortunately, war is fought differently. Laws which apply in peace-time lose their validity in war-time. No sane government would permit the morale of the civilian masses or, for that matter, of the troops, to be undermined by giving them the opportunity of listening to the enemy's point of view. If I happened to be a

A Special Article by

ARTHUR GULLILAND

Describing

what would happen to broadcasting should another European war break out.

fussy retired Army officer of the humorous stories I could close this article now with, "Broadcasting is all bosh!" and I would not need to add another word.

But I happen to belong to the younger generation, and have neither retired nor am I a particularly blood-thirsty member of the human community. I have seen too much to let my ideals run away with me, and I have attended too many international conferences to believe that they will ultimately prevail.

War is a reality. At the moment I write mothers are weeping over dead sons, and young wives are

jammed by strong telegraphy the news broadcasts of a neighbouring station.

But let us visualise what would happen in the case of Italy and Abyssinia. Every day the Italian stations pump out the Italian point of view regarding the Abyssinian conflict. They do so in many languages. They do not mince their words.

Let us suppose that, as a kind of reprisal, France or Britain were to arrange similar broadcasts about the British or French point of view. These programmes would, naturally,

We must bear this fact in mind, also the fact that if you have five broadcasting stations to supply a country with suitable local service the moment one is disabled there is one area already which you cannot reach. Governments are well aware of the value of broadcasting for propaganda. Knowing that the present system of broadcasting is vulnerable they would attempt to replace it by some arrangement which is less liable to be destroyed.

Here again I have facts to support

telephony along cables to supply telephone subscribers with programmes.

Most certainly broadcasting receivers will be confiscated at the outbreak of war. Until a system of wired broadcasting is properly in operation community reception sets will be left in the charge of reliable people. The population will be able to gather round these carefully controlled loudspeakers and listen to what is intended for them. The government would thus be able to continue the use of broadcasting as its most valuable instrument of propaganda.

If all the vital broadcasting stations had been disabled by aircraft, cables would be used to relay speeches, information, etc., to central points in each town where, again, large assemblies could be held in front of loudspeakers.

The Neutral Countries

But what of the neutrals? Each combatant will certainly desire the inhabitants of neutral countries to know its individual point of view. Neutrals will, no doubt, be allowed to continue listening. Each country will attempt to keep at least one station going in the ether, and I do *not* think that there will be many attempts at jamming.

All considerations of broadcasting as a means for the dissemination of peaceful thought will be greatly clarified if one bears in mind that its utility in this direction ceases with the actual declaration of war. Governments have taken, and will continue to take, measures to ensure that their frontiers will be respected even by wireless waves, or that their nationals will be unable to, or prohibited to, reach out, which comes to the same thing.

THE ANNOUNCERS AT KOSICE



A picture taken in the Kosice station, one of the smaller transmitters of Czechoslovakia. In this country it is forbidden to listen to foreign political broadcasts except in private. Windows must be kept shut and no friends invited.

be in Italian. What would the reaction of Italy be?

I leave this question open. Probably they would confiscate highly sensitive and selective sets and only leave the population with simple receivers. They might jam the transmissions by superimposing powerful telegraphy; they might also resort to police methods and make a rule that these broadcasts should not be listened to. The idea that the Italian government would permit its population actually to listen in to these broadcasts seems very vague indeed to me.

An Easy Mark

Up to now I have concerned myself with facts and realities regarding "peace-time" broadcasts. Now I must ask readers to follow me a step further. Let us suppose that two countries with efficient broadcasting services declared war on each other. We know a lot about the efficiency of modern bombing aeroplanes. Broadcasting stations are an easy mark.

my supposition. In Switzerland broadcast listening over the telephone and over systems of cable and wire relays is becoming increasingly popular. In Germany a method has been evolved to make use of high-frequency

NUMBER TWO OF OUR GREAT SERIES OF COMPETITIONS

will appear

NEXT MONTH

FEATURING HARRY ROY

That ever popular Master of Jazz

There will be more attractive batches of

RECORDS FOR READERS

So see that you

DO NOT MISS THIS WONDERFUL OPPORTUNITY

THE astonishingly successful results obtainable from the use of only two valves in this year's reflex circuit are not attributable to any special operating skill. In fact, the only point that really calls for emphasis in connection with operation is the avoidance of too much "anode coupler." The intelligent use of the aerial balancer condenser is also to be commended, and a few words on that topic will not be amiss as the idea of an aerial balancer control tuning a circuit without any calibration whatever is something new to the home constructor.

Battery Leads

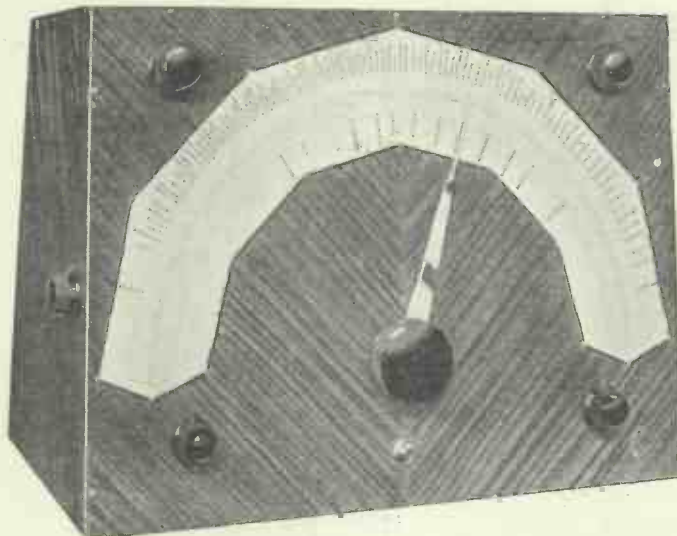
The installation of the receiver calls for little comment, as the grid-bias battery is already fitted in the set, and there is only one H.T.+ terminal. But there are two terminals to which are affixed more than one wire, and so a reference to the connections of the H.T. and L.T. batteries and the loudspeaker is desirable.

should be clear of the loudspeaker in order to avoid any back-coupling effects which might arise; this again is a standard rule to follow.

You will find it very difficult to go

would be received, but if the grid bias is the wrong way round signals may still come in, but not effectively.

Now let us have another look at the controls. Looking at the set from the front you will find a knob on the left-hand side. This is the wavechange switch. When you turn it towards you, i.e. clockwise when looking from the side, you will be working on the long waves, while if the switch is turned away from you you will be on the medium waveband.



The controls of the receiver, which are fully discussed in this article, are all visible in this view of the completed set.

Panel Controls

On the front of the panel there is an on-off toggle switch. When this is pressed down you will be "on," while if it is left up the set will be "off." In the top left-hand corner of the panel there is an aerial coupler, while in the top right-hand corner there is the reaction control. The knob in the bottom right-hand corner is the anode coupler, and its function is similar to that of the anode coupler in the S.T.300, S.T.400 and S.T.500

wrong with the grid-bias battery as there is only one tapping on it, the voltage applied to the grid of the Harries valve being -3 volts. The sockets on a grid-bias battery occur at

THIS YEAR'S S.T.100

By
John Scott-Taggart
M.I.E.E., F.Inst.P., Fel.I.R.E.

Further details by the designer of the efficient and up-to-date two-valve reflex receiver, of which we published full constructional details last month.

1½-volt intervals, so that there should be only one intermediate socket unused between the two wander-plugs. I have recently been greatly alarmed at cases where constructors have reversed grid-bias batteries so that the grid or grids have been made positive by the required voltage, instead of negative. This, of course, will ruin reception, but any readers of this should make quite certain, quite apart from this particular receiver, that their grid-bias plugs are connected the right way round. Such a mistake is easily noticed on the high-tension battery because probably no signals at all

To economise on terminals these are not duplicated. One side of the loudspeaker is connected to the L.S.—terminal of the ebonite strip at the back of the set, while the other side of the loudspeaker is connected to the H.T.+ terminal. The negative terminal of the accumulator is connected to the terminal E on the strip, while the positive of the accumulator is connected to the L.T.+ terminal on the strip. The negative socket of the high-tension battery is connected to the E terminal on the strip, while the 120-volt positive socket is connected to the H.T.+ terminal on the strip.

An Important Point

The usual place for the accumulator and high-tension battery will be behind the receiver, while the loudspeaker will be on the right of the set. It is undesirable that the loudspeaker should point directly towards the receiver; this is a general rule applying to all sets and is for the purpose of avoiding a microphonous howl developing through sound waves vibrating a valve. The lead from the aerial

receivers. None of these three controls makes any practical difference to wavelengths, which is a very important point when simplicity of operation is desired. In the case of the three earlier sets mentioned the various controls all affect tuning, and although thousands have become used to this effect my sets nowadays are being designed so that all the advantages of adjustable controls are obtained, but without the embarrassment of a change in tuning.

The Tuning Knobs

The two remaining knobs to be discussed are for tuning to the desired station. The knob in the middle (to which is attached the long pointer) is, of course, the main tuning control, but the little knob in the bottom left-hand corner is also a tuning control which is used for tuning the first tuned circuit of the receiver. It may be wondered why this latter knob requires no calibration. The reason is that all the calibration is done on the second tuned circuit, and the long pointer is simply turned to the desired

station "dot" as explained last month, and then the aerial balancer (the knob in the bottom left-hand corner) is simply turned until that station is heard. The process takes only a moment.

Tuning-In Stations

I strongly advise you to start calibrating the set as soon as you get it working: that is to say, when you get a definitely identified station, which will usually be one of the British stations at first, you should put a dot on the appropriate dot-line on the dial. In going back to that station you will turn the long pointer until it comes exactly over the dot, and then adjust the aerial balancer knob until the station is heard. It is important to see that the aerial balancer points in the same general direction as the main knob. Otherwise it is quite on the cards that you will pick up some strong station which will be heard even though the main tuning condenser is pointing to another station. Selectivity, of course, is only obtained by the correct tuning of both circuits. I propose to give a few hints on the avoidance of this possible

CALIBRATING THE SET

reception of the wrong station which, of course, can occur on practically every simple straight set.

You should think of the receiver as consisting of two tuned circuits, each of which has to be in tune with the desired station. The aerial balancer in the left-hand bottom corner tunes the aerial circuit, while the main tuning knob tunes the second circuit. The first circuit is fed with high-frequency currents through the aerial coupler at the top left-hand corner, while the second circuit is fed through the anode coupler at the bottom right-hand corner. Increasing the aerial coupler, i.e. turning it clockwise (to the right), will increase signal strength, but decreases the selectivity of the first tuned circuit. Similarly, the anode coupler if turned to the right will increase signal strength but will decrease selectivity on the second tuned circuit.

The anode coupler, however, does more than this, and it is essential to

inform you that if the anode coupler is turned too far to the right the set will become unstable. This applied equally to the S.T.300, S.T.400 and S.T.500. The instability will result probably in a growling noise—quite enough to make you wonder whether something has gone wrong. Actually, the effect is perfectly normal and need cause not the slightest anxiety. It would be a very simple matter to stop the instability by just reducing the capacity of the anode coupler, but a greatly increased sensitivity and effectiveness of the receiver is possible if the user is trusted to the extent of allowing him to increase this coupler knob to a position just before instability arises.

Concerning Reaction

A point should be noticed in connection with the reaction, and that is reaction and anode coupler are to some extent interlinked. This applies, I think, to every known straight receiver, whether an anode coupler or a variable-mu valve is employed. Changing the anode coupler will alter the "inherent reaction," which is unavoidable and unintentional and exists in every receiver to some slight extent. If you alter the anode coupler you will be changing this slight amount of reaction which is automatically applied to the tuned circuit, and so if the *intentional* reaction knob is at a critical setting an increase of the anode coupler will cause the set to oscillate. You can either work the receiver with much anode coupler and little reaction, or a little anode coupler and critical reaction. This last method is definitely the better, and, therefore, you should always use as little anode coupler as possible to give you the desired signal strength. In other words, have the knob in the bottom right-hand corner as near zero (to the left) as possible. This is also the condition for giving maximum selectivity.

Maximum Selectivity

When you desire maximum selectivity, the rule is to reduce the anode coupler, use reaction at the critical point, and if signal strength is still loud you can afford to reduce the aerial coupler and obtain greater selectivity on the aerial circuit; this latter adjustment may call for a very slight retuning of the aerial balancing condenser (bottom left-hand corner). When tuning is critical, any adjustments of the various controls may cause a very slight change in tuning, or possibly you were not previously exactly in tune. The rule, therefore,

THESE ARE THE PARTS USED BY MR. SCOTT-TAGGART

COMPONENTS.	Make Used by Designer.
Coil unit.	Colvern, type S.T.700.
·0005-mfd. tuning condenser (aerial balancer).	Ormond R483 (with small knob complete).
·0005-mfd. main tuning condenser.	J.B. with long pointer (as for S.T.700).
·0005-mfd. solid dielectric variable condenser (anode coupler).	B.T.S.
·0003-mfd. solid dielectric variable condenser (reaction).	Polar "Compax."
·0005-mfd. solid dielectric variable condenser (aerial coupler).	Graham Farish log-mid-line.
·00005-mfd. fixed condenser.	T.C.C. mica, type 34.
·0001-mfd. fixed condenser.	Lissen mica.
H.F. choke (anode feed).	Wearite, type H.F.P.
H.F. choke (reaction).	Wearite, type H.F.P.J. (marked H.F.J.).
1 anti-mic. valve holder (5-pin).	Benjamin.
1 valve holder (4-pin).	Benjamin "Vibrolder."
L.F. transformer, 3.5/1.	Varley Nietet.
75,000-ohm resistance.	Dubilier, 1 watt.
1-mfd. fixed condenser.	T.M.C./Hydra, type 30, with terminals.
1-meg. grid leak.	Ferranti G1.
On-off switch.	Bulgin S.80.
5 terminals—A, E, L.T., H.T., L.S.—	Belling-Lee, type R.
2 wander plugs—G.B., G.B.—	Belling-Lee, midget type No.1019.
2 aluminium brackets with bolts and nuts.	Peto-Scott.
Terminal strip, 5 in. × 1½ in. × ⅜ in.	Peto-Scott.
Panel, 16 in. × 12 in. × 7 mm., plywood.	Peto-Scott.
2 cabinet side-pieces, 1 cabinet top and G.B. battery spar.	Peto-Scott.
Wire (Maxamp).	Peto-Scott.

VALVES.

Y 220 Hivac Harries.

210 R.C. Cossor.

LOUDSPEAKER.—W.B. Stentorian.

that applies to all straight receivers also applies to this one, namely, that a final very slight re-tuning of the main tuning control may be required.

I have already hinted that you may pick up the wrong station through not having the aerial balancer condenser correctly adjusted. There is a very simple remedy for this. A rough-and-ready plan is to have the aerial balancer knob pointing in the same general direction as that in which the main tuning pointer points. But, even so, it is possible to pick up the wrong station on the aerial coupler and to let this station "barge through" into the set. Actually, in practice one very soon learns to ignore false stations, and to turn the aerial balancer until the recognised station is heard. There is an infallible test as to whether the aerial balancer is giving you the desired station, and that test is to leave go of the aerial balancer knob and to adjust the main tuning knob a little to each side of the dot corresponding to the desired station. If the signal immediately weakens whichever way the main tuning pointer is moved, then the aerial balancer is on the correct station. If, however, the movement of the main tuning knob produces no effect on signal strength, or even increases it, then it shows that you are not picking up the desired station at all, but another station is coming through.

"Local" Effect

The simplest case of this, of course, is experienced when you are near a B.B.C. station. The main tuning pointer may be several stations away from, say, London Regional, but when you turn the aerial balancer round you are almost sure to hear London Regional quite loudly at a certain position of the aerial balancer. You should, however, alter the adjustment of the aerial balancer until you hear not the London Regional but the station you want.

There are two ways of avoiding the effect altogether. One is to make the set more selective. This is done by reducing the aerial coupler and the

anode coupler and applying reaction. The main tuning pointer is now set exactly to the dot for the station desired and the aerial balancer is then

aerial balancer may give the impression that this is working in some different way from an ordinary tuning condenser. This is not so, and the possibility of bringing in the wrong station is present in every straight receiver, except the perfectly ganged arrangements. After ten minutes' practice you certainly will have no difficulty at all.

With regard to obtaining selectivity, I wish to repeat the advice I regularly give to users of all straight sets of any type. This advice is to have the signal weak to begin with and to build it up with reaction.

Applying reaction to a signal already strong will be futile. You will probably get distortion and certainly no greater selectivity. When receiving a station selectively it should never be quite as loud as it might be, even with reaction at maximum.

The method of using the dot lines has been sufficiently explained in the preceding number, but anyone who has built the S.T.100 (1936) and has not obtained the S.T.700 copy of POPULAR WIRELESS dated November 2nd, 1935, should obtain this earlier publication which gives full details of the use of the dial, with numerous illustrations. A copy of this is obtainable for fourpence, post free, from the Back Number Department, Amalgamated Press, Ltd., Bear Alley, London, E.C.4.

S.T.100 BLUE PRINTS

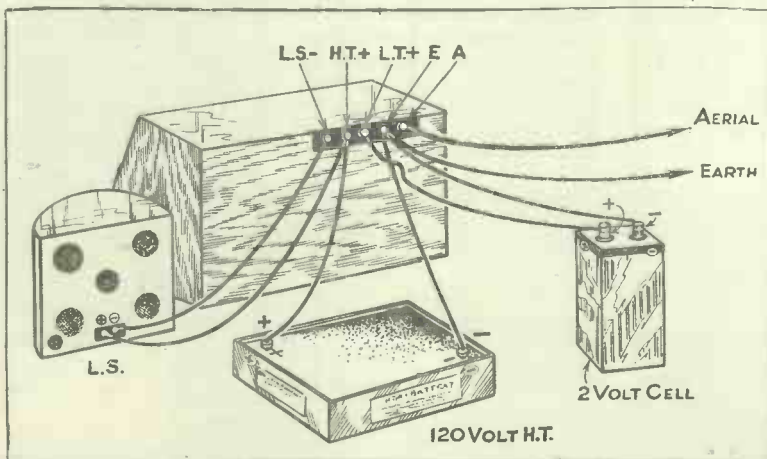
By special arrangement, we are able to offer genuine full-size blue prints of the S.T.100 (1936) taken from the draughtsman's original drawing. These cost only 1/- each, post free. Applications for these blue prints should include a postal order for 1/-, and be addressed to Blue Print Dept., "Wireless and Television Review," Tallis House, Tallis Street, London, E.C.4, AND TO NO OTHER ADDRESS.

turned until that station is heard. Since the set is more selective, there will be no false stations. If while turning the aerial balancer knob you do happen to hear another station than the one desired, the signals will be so weak that you will be able to ignore them. As you turn the knob round and suddenly hear the station at full strength you will then at once know that that is the desired station.

The Second Method

The most subtle method which may be used in those cases where you are desiring to pick up a very weak station is to set the pointer to the desired station, make the set oscillate by the use of reaction, and then to turn

MAKING THE EXTERNAL CONNECTIONS



The correct way of joining up the batteries, loudspeaker, aerial and earth to the terminals on the back of the set is clearly shown in this sketch.

the aerial balancer until there is a change in the heterodyne whistle note; the effect is unmistakable and occurs when the aerial balancer is tuned to about the same wavelength as the main tuning condenser. Probably this method should only be used by experienced amateurs.

The fact that I have devoted so much space to the operation of the

set shall always be delighted to hear from constructors of this set and to reply personally to all letters of appreciation.

LISTEN TO AMERICA

on the inexpensive short-wave set to be described next month. Anyone can build it. For use on 'phones or loudspeaker.

FRENCH BROADCASTING IN SWITZERLAND

Details of the New Sottens Station and its Studios



On the right of the talks desk at the Lausanne studios are three signal lights to tell the speaker to talk faster or louder, etc.

THE well-known Swiss broadcasting station Sottens, the regional transmitter for the French-speaking part of the country, which originally was built for a power of 25 kw., has now been replaced by a 100-kw. outfit which started operation shortly before Christmas, 1935.

The original and the new transmitter are entirely of British make, and it is largely due to the skill of the manufacturers and the local Swiss telegraph engineers that the changeover from the old 25-kw. station to the new 100-kw. transmitter, which is housed in an annexe to the old building, went so smoothly, with only a very short period of interruption.

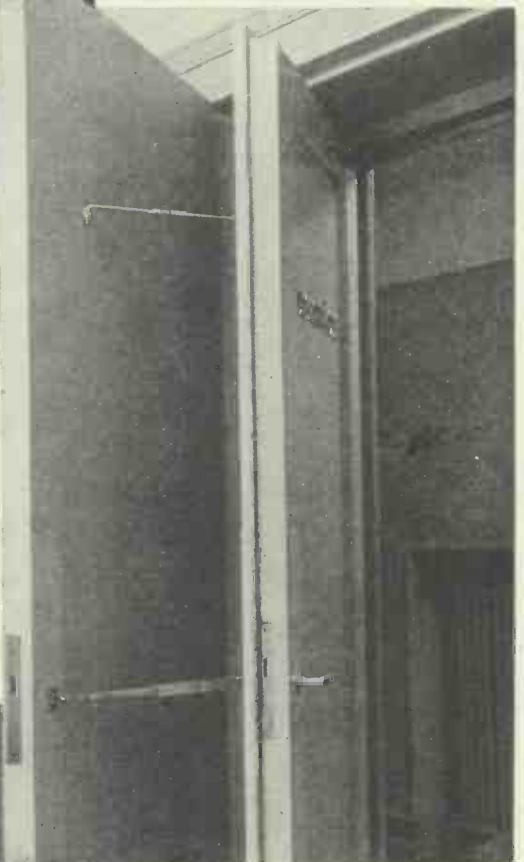
Reception reports from the various parts of Switzerland show that the power increase has generally improved service conditions, especially in sections of the country which hitherto had cause to complain.

Sottens is a small village in the centre of the Canton Vaud, and receives its programmes from studios in Lausanne and Geneva. Two separate companies operate in each of these towns, but close co-operation prevails and programme time is divided in half between the two towns. At the present moment Lausanne has an

advantage over Geneva as a new Broadcasting House was opened at Lausanne early last year, whereas Geneva still has to work in studio premises situated on the top floors of an apartment house.

Plans for a new Geneva Broadcasting House have recently been completed, and contracts for the building were signed this winter, so that Geneva will have up-to-date broadcasting premises early in 1937. The new Broadcasting House will form the centre of what the architects intend calling "Radio City."

At Geneva the former chief engineer of the station, Monsieur Henry Ramseyer,



Here the double "silence" doors to the Lausanne studios are linked to facilitate use.



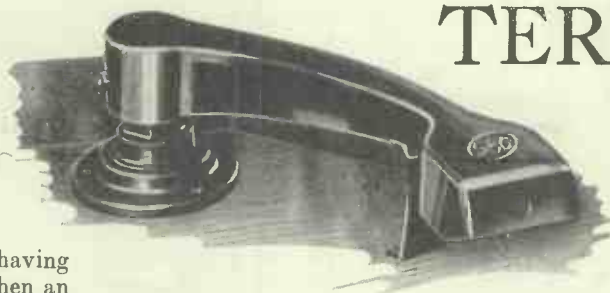
In the effects studio at Lausanne. Note the various sized doors in the background for producing different sounds.

has for the past years worked as chief announcer, although he would prefer to go back to screwdriver, and slide rule. But his success as an announcer keeps him at the microphone. Although quite a young man he has a deep voice, which makes a number of listeners believe that he wears a long beard. At Lausanne a former school teacher, Mlle. Angèle Golay, is chief announcer, and she is aided by Mlle. Françoise Cornamusaz.

There is a certain rivalry between the two sets of studios, especially over the radio orchestra, which at present is stationed at Lausanne. A. A. G.

Making the Most of YOUR PICK-UP TERMINALS

OF course there are a tremendous number of pick-ups in use in this country, but if there were even more there would be far less grumbling about the B.B.C. programmes! "How come?" did you ask. Well the reason is simple.

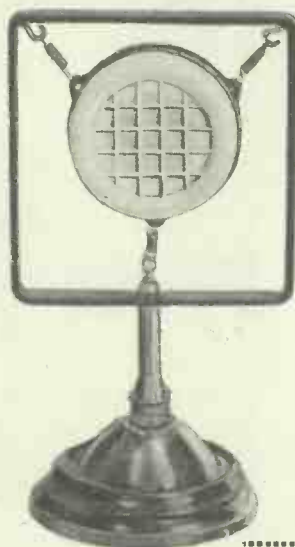


This and the following practical articles will help you to get the greatest possible entertainment from your radio receiver.

People become so used to having the radio switched on that, when an item crops up they do not like, instead of switching off and sitting in peace, many leave it on to aggravate their feelings and give point to their grumblings. What a pity they don't put on a few records and listen to their favourite artists and numbers!

Quite Simple

But, quite apart from this aspect, you know you are not taking full advantage of your radio if you do not make provision for playing the records. For a pound or two you can get the necessary apparatus and, as two of the following articles explain, the whole business is really a very simple matter.



One of the many types of microphone supplied by Electradix Radios. It is priced at 21s. 6d.

The argument sometimes offered against records, that one soon tires of the same records and, anyway, one hears the latest dance numbers often enough in the programmes, bears but little close examination. For instance, the first part—that one soon tires of the same records—ask any record "fan" and he will tell you that on the whole the older records get played most because they become favourites.

Careful Selection Needed

Naturally, I am assuming that the records are selected carefully, and not bought haphazardly and unheard just because someone recommends them. Then the second part of the argument.

I will grant you that if you are not a dance-music enthusiast you may get your fill of a number from the dance bands on the air, but you *might* be jazz crazy. Thousands are! And then, why generalise by mentioning a specific type of record?

What about all the other types of record? No matter who is your favourite on the radio, or the band you like best, I wouldn't mind taking long odds that records are available which they have made.

Perhaps, still feeling a bit doubtful about going in for record work, you ask why, in spite of the advantages, are not more radiograms sold. Well, personally, I think it is entirely a question of cost.

There are but few sets on the market which do not have provision for pick-up connections. And you can take it from me that, in the matter

of commercial receivers, the supply is an accurate mirror of the demand.

And, carrying on our tradition of helping readers to get the last bit of pleasure out of their radio sets, we include an article on microphones in this series dealing with the "pick-up" connections of your receiver. If you get the apparatus just right you can have an amazing amount of fun with a mike.

Special Language Records

But just one more word about records: Remember, these don't end at mere entertainment. For instance, if you are learning a language, there are special language records available. And for the technical minded there are constant frequency and varying frequency records for testing out the response of loudspeakers and other L.F. apparatus.

A.S.C.

TECHNICAL DETAILS OF POPULAR MAKES

Make	Type	Volume Control	Volts at 1,000 cycles per sec.	100 cycles per sec.	Needle	Price
B.T.H.	Minor	30,000 ohms incorporated	1.06	1.2	H.M.V. Loud	s. d. 17 6
Do.	Needle Armature	100,000 ohms	1	1.2	Do.	40 0
Do.	PezoLeetric	500,000	1.7	6.0	Do.	42 0
Belling-Lee	Model A	50,000	.5	.75	Medium	27 6
Do.	Model C	50,000	.5	.75	Do.	35 0
Do.	Clip On	50,000	.5	.75	Do.	35 0
Do.	Model D	50,000	.5	.75	Do.	30 0
Collaro	Standard	—	.65	1.1	—	22 0
Do.	Standard	Vol. Control incorporated	.65	1.1	—	25 0
Do.	No. 20	—	.65	1.1	—	20 0
Cosmocord	Model 10 (for attaching to acoustic instrument)	10,000	.45	1.5	Golden Pyramid	10 0
Do.	Model 15	10,000	.45	1.5	Do.	15 0
Do.	Model 21	10,000	.6	2	Do.	21 0
Do.	Model 276	10,000	.4	.9	Do.	27 6
Garrard	Standard	50,000	.8	2.5	Col. Duragold	32 6
Do.	Standard	Vol. Control incorporated	.8	2.5	Do.	37 6
G.E.C.	G.E.C.	25,000	.65	1.5	Loud Tone	27 6
Graham Farish	—	50,000	.5	.55	H.M.V. Loud	14 6
Do.	—	Vol. Control incorporated	.5	.55	Do.	18 6
H.M.V.	No. 11 (for attachment to acoustic machine with volume control provided separate).	250,000	1 volt average		Loud Tone	32 6
Marconiphone	Model 19	100,000	.75 average		Loud Tone	32 6
Do.	Model 25	100,000	1.5 average		Do.	32 0
Rothermel (Piezo-electric)	Standard	500,000	1.7 average		Do.	42 0
Do.	De Luxe	500,000	1.8 average		Do.	84 0



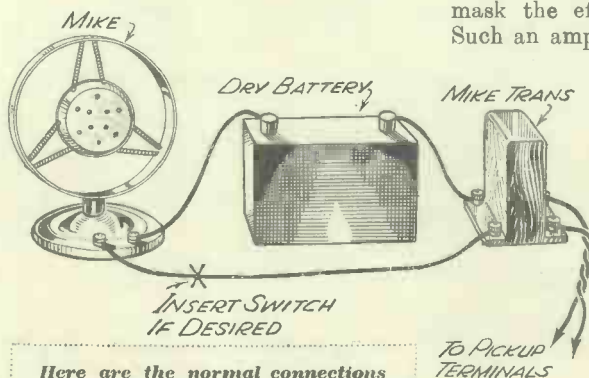
The G.E.C. Home Broadcaster, an attractive unit which sells for a guinea.

You can buy a microphone from five shillings upwards. The more you pay the better the quality and the better the sensitivity you can expect. Anything between ten shillings and a pound will buy you a really good instrument with its own stand.

The Carbon Type

Practically all the popular-priced microphones are of the carbon type in which resistance varies according to the pressure produced by the sound waves. So, to get your varying voltages for application to the pick-up connections of the set, a local battery is needed.

Generally speaking, a 4½-volt dry battery of the type often used for



Here are the normal connections for a carbon-type microphone. A microphone transformer is a necessity for connecting up.

handlamps and cycle outfits is ideal, but the voltage needed will naturally vary with the particular instrument and the transformer employed.

A microphone transformer is a necessity with the ordinary carbon microphone, in order to step-up the

“HELLO, EVERYBODY!”

voltages of the varying currents before they are applied to the amplifier in the set. The connections are very straightforward and are illustrated in a sketch in this page.

One side of the battery—it does not matter which—is joined to one side of the microphone. The other sides of the battery and microphone are taken to the two primary terminals on the transformer. The two secondary terminals are joined to the pick-up terminals.

Inserting a Switch

When the microphone is not in use the mike battery must be disconnected, as current would flow from it the whole time. If desired, a mike switch can be inserted at the point marked “X.” Any simple on-off switch will do.

An alternative to the carbon microphone, and one which scores on the ground of background silence, is the condenser microphone. Normally this is a very expensive instrument, but Messrs. A. F. Bulgin & Co., Ltd. supply a mike of this type for 30s. That is without stand, in the form illustrated on this page. It has an aluminium finish.

There is one important point that should be realised about condenser microphones, namely, that a pre-amplifier is necessary. This is because the leads from mike to first valve must be of the order of a few inches, otherwise the capacity of the leads would mask the effect of the microphone. Such an amplifier is also necessary to bring the output up to that of an ordinary mike.

A “Midget”

Messrs. Bulgin also have just introduced a new midget microphone transformer which provides ratios of 1:35 or 1:70. It has a centre-tapped primary enabling two mikes to feed the one secondary. The list number of the component is L.F.35, and the price 5/-.

Another firm who can be of great assistance to those interested in microphones is Messrs. Electradix Radios, who issue a special microphone catalogue. The prices in this range from 1/- to £50! There are actually 27 types of microphone illustrated, and

How to Make the Most of a Microphone

many more listed, together with amplifiers and other associated apparatus.

A very attractive instrument incorporating transformer and combined switch and volume control is made by the G.E.C. and sold for the modest

MADE BY BULGIN



An inexpensive condenser microphone which is ideal for high-quality reproduction.

price of one guinea. It is ideal for amateur work.

The popular uses of microphones have been dealt with time and time again, but a brief reference to some of them will not be out of place.

At any party they provide scope for plenty of fun in the way of sound-guessing competitions, naming the speaker, playlets, etc. A microphone is also a useful adjunct to a pick-up when an extension speaker is in use, enabling timely announcements to be made. And many uses for a hidden mike as a detectaphone will occur to everybody.

How to Speak

Don't speak too close to your microphone or you will get what is called “blasting.” Speak up well about six or seven inches away, unless you want to try crooning, when you should sing across the microphone and not directly into it if you want clear enunciation.

ITEMS YOU REQUIRE



An ingenious and inexpensive needle container made by Messrs. Erwin Scharf, of 114-116, Southampton Row, London, W.C.1. By pressing the top a single needle is delivered, and used needles are put in the outer section of the container.

PRACTICALLY every set nowadays is fitted with some sort of arrangement whereby a gramophone pick-up can be attached to enable records to be played "through" the radio receiver. Sometimes the method used to attach the pick-up is the provision of sockets at the back of the set, sometimes terminals are used, and in a few instances a plug has to be inserted in one of the valve holders of the receiver.

But more of this last method in the next article.

Easily Fitted

Whatever the method, it is explained by the makers of the set in question, and the attachment of the pick-up is a very easy matter.

But the provision of the makers for the attachment of a pick-up is not the end of the whole affair. Other things have to be done before the set can be said to be ready to be used as a gramophone.

A motor has to be provided, and the pick-up itself has to be bought. Some sort of control of volume also has to be provided. In this article we are concerned with the apparatus that is available for the use of those wishing to play gramophone records through their sets—the technical aspects of such things as volume controls, connecting the pick-up, and so forth we shall discuss in another article.

Question of Sensitivity

The first thing to consider is the pick-up itself, and there are many makes on the market, all suitable for use with a radio set, but not neces-

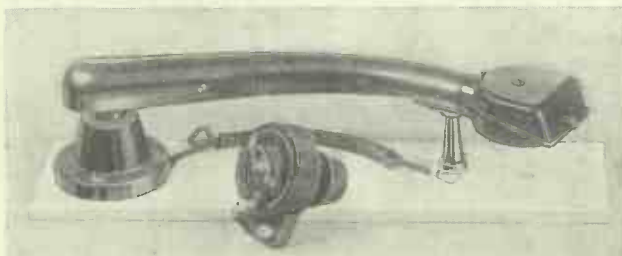
sarily suitable for any or every set.

Let me explain: The pick-up provides electrical impulses from the gramophone record. These impulses are amplified by the set, and the resultant music or speech is reproduced by the loudspeaker. Now, obviously, the pick-up has to provide sufficient strength of input to allow the set to amplify it to the required strength. Some sets have more power than others, and do not require what is termed a sensitive pick-up, while others, with few valves, perhaps, need the attached pick-up to be as sensitive as possible so that not very much amplification has to be carried out.

Makers' Advice Advisable

It is best always to get the advice of the makers of the set as to the type

A WELL-MADE INSTRUMENT



The "Garrard" pick-up, which is supplied complete with a volume control for 37s. 6d. Resonance is avoided by an armature of very small mass.

of pick-up required, for according to type so the sensitivity varies. For instance, what are called piezo-electric pick-ups (discussed elsewhere in this issue by G. Stevens) are very sensitive indeed, and are particularly good if you want full bass reproduction, which makes them very desirable for use with certain types of sets.

THE CONNECTIONS

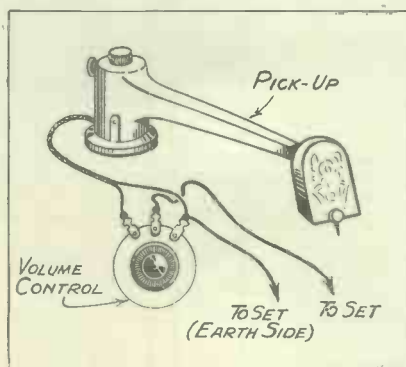


Fig. 1. How to wire a volume control to a pick-up. The centre tag on the volume control is the slider connection.

Details of Pick-ups, Motors, Volume Controls, Playing-desks, etc.

Then there are needle-armature pick-ups, such as the B.T.H. These are moderately sensitive, and they produce very good quality reproduction. They deserve to be used with a good set in order that their excellent reproductive powers may be fully used. The rest of the pick-ups are the ordinary magnetic type, and vary in sensitivity, though they are in the main quite sensitive. These are suitable for practically any set, unless the makers state definitely that some sort of other pick-up is desirable.

The sensitivity of a pick-up can be judged by the voltage output at certain frequencies, and the table given on page 277 shows the average voltage outputs at 100 and 1,000 cycles per second with representative pick-ups.

Volume Control

Whatever the pick-up chosen, however, the question of volume controlling arises. No one wants to have an instrument that has a fixed volume level and which cannot be turned up or down at will. So it is usual to fix some sort of variable resistance potentiometer across the pick-up in order that the volume may be controlled.

Sometimes this resistance is provided in the radio set itself, in which case an external volume control will not be necessary. When the control is not provided by the set maker a potentiometer of from 10,000 to 500,000 ohms has to be connected as shown in the diagram Fig. 1.

The Resistance Value

Alternatively, the control may be incorporated by the pick-up manufacturers in the base of that instrument.

The resistance to be used is determined by the make of the pick-up, and the advisable volume control is always stated by the maker of the pick-up. As the quality as well as the volume may depend on the correct

value being used, the maker's recommendation on this matter should always be followed.

There is obviously a converse to this. If the volume control is provided by the makers of the set and is situated in the set itself (very often the volume control that is used for controlling the radio also acts when a pick-up is used), then the resistance of that control must be ascertained and a pick-up chosen to suit the volume control instead of the value of the control being chosen to suit

instead of the sound box, and Belling-Lee make one to fit on to the side of the gramophone.

But whatever method you choose the final result is the same—music via your radio set. The one thing to watch for being that the pick-up used on the record-changer or the complete playing-desk is suitable for the set.

Clockwork or Electric?

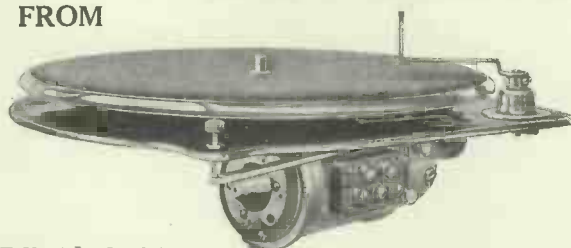
Usually there will be no difficulty here, but in a few instances the set makers recommend a piezo-electric

motors will run longer still, of course.

If an electric motor is desired you have two types to choose from—the universal type that is used on D.C. and which will also work on A.C., and the A.C. motor which will work only on A.C. mains. If you are going to use it on A.C. only we advise the latter type. It is usually quieter (mechanically and electrically) and it has no brushes to require attention. Also, if you want to economise in space there is a very useful synchronous motor (the Simpson) which takes up very little depth and can be fitted into a shallow



TWO ITEMS FROM B.T.H.



On the left is the B.T.H. Piezolectric pick-up, the principle of which is described in another article. On the right is "Truspeed-D.C." motor, which will also work on A.C. if desired. It costs £3 7s. 6d.

the pick-up. Here, again, the table will help those who are considering the fitting of a pick-up to their sets.

With the pick-up decided (and do not forget that the price is not the only criterion of quality here, for some of the very cheap pick-ups are excellent) the question arises of the motor to be used to drive the gramophone record round.

Here we find that there is a very wide variety of choice. We can buy either a clockwork or an electric motor and fit it on a motor board with the pick-up, or we can purchase a playing-desk (such as the Peto-Scott "Adagram," or the H.M.V. playing-desk) which is complete with motor pick-up, volume control, etc., ready for connecting to the set. Again, we can get a playing-desk complete with record cabinet such as the Plus-a-Gram, or one can obtain an automatic record-changer in complete form with pick-up and everything. An example of this is the Collaro.

Automatic Changers

Then as a final choice there is the separate automatic record-changing unit, consisting of the motor chassis and the pick-up ready for fitting to a board, or in a cabinet. These changers are made by such firms as G.E.C. and Garrard, and allow eight records to be played without any manual operation in the way of changing the records. If you have an acoustic gramophone you can fit a pick-up to that. H.M.V. provide one to fit the ordinary tone arm

pick-up and so far there is no record-changer available with that type of pick-up fitted, though I believe they can be fitted to the playing-desks provided by Peto-Scott and others if desired.

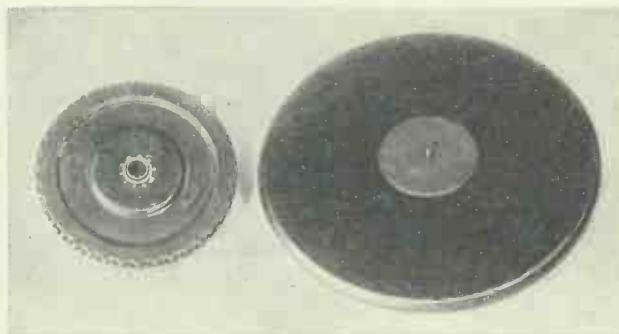
Playing-desks are available in either electric or clockwork motor types, but the record-changers are only available in the electric motor types.

If you are considering the choice of a clockwork motor to be fitted on the motor board by yourself it is desirable

cabinet. This motor runs automatically at the correct speed and has no speed control, as have the other types.

About needles it would be possible to write a dozen pages. There is such a wide variety that I cannot hope to give you any but a skeleton guide here. If you are using an ordinary motor (not a record-changing type) I advise the use of needles that have to be changed after each playing. It sounds tedious, but most pick-ups give better reproduction with the ordinary steel needle. With an automatic changer you will have to use a semi-permanent needle such as the H.M.V. Hi-Fidelity type, or the Columbia chromium needle. I prefer these to the Tungstyle, but this can be used if desired.

FOR CONSTANT SPEED



A synchronous motor drives this turntable designed for A.C. only. The speed is always constant for a given frequency, and the turntable seen on the right fits over the section on the left. The unit is marketed by Messrs. Kingsway Radio.

to have at least a double spring motor to avoid the necessity for frequent winding up. A double spring motor should play two ten-inch records easily, and very often it will be found capable of playing two twelve-inch records with one winding. Triple-spring

Scratch Not Excessive

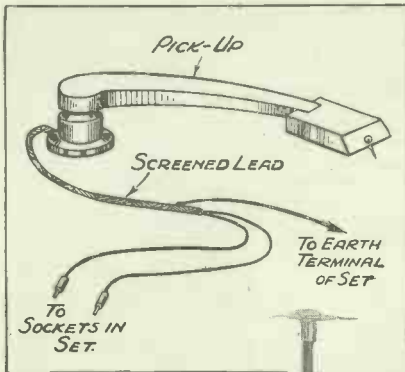
But in the needle, as in the volume control, it is best to go by the recommendations of the pick-up manufacturer. The output of the pick-up varies surprisingly with different types of needle, and it is always best to use the recommended type of needle if possible.

There is one more thing. Many people think that the use of a pick-up means a lot of needle scratch. That is nonsense. A certain amount of scratch is essential if the high notes are retained, but a good pick-up is not scratchy. If the scratch is too great a special filter can be obtained to fit across the pick-up.

K.D.R.

The Pick-up IN PRACTICE

Things to bear in mind when
installing the apparatus



In the diagram above the best method of screening pick-up leads is seen.



The "Garrard" automatic record changer.

THE actual fitting of a pick-up and its associated volume control to a radio set, whether it be a battery or a mains set, is very straightforward. But there are one or two points that one has to keep in mind. The most important of these is that the leads from the pick-up to the set should be as short as possible. This is not because any volume is lost by using long leads, but because they are liable to cause instability in the case of all types of sets, and in mains sets they are also liable to cause hum.

Even with short leads it is advisable to use proper screened wire, or to wrap metal foil round the flex used and to connect the foil to earth. A diagram showing this has been drawn illustrating the connections used where the pick-up is connected direct to the set without the insertion of any volume control. This is done when the set itself has the volume control incorporated in it. If a control has to be used on the motor-board, then the diagram in the previous article should be followed, and the screening should be placed round the leads from the volume control to the set.

Earthing the Tone Arm

The tone arm of the pick-up should also be earthed to the screening, if it is not already done by the makers, who sometimes connect the tone arm to one of the leads coming from the pick-up. If this is done that lead should be the one taken to the "minimum side" of the control.

On the volume control there are three terminals. Place the control so that they come at the top. The centre one is the one connected to

the slider inside and must go to the set and to nowhere else. Of the other two, one goes to the pick-up only, and the other goes to the set *and* to the pick-up. Usually the terminal on the right, looking at the front of the volume control, is the one that goes to pick-up and to the set. This can be termed the minimum terminal, for it is towards this contact that the slider moves when the control is turned towards minimum volume (anti-clockwise).

If you find that when the control is connected to the set you have to turn to the right to reduce volume, then you have the two outside terminals transposed as regards their connections.

I have mentioned in the other article that some pick-ups have the volume controls incorporated in their bases. These obviously do not require a volume control, either on the motor-board or in the set. If there is one in the set, you can place either the one in the set or that on the pick-up at full volume and control on the other, whichever is the more convenient; but it is preferable, when a control is incorporated in the set, to choose a pick-up that has no volume control integral with its design.

In the case of the pick-up with the

incorporated volume control, the connections to the set are as in the figure shown with this article.

We have mentioned that the pick-up leads should preferably be screened and earthed. The chassis of the motor used for driving the turntable should also be earthed, and usually a special tag or terminal is provided by the motor makers for that purpose. Never run the pick-up leads close to the loudspeaker leads, or you may experience feed-back and howling.

Universal Mains Sets

A word may be said here about Universal sets. If these are fitted with pick-up sockets or terminals, it can be assumed that suitable precautions have been taken by the makers to ensure that no "live" connection with the mains can occur by reason of the pick-up connections. But if the set has *not* been provided

with terminals, it is very inadvisable to try to adapt the set by any system such as plugging-in one of the special pick-up adaptors that are sold for insertion in a valve holder. This may result in trouble, due to the pick-up leads becoming "live." If it is tried, large series condensers must be inserted in the leads, close to the plug, to isolate the pick-up leads from the mains; also some grid return circuit for the first valve will probably be required. Best of all, if you have a set that is not provided with pick-up terminals or sockets, it is advisable to get in touch with the makers before you use any of the adaptor "stunts." We say this because, though there is nothing

A MARCONIPHONE MODEL



This is the Marconiphone Model 25 pick-up and arm. It is the most sensitive of the Marconiphone models and sells at 32s. 6d.

against the adaptor scheme as such, it has to be used with discretion, and on no account should it be used unless you are sure of the internal arrangements of the set, and are fully cognizant of its technical details.

Speed Adjustment

Unless you are using one of the Simpson synchronous motors, you will have to adjust the speed by means of the lever provided on the motor, so that the records run at the right speed of revolution and the pitch of the reproduced music is correct. The setting is determined either by one of the special speed testers or by the simple means of marking the turntable on the edge with a white piece of paper and counting the revolutions

speed of the motor until the lines on the disc appear to be stationary. That speed will be the correct 78 revolutions per minute.

Speed indicators for use when no A.C. mains are available, and which can be employed with every type of motor, are made by H.M.V. and Columbia. These are held against the edge of the turntable, and the speed is indicated on the instrument; but the Stroboscope is the simplest method of all.

One thing should be said here about the fixing of the motor and motor-board. They must be level. You will be tempted to retort that anyone knows that. But it is all too easy to get just that slight amount of slope on the motor-board that will cause the pick-up needle to bear more against one side of the record grooves than the other.

Obtaining Minimum Wear

In order to obtain minimum wear it is essential that the needle shall run truly down the centre of the grooves. If it bears against one side due to the tilt of the motor-board it will tend to wear the groove unequally, and the record will not last as long as it should. Especially will this be the case if the tilt of the motor-board is such as to cause the needle to bear on the side of the groove towards the *outside* of the record.

Every pick-up is forced in towards the centre of the record by the spiral nature of the groove, so that even with a level motor-board the wear on the groove always tends to be slightly more on the outside edge than on the inside. If you increase this by causing the pick-up to "lean" against the outside edge owing to motor-board tilt the wear is obviously greatly increased.

As a matter of fact it is really an advantage to have a very slight tilt, causing the pick-up to bear very slightly in towards the inner edge of the groove, thereby decreasing the wear caused by the "driving" of the pick-

The Belling-Lee "Clip-on" unit for use with portable acoustic gramophones. Price 35s.



up and needle towards the centre of the record.

A good test for level is to place the pick-up on the revolving record so that the needle comes on the smooth outer edge. If perfect level has been attained the pick-up will not run either in or out, but will remain on the edge until it is pushed into the first groove by hand. The slight inward tilt that I mentioned as being beneficial will show up by the pick-up moving slowly inwards when placed on the outer edge of a revolving record.

Some Needle Hints

A word about needles: Take my advice and keep to the well-known good makes. Cheap needles often have very poor points and tend to ruin the record. Also, if you use the ordinary steel needle do not omit to change it after every *SIDE* of the record has been played. And do not merely turn it round to get a "fresh point." This results in a chisel edge being used against the record, with corresponding damage. And finally, if you use the semi-permanent or long playing needles, don't play the full needle "life." Change needles about two thirds of the specified number of

MADE BY G.E.C.



This A.C. automatic record changer is made by the G.E.C. It takes eight 10- or 12-in. records.

for half or one minute. The speed should be 78 revolutions per minute.

With A.C. mains in the house, you can make use of what is called a Stroboscope, no matter whether your motor is a mains-driven or a clockwork one. This Stroboscope is a disc of paper that can be obtained from practically any gramophone shop (and is often supplied with A.C. motors by the manufacturers). It has a number of black radial lines on it. All you have to do is to place the paper on the turntable, switch on the motor, and also turn on the electric light in the room. Electric light run on A.C. flickers many times a second (quite invisible to the ordinary eye), and the flickers have the effect on the revolving Stroboscope lines of making them appear to move. They will move either in the direction of the rotation of the turntable or in the reverse direction.

A Ready Indication

If they "go" in the same direction, you have your motor running too fast. If they appear to move in the opposite direction, the motor is going too slow. All you have to do is to adjust the

WITH ALL-BAKELITE COVERING

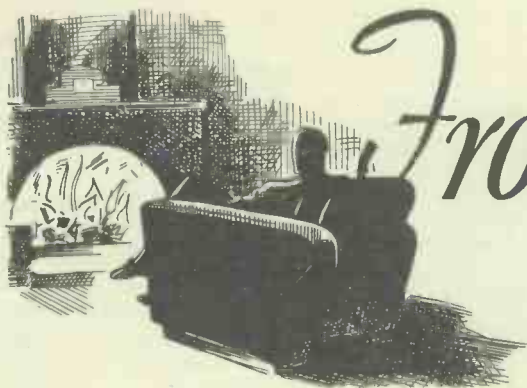


Two models of the Graham-Farish Pick-up are available, one at 14s. 6d. and one at 18s. 6d. The latter includes volume control.

playings. This is wise economy, and it definitely saves the record.

A refinement that is well worth consideration is the fitting of a pilot light on the motor-board, so that a good light is available for needle changing, and for any other adjustments. Special lights for this purpose are sold by Bulgin and other accessory firms.

K.D.R.



From My Armchair

To Wear a Beard or Not—What's Behind Some of the S O S's?—and Cosmic Rays are subjects on which John Scott-Taggart dwells this month. Of cosmic rays, he writes in introduction: "What are cosmic rays? I do not know. I will mitigate my ignorance by saying that in this respect I resemble the greatest scientists and astronomers who have ever lived. None of us knows. You can join us."

As pipes are nowadays almost taboo amongst radio designers since the Irish invasion—and a very successful one, too—of the radio manufacturing field, lest the sincerest form of flattery be suspected, the growth of a beard was suggested in these irresponsible columns as a means to personality—that indefinable aura which means so much (at least £200 a year) in commercial life.

Obviously a Draw

Listening with only a nominal ear to a peculiarly frothy speaker in a discussion at a meeting of the Institution of Electrical Engineers, I allowed my glance to wander round the portraits which grace the walls of that austere and beautiful meeting-room. There are ten portraits of great electricians. Five have beards and five are beardless. Clearly a draw. Little guidance is thus given to aspirants to greatness. There is not even a casting vote. We must patiently await the hanging of another great electrician. If it is Sir Ambrose Fleming, those of us who shave our skins will take heart (although a moustache will be a necessary compromise).

But if Sir Oliver Lodge is chosen the balance will swing the other way with a bump. For the Grand Old Man of radio, to whom we owe a debt which few can estimate, has set a standard which few could emulate.

Those Radio Appeals

"Will Harry Smith, last heard of as the driver of a hansom cab in London twenty-five years ago, proceed at once to the Liverchester Hospital where his brother John Smith lies dangerously ill." This is the nightly dose of reality

which reminds us that we—even Mr. G. K. Chesterton—are just airy bubbles floating precariously through life.

There are critics who feel we should not be subjected to this gloomy "imposition": that John Smith should forgo meeting his brother Harry who apparently has so little brotherly love that he has not bothered to keep up the old family contact for twenty-five years. Probably John himself has no particular wish to meet his errant

desires for certain reasons—perhaps monetary—the return of one who has cut adrift. I should not be surprised if four out of five of these long-lost people regretted their decision to answer the radio call. But we shall never know the inside history of these agony appeals. To me the most deserving case would be the appeal to someone on a walking-tour or otherwise temporarily out of touch with home. Those who have been out of touch for years are usually best left alone. The broadcasting of their *prima facie* "desertion" (we cannot hope to know the circumstances) is a gratuitous and probably unwelcome intrusion upon their private lives.

Make the Most of Me

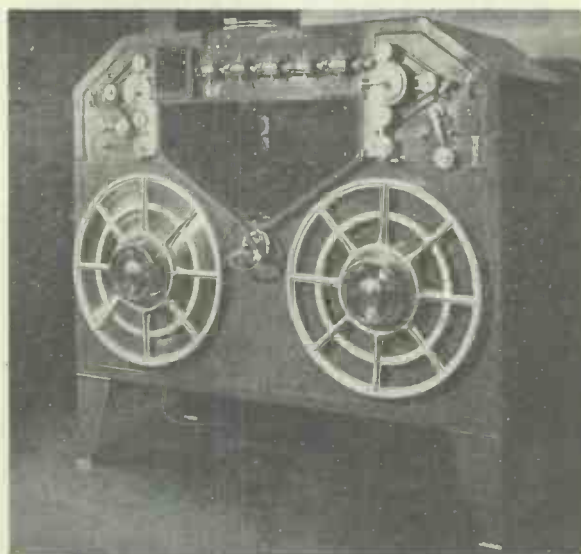
From the above you may come to the conclusion that I myself am about to decamp, sunk without trace. " . . . last heard of writing brilliant, provocative articles for WIRELESS in his inimitable style," as the Editor would draft it.

So make the most of my writings while ye may. I may suddenly realise I am not being paid enough—or the proprietors may awake to the fact that they are paying me too much—and a yawning chasm will gape in the radio Press. For a time you yourself will yawn and wonder what's happened—

and then you'll wish you had written kinder letters to me. A sodden pillow will be little solace to you. ♪

Or I may want a change—perhaps to change the pen for the tongue and the laboratory overall for wig and gown which lie at present musty in a

THE B.B.C.'s "TAPE" MACHINE



The machine which stores programmes. It is the Marconi-Stillé recording and reproducing machine—at Maida Vale. On the front are the two reels which carry the steel tape on which the record is made.

brother, but some fussy person at the bedside thinks it best.

One has a shrewd suspicion that sentiment is often missing in these cases. Perhaps a local authority is concerned about possible funeral expenses, or a member of the family

drawer. Perhaps I'll tire of the spurious notoriety of the Press and yearn to go unheralded and unsung. Almost thou persuadest me—but not yet.

* * *

How would you like to spend your life studying cosmic rays which never did anybody any harm and nobody a ha'porth of good? I have been talking to two gentlemen of great sanity and balance to whom cosmic rays mean everything in life.

What are cosmic rays? I do not know. I will mitigate my ignorance by saying that in this respect I resemble the greatest scientists and astronomers who have ever lived. None of us knows. You can join us.

Great Penetrative Powers

Cosmic rays appear to be electrons which bombard the earth with terrific velocity and irresistible pugnacity. They will penetrate sheets of lead, and have even been detected in the Holborn Underground tube station—90 feet below the level of civilisation. Why they should be there is a trifle uncertain, but it is certainly not with the intention of travelling to Oxford Circus or Liverpool Street. They have already travelled millions of miles with the sole purpose of hitting this earth—a rather futile object, but then Nature generally is futile and often—as in the case of thunder and lightning—vulgar and ostentatious.

“Shooting Stars”

But there is nothing ostentatious about cosmic rays. In fact, before Elster, Geitel and C. T. R. Wilson discovered them around 1900, these miniature shooting stars spluttered on to this planet without the slightest publicity. Now they are Big News—headline stuff—and are at this very moment earning me an honest penny.

Their enormous velocity permits them to pass through our bodies, metals, the upper layer of the earth itself. They do not come down like rain, however—or like the stream of electrons in a valve. They are more like tiny meteorites, about ten falling every minute on every square inch of the earth's surface. With quite simple apparatus you can “hear” them falling.

LIKE TINY METEORITES

Where do they come from? No one knows. Certainly not from the sun. Day and night do not affect their intensity. In this they differ from the very much slower electrons which do come from the sun and ionise the upper “layers” of the earth's atmosphere and so enable us to get “fascinated” by the sinister cry of the Laughing Sucker-Bird, carried to us as an interval signal on the short waves from the other and more romantic side of the world (between 2.25 p.m. and 2.30 p.m. on the first Thursday of the month during Leap Years).

Counting the “Clicks”

Perhaps the cosmic rays come from the stars, but that is pure conjecture. They do not fall only vertically. Many do, but others come in at angles. One way of detecting them is to arrange a glass tube containing an oxidized copper cylinder through which passes a rod. The air is evacuated and a potential of 1,500 volts negative is applied to the cylinder. When

three are usually arranged, to avoid queer spurious effects not due to genuine dyed-in-the-wool cosmic electrons. When each tube detects the same cosmic electron, then and only then does the “counter” work.

The earth's atmosphere does not keep back all the cosmic rays, but actually few survive the opposition of the atmosphere. It is a case of reversing the old law of “the higher the fewer.” The higher the stronger is the verdict of those who have taken the counter apparatus up to the heavens in an aeroplane. At 30,000 feet the cosmic rays are 15 times as strong as at the surface of the earth.

Peculiar Ideas

By the way, it is advisable to keep this information about cosmic rays to yourself. If it gets into the hands of mentally unbalanced people they will at once blame the poor things for all their imaginary ills. There are quite enough people who have to sleep north and south or whose health is undermined by wireless waves passing through them (or using them as indignant and reluctant aerials with poor earths). There are already hundreds who are weighed down by radio waves, made to tremble in sympathy with them (every 10,000th wave, or after rectification, presumably), or hear a continual hissing noise since broadcasting began. I once knew a retired colonel whose blood boiled whenever Hughie Green was radiated. J. S.-T.

SPEAKING OVER A LIGHT-BEAM

A device for speaking over short distances by means of a light beam is illustrated below. The mike is attached to a small battery and bulb. A light sensitive device picks up the varying light rays and converts them into electrical pulses for amplification and final reproduction by a loudspeaker.



IMAGINARY EARTHS

Have you a real earth for your radio set? Or is it one of those imaginary affairs? Many people consider that having buried an

a “cosmic electron” comes down it passes through the copper cylinder, and as it passes through the semi-vacuum it partially ionises it; a pulse of current thus produced may, after amplification, work a relay which can “count” the number of clicks. By arranging two “detectors” above each other you can count only the vertically-dropping cosmic “rays”;

earth plate or driven a copper tube into the ground they can forget it. It pays to examine the wire connection to the buried earth at least once a year. And beware of those biscuit tins, sheets of tinned iron, and so forth. They are not lasting earths. Rust soon upsets the whole affair and leaves you with a useless length of wire diving into the ground.

Di-Pole Aerials



A group of aerials used for the short-wave transmissions from P.C.J., the Philips station in Eindhoven, Holland.

behoves us to settle down and investigate the possibilities of the various types of resonant aerials again.

With the imminence of regular high-definition television transmissions, readers will welcome this article on di-pole aerials for television and ordinary short-wave reception.

By W.L.S.

EVER since short waves were discovered, it seems to have been the fashion to assume that "any old length of wire" would serve as a receiving aerial. The amateur transmitter who dates back to 1924 will remember the sudden re-discovery of the Hertzian type of aerial for transmitting purposes, and the enormous effect it had upon efficiency of propagation in those days.

It is all very well, however, to talk about tuned aerials or resonant aerials for transmitting work which is generally carried out on one particular frequency and its harmonics. It is quite a different matter to design a receiving aerial which will work satisfactorily over the huge range of frequencies that has to be covered by the average short-wave receiver.

Hertz's Experiments

It has recently been remarked that radio is "reverting to type." Hertz's original experiments were carried out on extremely short waves, and short, resonant aerials were used both for transmission and reception. Marconi used very long wavelengths for his first transatlantic transmission, and as it was not feasible to construct resonant aerials a matter of a mile long, he may be said to have started the fashion of loading up a short length of wire to resonate at the desired frequency.

Now that we are all back on "Hertzian" waves once more—particularly in connection with television and other ultra-short-wave work—it

Let us start by taking the case of a television transmitter working on the fixed wavelength of 7 metres: One of the simplest and most efficient forms of aerial that might be used by such a transmitter is the "di-pole" shown in Fig. 1. Each half of the aerial is a quarter-wave in length— $1\frac{3}{4}$ metres, or roughly 6 feet.

A SIMPLE SCHEME

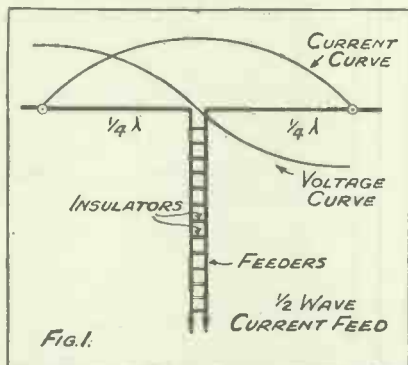


FIG. 1. An efficient and simple aerial system such as a 7-metre television transmitter could employ.

The energy from the transmitter is fed to the centre of the aerial along a pair of non-radiating feeders joining the main aerial at right-angles. The distribution of voltage and current in the aerial will be seen from the diagram, a complete half-wave "standing" on the top. Obviously current is transferred from the feeders to the aerial, which has voltage, but no current, at each free end.

The direction of radiation is at right-angles to the plane of the aerial, and if we erect a similar receiving aerial in the same plane, it will form a most efficient "collector" for the radiated signal. The feeders, or transmission line, now serve the purpose of transferring the minute amount of energy picked up by the aerial to the receiver. The aerial is still a current-operated arrangement.

The receiver could also be voltage-fed from either end of a single 12-ft. rod, but it would have to be in close

proximity to it. The use of a single feeder would completely upset things, for its length would simply "add on" to the length of the aerial itself. Sometimes, therefore, it is the practice to install, close to such a feeder, a "dummy feeder" terminating at a free end (Fig. 2).

A "Zeppelin" Antenna

To transmitters such an arrangement is known as a "Zeppelin" antenna. The feeders are not extremely critical about length, but must be tuned to resonance at the "home" end, remote from the aerial itself.

FEEDER CONNECTIONS

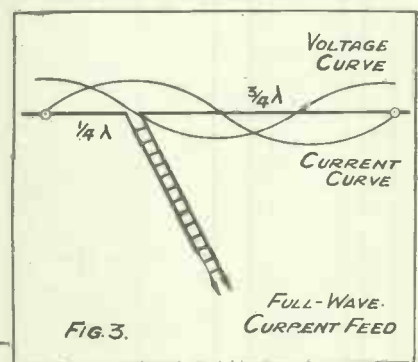


FIG. 3.

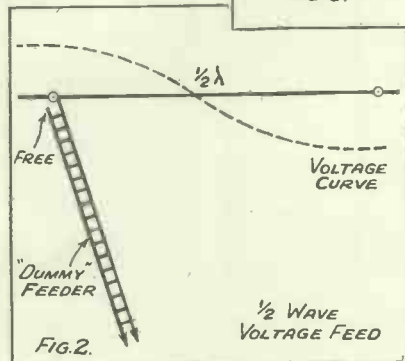
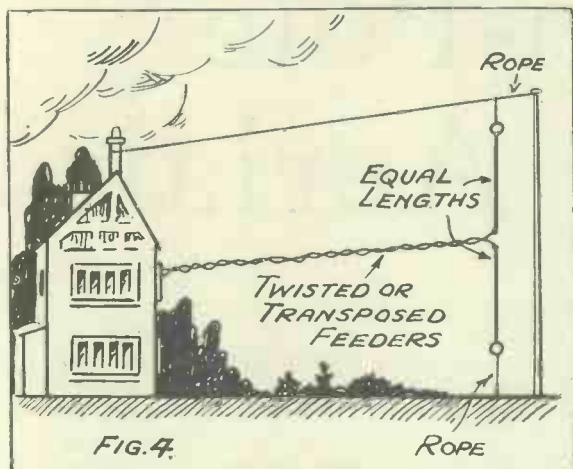


FIG. 2.

When an aerial is a full wavelength long, the feeders must be attached a quarter the way along, as in Fig. 3.

Fig. 2 shows the use of a dummy feeder with a half-wave aerial.

AN IDEAL DI-POLE SYSTEM



It is important in an aerial of this type that the two halves of the aerial are kept in a straight line.

Now, as far as theory and practice go, these arrangements are all very well for receiving signals on the one particular wavelength to which they are resonant. But it has become the fashion to talk about a "doublet" aerial, which usually turns out to be a di-pole of any convenient length, which is supposed to operate efficiently on practically any wavelength.

How do we reconcile theory and practice now? And what is the point of using twisted or transposed feeders now? We may settle down to an aerial with two horizontal arms of, say, 16 feet each. These will be roughly quarter-waves for 20-metre reception; but for 10-metre reception the system will be completely out of joint, for we shall now have a complete wave-length "standing" on the top (Fig. 3) instead of a half-wave as in Fig. 1. Our feeders in Fig. 1 join the aerial at a current antinode; to do so under the new conditions they must be connected at a point one-quarter of the way along, instead of at the centre.

In other words, if the two horizontal arms are each $\frac{1}{4}$ -wave, or $\frac{3}{4}$ -wave, or $\frac{5}{4}$ -waves, etc., in length, the feeders may be arranged at the centre and the arrangement will function as a true di-pole. When the arms become $\frac{1}{2}$ -wave, full-wave, etc., the whole thing is out of joint.

So much for the theory; yet in practice such a di-pole works quite

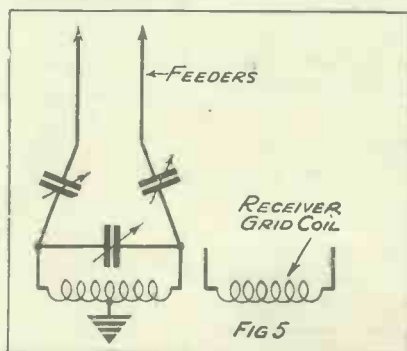
nearer to the source of interference than the other will hold water no longer, and the noise-level should be practically zero.

The Preferable Position

Fig. 4 shows an ideal system. The feeders should leave the aerial at right-angles; and since a horizontal di-pole, when operating on its proper frequency, is strongly directional, it is preferable to use it in a vertical position, as shown.

Coupling to the receiver is effected by taking each feeder to one side of a tuned coil, the centre of which is earthed. Sometimes it is advisable, also, to insert a small variable condenser in series with each feeder

METHOD OF COUPLING



How the aerial of Fig. 4 should be joined to the set. The variable condensers in series with the feeders are not always necessary.

satisfied with the results that they obtain from such a system, so that its description is amply justified.

We must now come back to the true resonant aerial, designed for use on one fixed wavelength, or, at any rate, on one narrow band. Many amateurs who have been working on the 5-metre band have discovered that

well for reception. Used as an "all-wave" aerial, its chief advantage is that one can practically remove "man-made" static by placing the aerial well out in the clear, away from house wiring and out of the actual field of the interference. The feeders naturally pick up the interference as well, but if they are twisted or "transposed" by means of special insulators at regular intervals the two components will not only be 180° out of phase, but the criticism that one feeder may be

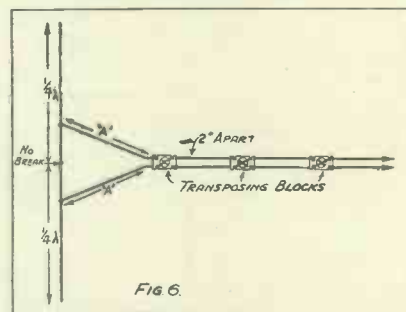
they could receive a certain station by using an 8-ft. (half-wave) length of indoor aerial, either vertical or horizontal, although they could not find a trace of it on a large outdoor aerial.

Certain tests made on a 7-metre television transmission, at a considerable distance, also proved that an accurately cut di-pole would produce strong signals, compared with which a big "brute-force" arrangement provided nothing at all.

A Question of Polarization

And here another factor enters in. Some transmissions are horizontally polarised when they arrive at the receiver, others vertically. One may find, on the five-metre band, that station A requires a horizontal aerial and station B a vertical. One might imagine that an enquiry would reveal the fact that A used a horizontal transmitting aerial and B a vertical—but in practice it is often the other way about. When the signals come

A TIP TO TRY



The efficiency of a double quarter-wave aerial is sometimes improved by being joined in the middle instead of separated, as in Fig. 1.

from any distance it often appears that the plane of polarization is changed en route.

Now that we are talking about aerials expressly designed for the frequency on which we are receiving, we can begin to talk about impedance-matching, which, obviously, is a waste of time in the so-called "all-wave" arrangement, since the aerial impedance is different for every wavelength on which we try to make it work.

Impedance Considerations

Fig. 6 shows a vertical di-pole using two quarter-waves, each roughly 6 feet long, if we want to use it on 7 metres, or 4 feet long for 5 metres. The impedance of such an arrangement across the ends is about 12,000 ohms, and in the centre about 70 ohms. A two-wire feeder system with transposition blocks and a spacing of about

(Please turn to page 322).

WE'VE heard a lot about the Ullswater Report, but what about the Siepmann Report?

This very confidential document has been placed before Sir John Reith and the Governors of the B.B.C. Its criticisms of the present arrangement of provincial programmes, its recommendations as to the future of the Regions, its suggestions for a better use of the programme resources of the provinces—these are a close secret. Perhaps they will never be published.

A view inside the B.B.C.'s mobile recording van. Two similar vans have been ordered for use exclusively by the Regions.



Reforms in the Provinces

The report is the result of a tour of investigation recently completed by Mr. Charles Siepmann. You'll remember he used to be Director of Talks at Broadcasting House, London. He came out of the staff shuffle last year as Director of Regional Relations, and this was his first task—to go out into the provinces, and inquire whether the B.B.C. is doing its job there properly.

The B.B.C. is saying nothing, but, take it from me, reforms of provincial broadcasting are "in the air." There is much discussion behind the scenes. Action, when it is taken, may be drastic.

Or, like a Commons debate, the whole thing may be talked out.

Meanwhile, as I predicted, Wales is to have its own Regional Director: Mr. E. R. Appleton is leaving Cardiff after being in control there for twelve years. This is the crowning touch to the scheme of creating a separate Welsh Region, with a 100 per cent. Welsh staff. Mr. Appleton is English. As West Regional Director he will in future be based at Bristol.

Expansion at Bristol

Here the B.B.C. is expanding. Staff has leapt up to about sixty. The premises in Whiteladies Road have had to be extended accordingly. Even now an additional studio is being completed. This will bring the number of studios at West Regional headquarters to five, and the total of B.B.C studios in the provinces to no fewer than fifty-nine all told! This astonishing total includes the emergency studios provided at each of the transmitting stations, and is made up as follows:

Scottish Region	
Edinburgh	5
Aberdeen	4
Glasgow	4
Falkirk transmitter	1
Burghead transmitter.....	1
West Region	
Bristol	5
Plymouth	1
Washford Cross transmitter	1
North Irish Region	
Belfast	5
Lisburn transmitter	1
North Region	
Manchester	6
Newcastle	4
Leeds	3
Sheffield	1
Moorside Edge transmitter	1

AROUND the REGIONS

By

Leslie Baily

Welsh Region	
Cardiff	5
Swansea	1
Bangor	3
Midland Region	
Birmingham	6
Droitwich transmitter	1
	59

In spite of this, congestion in the studios is so bad in certain Regions as to affect the efficiency of the programmes, and the B.B.C. seems to have come to the conclusion that the best way, looking to the future, is to build a really spacious Broadcasting House in each main centre.

O.B.s from Northern Ireland

A site for such a building in Belfast has, in fact, been obtained. It will replace the present barrack-like place in Linenhall Street, which the B.B.C. has occupied since 1924.

Now that Northern Ireland has its high-power transmitter, programmes will expand. The Regional Director over there will feel more justified in arranging "O.B.s" from parts of Ulster which have hitherto been beyond the range of the old Belfast transmitter. On April 15th, for instance, the microphone will go to Portaferry, and on the 18th the Londonderry Feis (musical festival) will be broadcast.

Then, at Glasgow, the Queen Margaret College is in B.B.C. hands, for conversion into studios, but the hang-up over the actual plans (which I mentioned last month) still goes on.

And something will have to be done at Birmingham, where the Corporation wishes to drive a new road through where the B.B.C. building now stands. Also, pressure on the accommodation at Manchester is getting distinctly uncomfortable.

An innovation here—at Manchester—was the recent début of the Lancashire Singers, a choir of twelve voices formed by Mr. T. H. Morrison (North Regional Music Director) for general work in the studios, in all kinds of programmes—revue and variety as well as serious music. The formation of similar choirs at Newcastle and at Leeds is not unlikely.

More Money for the Regions

Such increasing amenities to provincial broadcasting are very welcome. For far too long the provincial studios were starved. Their orchestral and choral resources were poor. They struggled along with ridiculously small staffs. Even now the staffs are none too large. But the tide has turned. More money is flowing into the provincial studios. We shall expect programmes to improve accordingly.

One very interesting—and valuable—addition to the equipment of provincial Regions is to be mobile recording apparatus. The recording van attached to London headquarters has proved such a success that the Regional Directors have been tumbling over one another to obtain similar equipment.

Occasionally they have been able to borrow the London van—as when Midland Regional did that much-discussed

FEATURES FROM NORTH WALES

fox-hunting programme, with its recorded scenes of a Cotswold hunt. That was, I fear, not a particularly successful example of the uses of mobile recording, but, undoubtedly, recording vans could

be put to good purpose in the provinces; and so—the London van being too busy for more than occasional excursions far abroad—two additional vans are to be provided.

One will be shared by Midland and the West, the other by the North and Scottish Regions. The vans are now being constructed and will be delivered some time in the summer. Reproducing equipment for the provincial stations is also on order.

Some Useful Collaboration

Co-operation between the Regions is taking interesting forms. There was the recent feature programme, "The March of the '45," half of which was produced at Edinburgh, half at Manchester. (Val Gielgud thought so well of this show that he intends to revive it in London during the summer.) Now I learn that the Midland and Welsh Regions are to collaborate in a debate on "The Drift of Employment," on April 9th. Speakers, put forward by both Regions, will include Lady Rhys Williams, Mr. A. P. Jenkins, M.P., and Mr. W. M. W. Thomas (managing-director of Wolseley Motors).

Three important tit-bits from this month's provincial programmes are:

"Under the Greenwood Tree," radio play version of Thomas Hardy's novel, from West, April 4th.

First-night Impressions of Shakespeare Festival at Stratford-on-Avon, from Midland, April 14th.

"Western Week-end," an elaborate series of "O.B.s" arranged by West Regional, switching in turn from cabaret at the Headland Hotel, Newquay, to Herman Darewski's Band at Weymouth; to Reginald Porter-Brown at the organ of the Regal Cinema, Torquay; to variety from the Theatre Royal, Exeter.

Anglesey Relay Urgently Needed

When I visited the new Bangor studios recently Mr. Sam Jones, who is in charge at that North Wales outpost of the B.B.C., told me how keen he is to work up feature programmes of the history, the music and folk-lore of this historic part of Britain. Well, he has not been long getting down to it—the first feature from North Wales, a programme called "Around the Island," a sort of "Let's-make-believe" tour of the Isle of Anglesey, was broadcast last month.

A pity that most people in North Wales couldn't hear it! The West Regional transmitter, on which it was broadcast, cannot be received decently in this part of the country, and the new Anglesey relay station (which is to rectify that unfortunate state of affairs) is not yet built.

Mr. Sam Jones is, of course, a Welshman. He came to Bangor from Cardiff, where he was a newspaperman before joining the B.B.C. He is, I think, what is known as a "go-getter." I imagine he will make things hum in North Wales. His very studios are overlooked by towering mountains—these looking over the Menai Straits—an inspiration in itself.

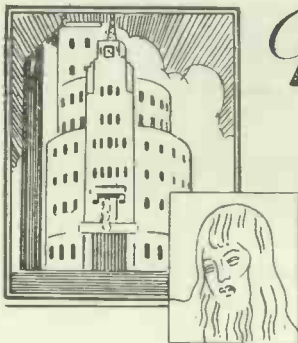
A Land of Possibilities

Nearby is Bangor University, chief of many institutions in this seat of learning. Along the coast are resorts full of fun in the holiday season. And every mile of this land is historic, the land of the Druids, the land invaded by the Romans, the land of the North Welsh with their slate quarries, their fishing, their singing, their Lloyd George. And now, their Sam Jones!

NEWCASTLE'S LARGE STUDIO



This picturesquely modern studio is the large one at Newcastle's Broadcasting House.



British Broadcasting NEWS & VIEWS

By "Prospero"

"London" and "Regional" Artists—An Indefinite Postponement—The Presentation of Poetry
—An Opera Committee

Gilbert and Sullivan— a Hitch

THE B.B.C. has been making a strenuous effort to secure the rights to use Gilbert and Sullivan operas as it likes. There was the particular reason that this is a Gilbert and Sullivan Festival Year both in England and America. The B.B.C. was ready to spend a good deal of money to achieve this purpose; a figure of the order of £10,000 was freely discussed.

But the negotiations have so far been abortive, the D'Oyly Carte interests, which control the Gilbert and Sullivan copyright, have declined to do business with the B.B.C. beyond the very limited permissions already extended. There is some criticism within the B.B.C. of the action of the administration in taking the negotiations away from Mr. Roger Eckersley, who had been handling them before.

Canals and Waterways

The bi-centenary of the Duke of Bridgewater on May 21st will provide a peg on which the B.B.C. will hang a feature programme dealing with the development of canals and waterways throughout the whole country. The Duke of Bridgewater was a pioneer in this line of activity.

A War Over Artists

Trouble has developed between the programme organisation in London and the various Regional centres of the B.B.C. The cause is artists. Now for B.B.C. purposes all artists appear to be divided into two parts: one is called London and the other is called Regional. To be a London artist means

that one is booked for National programmes; to be a Regional artist means that one has to be content with inclusion in a Regional transmission. London pays more than the Regions. There is also more "kudos" in being a London artist, so it is readily understandable that artists wish to get promoted from Regional to London as soon as possible.

But this does not please the Regional Directors, who, after taking a great deal of trouble to discover and train worthy local talent, see it slip away from them before they have reaped any substantial benefit. So a bargain was struck by which London agreed not to poach artists from the Provinces. This was all very well until the artists got to hear of it.

And they were not having any. So now the B.B.C. is investigating how to re-arrange matters so that the big difference in fees between London and the Provinces may be levelled up.

"The Citizen and His Government"

The Adult Education Advisory Committee of the B.B.C. is up in arms because of the continued postponement of a series of talks entitled "The Citizen and his Government." This has been on the stocks for about two years. It involves presenting all the main aspects of the practical problems of government under modern conditions. For example, democracy was to be explained, Sir Oswald Mosley was to talk on "Fascism" of the British kind, and Mr. John Strachey about "Communism."

The series had to be postponed because of the General Election and again because of the death of King George. Now the B.B.C. announces its further indefinite postponement, and it looks as if the Adult Education Advisory Committee will take such umbrage at this announcement as to dissolve. Anyway, allowance is being made for this possibility.

Poetry and Music

What is the right way to present poetry on the microphone? Should music be used? These are problems now engaging serious attention. The heat of controversy is raging. Music lovers are angry because of the mutilation of good music and its subservience to poetry. Poetry lovers, meanwhile, are indignant that it should be thought necessary to lighten poetry by music.

(Please turn to page 324.)

A FAMOUS TRIO



A fascinating photograph of Bubbles, Mimi and Honey Stewart, who are famous on the air in America, and as regular listeners will remember have been featured on the radio in this country.

USING THE PIEZO

IF you wish to be accurate you should pronounce it "pee-ay-zo," because it comes from a Greek word meaning "pressure."

The Piezo Effect

Piezo-electricity is the name given to the production of an electrical charge by mechanical pressure, and was first discovered by Curie in the latter part of last century. He was experimenting with various crystals and found more or less accidentally (as quite a lot of famous discoveries have been made) that certain crystals possessed the curious property of acquiring an electrical charge if they were compressed or stretched, one end becoming positive and the other negative.



Fig. 1. A typically asymmetrical crystal. It is tourmaline, one of the first crystals to be found exhibiting piezo-electric qualities.

The exact reason for this is still the subject of theory, but several facts have been found out in connection with this property of crystals. It seems to be confined to "asymmetrical" crystals, or those which do not take a definite regular geometrical shape.

We cannot go into the theory of crystal structure here, although it is a fascinating subject, particularly when we can now see the shadows of the atoms forming the crystal by means of X-ray photographs.

The First Crystal

The drawing of Fig. 1 shows a crystal of tourmaline, a typical asymmetrical crystal and one of the first to be found to show piezo-electric properties.

The optical properties of quartz are well known, so we should expect, and rightly, that this crystal will also be piezo-electric. Others are cane-sugar, zinc sulphate, and last and most important from our point of view, Rochelle salt.

Rochelle salt is a more melodious name than its chemical one, which is

By
G. STEVENS

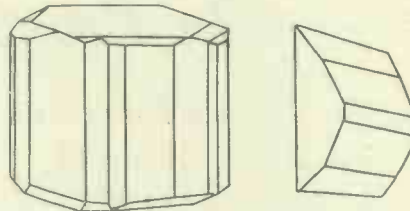


Fig. 2. On the left is a normal crystal of Rochelle salt, but they are grown as shown on the right for practical purposes.

Sodium potassium tartrate, while the formula is quite awe-inspiring: $\text{NaKC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$. The shape of the crystal is shown in Fig. 2 on the left, and enormous crystals have been grown weighing as much as 1 lb.

Specially Grown

Rochelle salt crystals for the purposes of producing the piezo-electric effect have been found better if their growth is restricted in certain directions. They are grown against a flat surface so that they appear as the right-hand sketch of Fig. 2. Before they are ready for use they have to be cut into a regular shape with attention paid to the direction of the axes of the crystal.

Fig. 3 shows a cut crystal with the three axes marked, and the significance of these is as follows: If the crystal is held along the bottom and an alternating potential is applied to the faces at right angles to the axis A

INSIDE THE HEAD

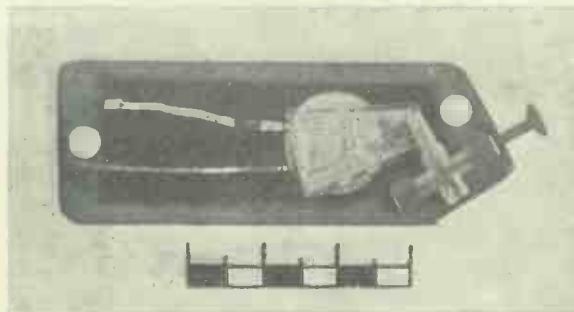


Fig. 4. A view inside a crystal pick-up. The reproduction is full size, the scale being in centimetres.

the crystal will vibrate along a line parallel with the axis B.

This effect is used in the well-known crystals for the control of radio-frequency oscillators, and it is the

reverse of the piezo-electric effect that we require. So if we move the crystal edge instead of holding it firmly, an electric potential will be produced between opposite faces, and the more the crystal is bent the higher will be the potential produced.

Much More Sensitive

To apply it to a circuit two pieces of tinfoil are fastened to the faces of the crystal and connected to the external circuit, and we then have a pressure generator. Rochelle salt is particularly valuable in that it has a higher potential for a given pressure than any other crystal, and is about 1,000 times higher than quartz.

The early crystals prepared gave a

THE THREE AXES

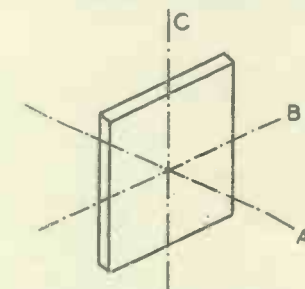


Fig. 3. A cut crystal with the three important axes marked A, B and C.

high output, but suffered from a defect known as electrical hysteresis—the potential did not always follow a change in the applied pressure. This has now been overcome in the latest crystals by special preparation and mounting, and the effect has been increased still further by putting two crystals together so that their output is doubled.

The cut and mounted crystals are then put in a moulded container similar to that shown in Fig. 4, and are ready for use as a pick-up.

Needle Fixing

The needle-holder is fixed between two rubber-lined bearings, which serve to damp-out vibrations from the outside case, and which prevents the needle responding to movement from the wrong direction.

The other end of the needle holder terminates in a fork, between the prongs of which is fitted the edge of the crystal. The body of the crystal is held firmly between two pads of rubber, one of which can be seen as a grey disc behind the crystal.

PICK-UP

Practical Details for Getting the Best Results from this Latest Type of Instrument.

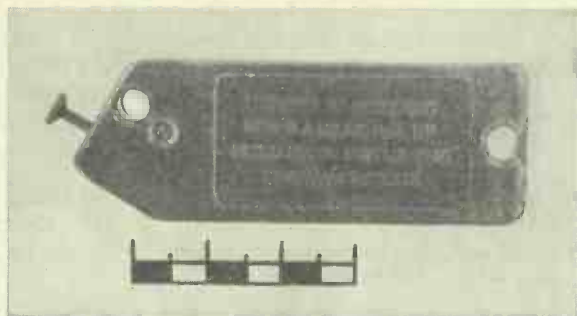


Fig. 5. Another actual-size view of a crystal pick-up head, this time of the outside. The scale is again in centimetres.

To prevent the crystal moving too far under a sharp blow on the needle two stops are screwed into each side of the casing.

One of these is seen as a screw head in the photograph of Fig. 5, which shows the other half of the moulding in place. The two halves of the cover are riveted firmly together to keep out damp and dust, and as an additional precaution against deterioration the crystal itself is varnished over with a damp-proof compound before being inserted in the moulding. The whole "cartridge," as it is called, is then ready for fixing in a tone arm of the usual type.

Light Pressure Sufficient

The crystal is so responsive that only a very light pressure is required on the record, and as low as 2 to 2½ ounces is sufficient. This is very satisfactory from the point of view of record

BASS ADJUSTMENT

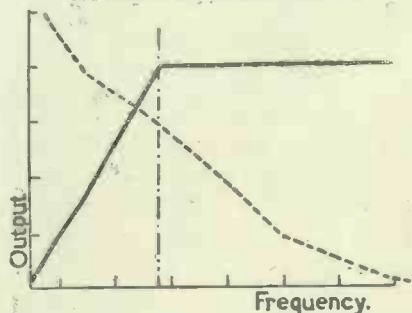


Fig. 6. The dotted line shows how a crystal pick-up compensates for the falling curve of a record at the bass end.

wear, as many of the older types of pick-up were so heavily weighted that they scored the record badly.

We can now see how this novel form of pick-up differs from the more usual types and what can be done to obtain the best results with it. The

fundamental difference between it and a pick-up of the moving-iron or moving-coil type lies in the fact that there is no closed circuit between the leads from the cartridge.

The crystal behaves as though it were a condenser, and its capacity has been measured in fact. An average figure is about .0011 mfd. This means that

the leads cannot be connected directly to the grid of an amplifying valve without some resistance connected across them, or there will be an open circuit. Further, since the crystal behaves as a condenser it will have the same characteristics, and its impedance will rise as the frequency of the output is reduced.

Unfortunately, the characteristics of the condenser are altered by the presence of the resistance of the volume control, which must be provided across it to close the circuit. If this resistance is low only a very small proportion of the voltage of the pick-up will be produced across it, and it is therefore necessary to have it at as high a value as possible consistent with good results. Too high a value will lead to excessive output at the lower frequencies, and the best value has been calculated at 0.5 megohm.

Ample Compensation

With this value the output of the pick-up rises steadily from 250 to about 50 cycles, which is just in the region where increased volume is required. It is well known that in order to accommodate the grooves on the record without overlapping at the low frequencies the amplitude of the side-to-side movement of the needle is reduced below 200 cycles.

A typical recording characteristic is shown by the full line of Fig. 6, in which the output from the record is constant until 200 cycles is reached (perpendicular dotted line), after

which it falls steadily, resulting in loss of bass. The characteristic of the piezo-electric pick-up is shown by the dotted curve superimposed, and we see that it rises at the very point where the increased output is required.

Why Top is Reduced

At the other end of the scale the top frequencies are slightly reduced if the volume control is turned down from the maximum position. The reason for this can be seen from the diagram of Fig. 7. If the slider of the volume control is at a point half-way down, a certain amount of series resistance is introduced in the circuit from the pick-up leading to loss of voltage across the grid circuit (G and —.V.C.).

To overcome this, all that is required is a condenser connected across the slider and the top terminal of the volume control, as shown in the diagram. The impedance of this condenser, falling with frequency, will act as a shunt to the resistance of the volume control and

THE CONNECTIONS

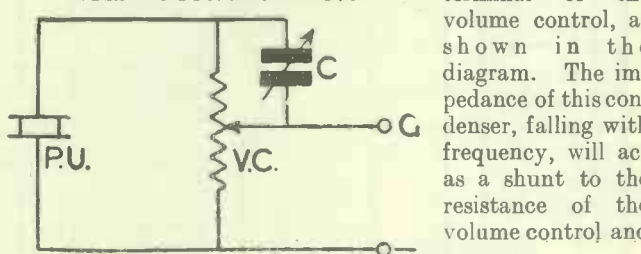


Fig. 7. The condenser prevents loss of top when volume is turned down.

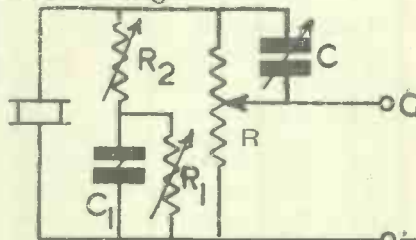


Fig. 8. A good circuit designed by Dr. MacLachlan to provide variable compensation and response over the whole range of the pick-up output.

will raise the output again at the top frequencies. The value of the condenser depends on the amount of compensation required, but a fair figure is .0001 mfd.

The circuit of Fig. 8 is one designed by Dr. N. W. ("Loudspeaker") MacLachlan to provide variable compensation and response over the whole range of the pick-up output.

Across the pick-up itself are connected resistances R_1 , R_2 and a condenser C_1 . These are in parallel with the volume control resistance R and the shunting condenser already described. The action of the various controls is as follows:

(Please turn to page 319.)

WHAT IS HAPPENING IN RADIO

A Good Response

WHEN an appeal was broadcast from the Aberdeen station for people willing to give a blood transfusion to save the life of a man in Aberdeen Royal Infirmary, 150 people, including two young women, responded.

It was necessary for the transfusion to be given within two hours of the appeal, and within half an hour over fifty of those who responded had presented themselves at the Royal Infirmary.

New SOS Rule

The B.B.C. has announced that in future no SOS messages will be broadcast for relatives who have been missing for more than seven years.

It has been the experience of the B.B.C. that in the majority of cases where no response for a missing relative has been forthcoming, the person has not been heard of for more than seven years.

The number of SOS's has been increasing year by year, and the B.B.C. feels that "the importance of the SOS broadcasts will be lost to listeners if too many with but small chance of success are sent out."

Interference Suppression

The final international conference on the abolition of man-made static is to take place this month. And it is anticipated that by the autumn all electrical appliances will bear an international stamp to show that they contain the necessary suppressors to prevent interference with adjacent radio apparatus.

"Hot" Television

A violinist who appeared in one of the early television broadcasts from Paris had an unexpected experience. Due to the great heat from the strong lighting employed his violin warped and went out of tune. It then proceeded to crack!

It would seem that instruments made of metal are wanted, but it would take "some" designer to infuse Strad-like tones into cold metal.

Shut the Door, Please!

A by-law in Rochdale requires that the door of a shop must be kept shut while a loudspeaker is being operated inside. The first proceedings under this law were brought for the purpose

Some Recent Items of General Interest

of calling attention to it, and the defendant said he thought that, providing the door of the shop was left only slightly ajar, the loudspeaker could be put on.

A Modernised Fire-Tower

In 1534 the Holy Roman Emperor Charles V. established a fire look-out tower in the spire of St. Stephen's Cathedral in Vienna. Fire warnings were first sent out by means of a red light at night and a red flag in the daytime.

Later the warnings were given by telegraph, and this was followed by the installation of telephone communication. The tower has now been equipped with radio transmitting and receiving apparatus. It overlooks a large part of the surrounding country as well as Vienna itself.

Broadcast News in America

A court of appeal in San Francisco upheld the claim of Associated Press

against the prior broadcasting of news by a radio station. The court maintained that there was a misappropriation of news during the period, while there existed in it a "quasi-property" interest.

The court set the period over which such interest exists as the time required for a paper to reach its farthest subscriber.

Proof of Good Definition

One of the first to use the German television-telephone service between Berlin and Leipzig was a three-year-old boy, who cried "Daddy" as soon as he saw his father at the other end.

B.B.C.'s Unannounced Transmissions

From the aerials on top of Broadcasting House the B.B.C. has recently been putting out transmissions on wavelengths similar to those to be used for television from Alexandra Palace. These have been entirely for experimental purposes, but have enabled a great deal of useful data to be accumulated concerning the reception of these very short waves in different localities and under different conditions.

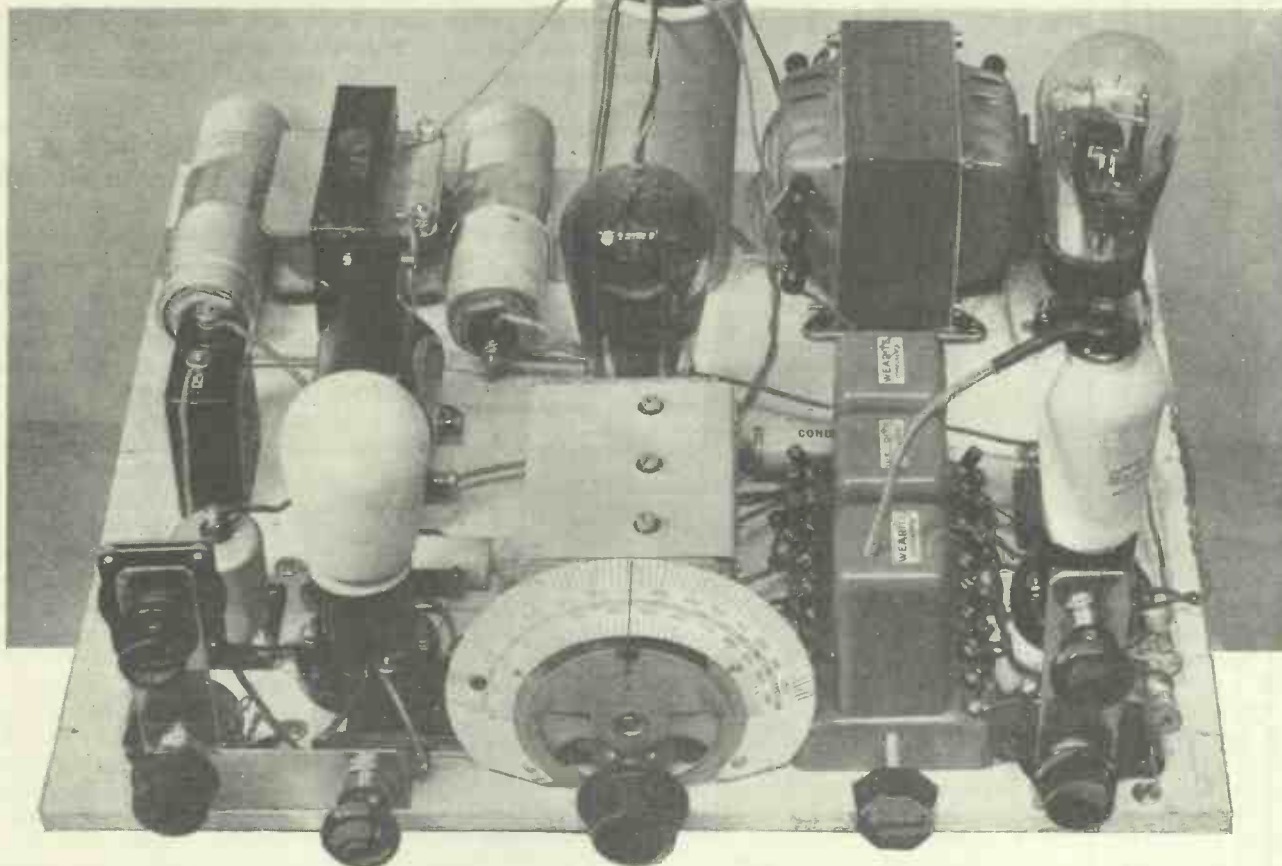
SPECIAL COSTUMES FOR RADIO REPORTERS



The two N.B.C. officials on board the American machine "Philippine Clipper" during its maiden voyage to Manila and back. They gave regular broadcasts, and the costume they adopted is to be used in future by all N.B.C. radio reporters.

An efficient and entirely complete radiogram chassis, for incorporation in any cabinet, which is quite straightforward in construction.

Described by
A. S. CLARK



BUILDING

A RADIOGRAM CHASSIS

IN presenting to readers a complete radiogram in chassis form, we feel we are filling a very definite want.

It so often happens that a reader already possesses a good cabinet—quite likely a valuable one—and requires a good up-to-date design which he can build into it. Or, on the other hand, he may wish to build his outfit into a sideboard or conveniently placed cupboard.

An Ideal Design

In such circumstances, the design described here is ideal. But at the same time it is also an excellent radiogram for anyone who requires a reasonably priced and easy-to-construct outfit, but who has no special cabinet or "housing" considerations.

The electric turntable, loudspeaker and receiver are all assembled on the one chassis. And the relative positions of these three parts are the usual,

FOR ALL-MAINS OPERATION

and so will most likely prove suitable for most cabinets.

At the same time, where requirements demand, the speaker and turntable can be mounted independently of the receiver itself. So long as the same relative positions are maintained approximately, the outfit will work just as well in every way.

In order to achieve a reasonable cost and easy construction, the circuit adopted is a straightforward three-stage one consisting of H.F. valve, detector, and pentode output. Also, every part is carried on one flat metallised baseboard.

Single-knob tuning is provided, and the operation is perfectly normal and straightforward, although at first glance it might appear that the radio-

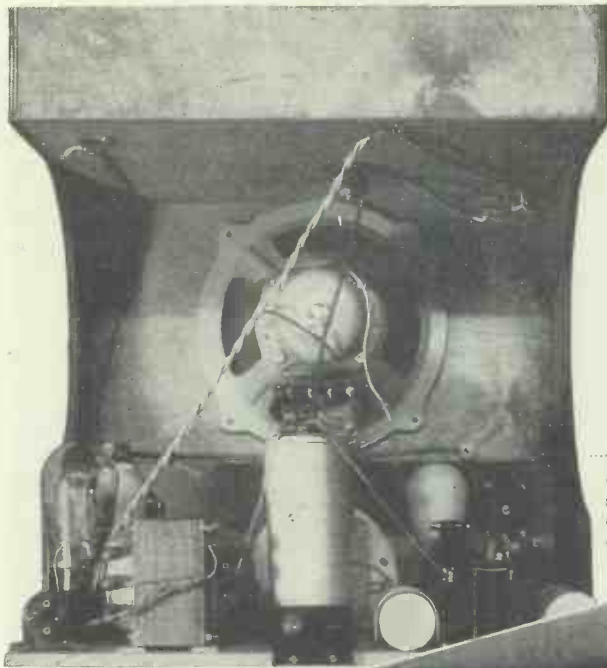
gram is rather "knobby." The reason for this is the aim which has been made at simple construction.

The switching and volume controlling operations have been given individual components in each instance. Thus there are separate volume controls for radio and record, and the wavechange switching and on-off switches for set and motor are independent.

Complications Avoided

It would have been possible to combine some of these functions, but little would have been gained and complications in the construction would have resulted. For instance, the two volume controls could have been arranged on one spindle, but this would immediately have introduced mechanical and long-lead difficulties.

Before getting down to the "brass-tacks" of construction, a few words



To the left is a view of the chassis from the back, which clearly shows the speaker below the motor-board.

about the electrical "turntable" will not be amiss for the benefit of those who are unfamiliar with this particular type of component. In itself, it considerably assists the simplicity of the design as a whole.

I describe it as an electrical "turntable" rather than as a turntable motor, because all the mechanism is in the turntable itself. The only part below the motor-board is one large nut, and the drilling of one hole and the tightening of this nut is all the fitting the electrical "turntable" needs.

Actually, it is a synchronous motor and is tuned to run at exactly the right speed so long as it is run on A.C. current with the right frequency, namely 50 cycles. Thus no speed regulator is required, another feature which does simplify assembly. The turntable is started by giving it a gentle flick round with the finger.

Metallised Baseboard

The top part of the chassis, which carries the turntable, is built up on the baseboard. The mounting of the components on this baseboard, and wiring them together, may be completed before the wooden structure is finished.

The baseboard itself has a coating of metallising on one side, which should be uppermost, and a number of leads are joined direct to it by means of wood screws and washers. Make sure that you get the wires well twisted round the screws and firmly clamped down into position.

There are seven control components, all of which are at the front edge of the

baseboard. The tuning knob and wavechange switch knob are carried by their respective components which are screwed to the baseboard. The remaining control components are supported by two sheet aluminium brackets.

Full details of these, together with the dimensions for

looking at the front of the set, is the .0003 differential reaction condenser; below it the "gramo" volume control, and to the right the changeover radiogram switch. The "gramo" volume control operates for record reproduction only, and takes the form of a 10,000-ohm potentiometer connected directly across the input from the pick-up.

The Pick-Up Connections

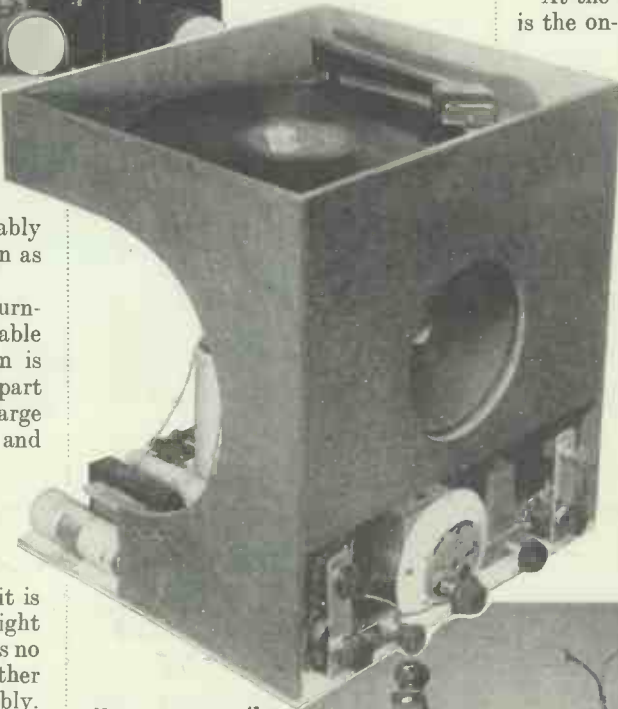
Actually there is only one lead from the pick-up, the second connection being made via the screening of the first lead. This screening is earthed by means of a lead running to the F2 vanes of the differential reaction condenser, while the other pick-up connection goes direct to one terminal of the 10,000-ohm volume control.

At the top of the right-hand bracket is the on-off switch for the radiogram.

This is a master switch.

There is another on-off switch on the motor-board for the turntable, but this is in series with the master switch on the front of the set. So long as the master switch is turned to off, the turntable will stop, irrespective of the position of the turntable switch. By having a separate switch instead of making it controlled by the radiogram changeover switch, considerable simplification of wiring is achieved.

The two flex leads which supply power to the turn-



Above you see the chassis as it appears when completed, while to the right is a general view of the receiver section. Note the positions of the reaction condenser and on-off switch.

the positions of the holes in them, are given in a special diagram. Note the 1-in. turned back part for securing them to the baseboard.

At the top of the left-hand bracket,

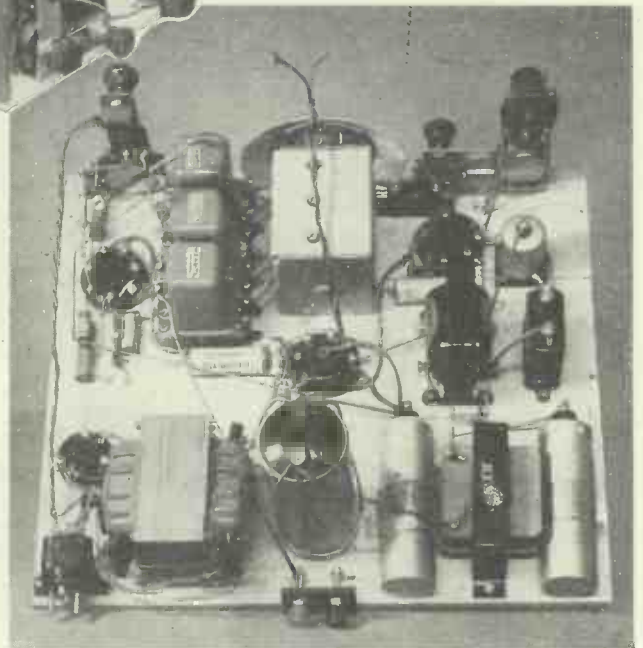


table are attached to the two input terminals of the mains transformer. There are thus two wires going to each of the transformer's input terminals.

Mains-Voltage Adjustment

The outer of these two terminals can be unscrewed from the transformer to permit of adjustment to suit the voltage of your particular mains. All you have to do is to turn the disc on the side of the transformer until the right—or nearest—voltage shows through the slot, and then insert the terminal and screw it up tight. The turntable itself will run at the correct speed on any of the voltages marked on the transformer.

The lower control on the right-hand bracket is the radio volume control. This is a potentiometer which varies the bias on the grid of the multi-mu H.F. valve.

One advantage of separate volume controls for radio and record is that you can set the record volume to what you find best, and will know that it will still be set there after a spell of radio reception.

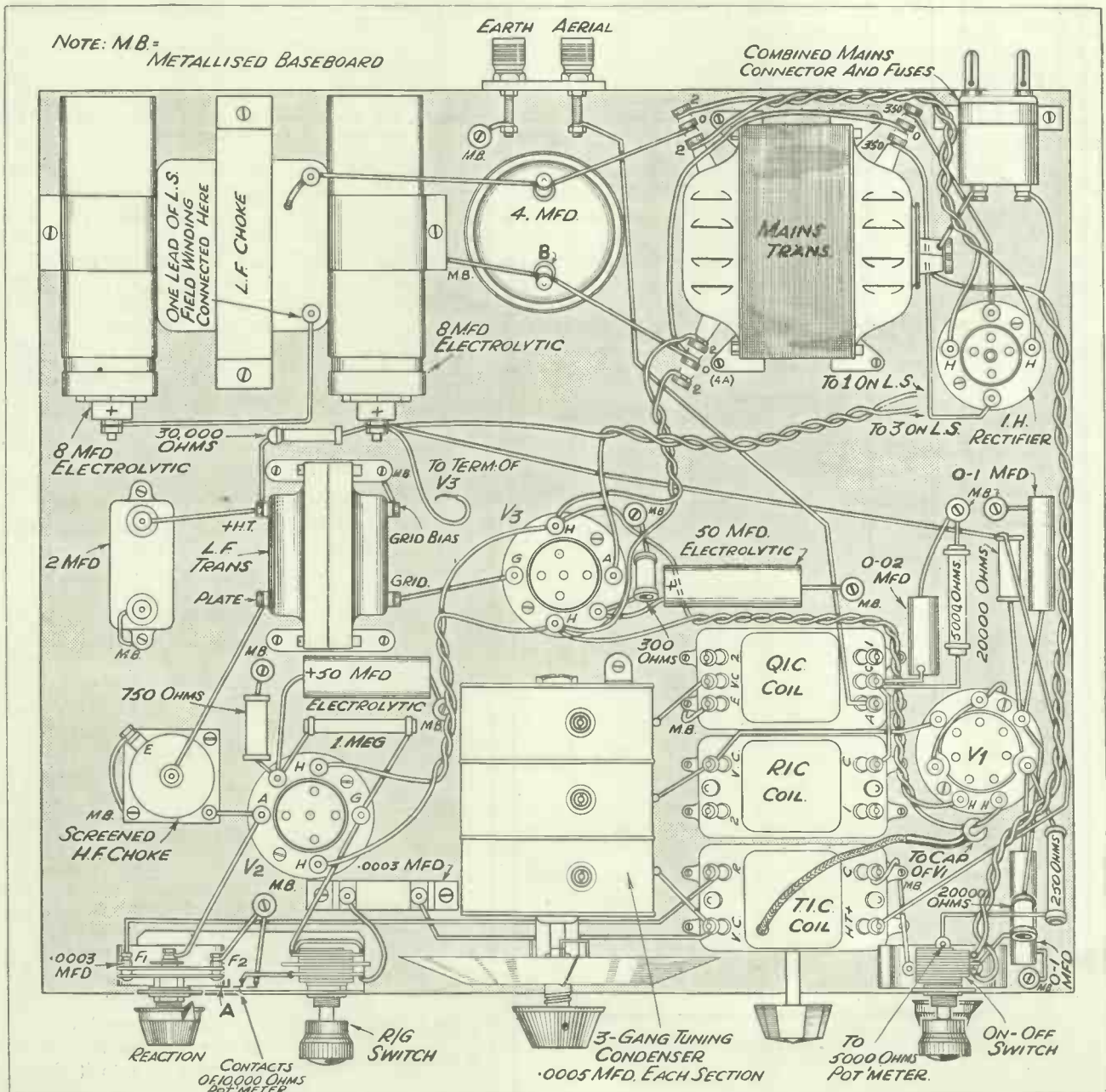
As well as the two brackets for control components you will also need to cut two clamps out of the aluminium sheet to strap down the two 8-micro-

farad electrolytic condensers at the back of the baseboard. These straps should be held by a screw on either side.

You cannot see two of these screws in the wiring diagram because they are hidden by the L.F. choke. The latter, incidentally, will naturally have to be fixed in place after the two electrolytics.

Note that there are two "2-0-2" windings on the mains transformer. One of these is for the heaters of V1, V2 and V3, while the other is for the heater of the rectifier valve. Be careful to wire the three receiving-valve heaters to the right winding, namely, the one marked "4 A."

SIMPLE CONSTRUCTION



All the receiver and power-supply components being on one baseboard with an absence of below-baseboard wiring, renders the assembly particularly straightforward. This diagram should be followed for layout and wiring.

If you wish to wire up the dial lights, of which there is provision for two, these should be joined to the "4 A" winding also. Standard 6-volt bulbs are suitable for the job, ordinary 3.5 volt flash-lamp bulbs being too bright and not likely to last long enough.

You will find that the twin bulb carrier slides out of position to facilitate the insertion of bulbs and the fixing of wires. On it are three tags, and care must be taken to connect these correctly.

The Woodwork

One of the outer of the three soldering tags will be seen to go direct to the centre contact on which the little solder points on the ends of the bulbs bear. This is one contact; the other two tags should be joined together and form the other contact. Wire with a length of twin flex across the heater terminals on the V2 holder.

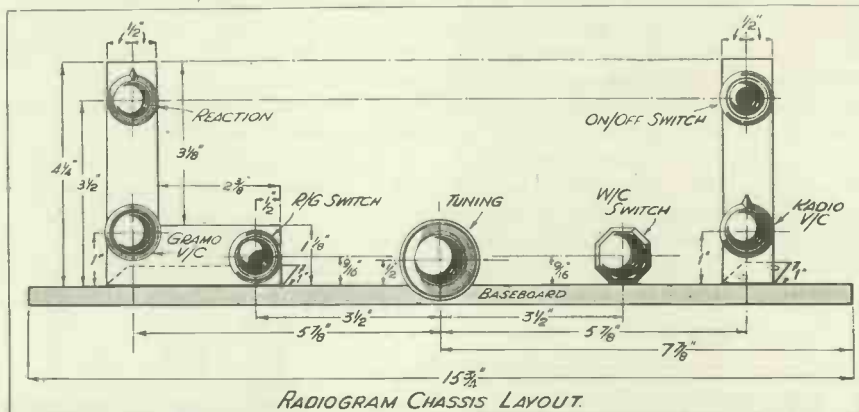
When you have completed the wiring on the receiver chassis, attention can be turned to the woodwork assembly. This is made entirely of 3/8 in. plywood, and the complete dimensions and overlap of the various

pieces are shown in a perspective diagram on the last page of this article.

Cut the hole for the loudspeaker in the front before fixing the pieces of wood together. Similarly the four

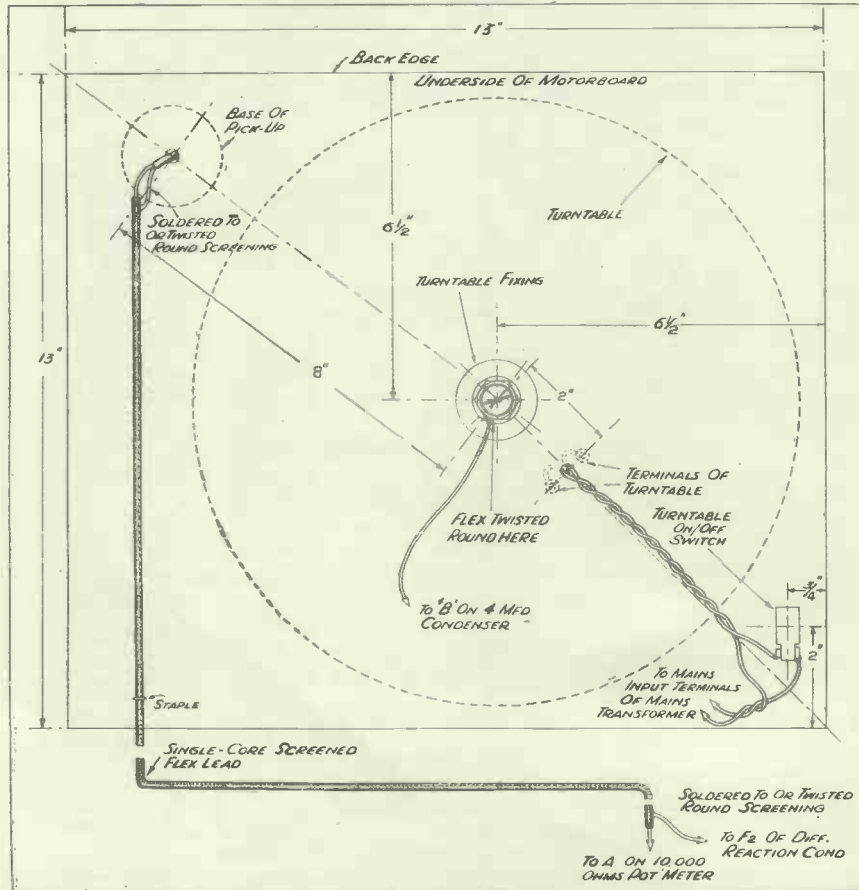
pieces are shown in a perspective diagram on the last page of this article. When it is completed the loudspeaker, turntable, pick-up and switch can be mounted and the necessary wires attached to them. There are

PREPARING THE ALUMINIUM BRACKETS



The positions of the various controls, and the dimensions of the mounting brackets are contained in the above elevation diagram.

ARRANGEMENT OF THE MOTOR-BOARD



All dimensions for preparing the motor-board are contained in this diagram. Note the marking-out lines which pass through the corners.

holes in the motor-board should be drilled before assembly.

The front and the back strip at the top fit inside the two sides, and the motor-board fits inside all four upright pieces. Use countersunk screws

three connections between the loudspeaker and the receiver section.

One of these is from one side of the field winding—it does not matter which—and is taken to one of the terminals on the L.F. choke. This terminal is clearly indicated in the wiring diagram. The other two connections are to 1 and 3 and are made via two twisted flex leads. Note that I do not say "by a length of twin-flex" because it is important which lead goes to which terminal. Number 3 comes from the anode of V3.

Across the Speaker

The so far unconnected field-winding terminal is joined direct on the speaker itself to terminal No. 1. Also across terminals 1 and 3 are joined a 5,000-ohm resistance and a .01-mfd. condenser in series.

Join one side of the condenser to terminal 1 and the other to one side of the resistance. The side of the resistance remaining then goes to No. 3 on the speaker.

Apart from the lead marked "To 'B'" on the 4-mfd. condenser we have dealt with the connections coming from the turntable board. The lead mentioned is for earthing the framework of the turntable motor. Note that the contact on the 10,000-ohm potentiometer to which the pick-up lead is taken is marked A. It is the top contact of the three.

Just one final constructional point. The upper wooden assembly stands on top of the baseboard, and the fixing screws pass up into it through the baseboard.

Your radiogram chassis should now be ready to try out as soon as the

"PEPPING UP" THE REGIONALS

INSISTENT cries for higher power among B.B.C. stations have at last galvanised the Big House mandarins into a specious activity. There is all the semblance of determination to catch up on our stentorian continental neighbours—but when you come to look into the facts the gain is more apparent than real.

First, though, let's have some facts. Within the past few weeks the engineers have been stealthily raising the power of Regionals—nigh unto bursting point of the long-suffering Diesels.

The Magic Figure!

The first to go up was West Regional—from its nominal 50 to a full-blown 70 kilowatts. Next, they tackled the new Midland Regional, raising that by the same amount. By the time you read this the London, North and Scottish Regionals will have reached the same magic figure.

Now that represents an all-round rise of 40 per cent in power for Regional stations. Looks, superficially, as though we were on the "up and up," doesn't it?

Wait, though. Lisburn, the new North Ireland Regional, has been designed to radiate a full 100 kilowatts—and it probably will do so right from the start.

Then again, the North Scottish Regional, the building of which is now completed at Burghead, will have as its installation a 100-kilowatt transmitter.

Nor is that all. The proposed North-eastern Regional, now being built at Stagshaw, inland by some 15 miles from Newcastle, will also be capable of a full 100 kilowatts.

You might ask why, if these new stations are capable of pumping out a century of kilowatts, the existing Regionals are limited to only 70 kilowatts. I think the answer is that if the "little Nationals" were shut down—as the B.B.C. has more than once threatened to do—the Diesels would supply them with just as much power as would be needed to reach the 100-kilowatt rating.

"Big Guns"

Now for a few comments by the B.B.C.: "It doesn't follow that because the new stations are capable of 100 kilowatts that we shall inevitably transmit that amount of power." Doesn't it? Well, it ought to. Why should we arbitrarily limit our radio armaments, as it were, when all around us "big guns" are going off on the Continent? Heaven knows, I am not a Jingoist—but with adjacent high power continentals our little Regionals look like being submerged, especially for those luckless listeners living on the fringe of the service areas.

"Another point is that the increase in the power of the Regionals will probably not be noticed," says the B.B.C. Well, well, in that case why do it—why put up the power? The B.B.C. must believe it will make some difference, otherwise why waste the kilowatts? Unless, of course, the agitation for higher power is being parried this way.

And as a matter of cold, hard technical fact you probably won't notice as much difference as the figures seem to indicate.

An Explanation of the B.B.C.'s Recent Power Increases

By
Alan Hunter

You see, in order to provide you with twice the signal strength at the receiving end, the B.B.C. would have to make the transmitting power *four times* as great. All they are doing—or have done by now—is to make it 40 per cent greater, which is a very different story from 400 per cent.

We are driven back, actually, to consider what effect transmitting power has on the real service area. And by the real service area is implied the non-fading night-time area covered by the transmitter.

We all know by this time that the shorter wavelength broadcasters have a smaller non-fading service area than the longer wave ones. For example, London National—even before synchronisation with North and West Nationals—started to fade much earlier than London Regional.

Fading Still Occurs

Power, then, is chosen to give a reasonable signal-to-noise ratio within the limits of non-fading. Merely increasing power beyond this necessary limit does not materially improve the service area, because if you double the direct ray you also double the indirect ray—and fading occurs at the same point.

At the same time, though, the increase of power beyond what is necessary to override static within the local service area has the

national affairs in the ether. Higher power will provide us with a greater service area field strength—and thus help to combat the enormous field strengths of foreigners reaching us at night from the Kennelly-Heaviside Layer.

As a matter of fact, it is not quite fair to the foreigners to say they are increasing power unreasonably. Most of them have to cover wider areas for a given station than we do—and the root cause of all the trouble is that the wavelengths available are not long enough to provide service conditions.

The last thing the B.B.C. has in mind in increasing the powers of the Regionals is the idea of making each and every station available on a National reception basis. The only station the B.B.C. claims to have a National service area is Droitwich—and that is mainly because it has a long wave, not simply because it has 150 kilowatts.

Limited Service Areas

Although the "crystal complex" must be dead even among the most conservative of B.B.C. engineers, it still remains a fact that real service from medium-wave stations—service independent of indirect ray—is severely limited.

The conclusion I come to, therefore, is that the "pepping up" of the Regionals has no very deep significance. Certainly I see in this move no radical departure from the Corporation's attitude towards the "economic limit" of transmitting power.

We are a very long way from seeing London with a power of 500 kilowatts—unless, of course, by some extraordinary act of international magnanimity we were presented with another long wavelength. Which seems about as remote to me as messages from Mars.

Actually, we haven't the least chance of being presented with any more wavelengths—long or medium. And that's the trouble. The B.B.C. engineers are really up against it.

By raising the power of the Regionals they may be pandering to public opinion. But that doesn't mean they are solving their implicit wavelength problem—nor do they pretend they are.

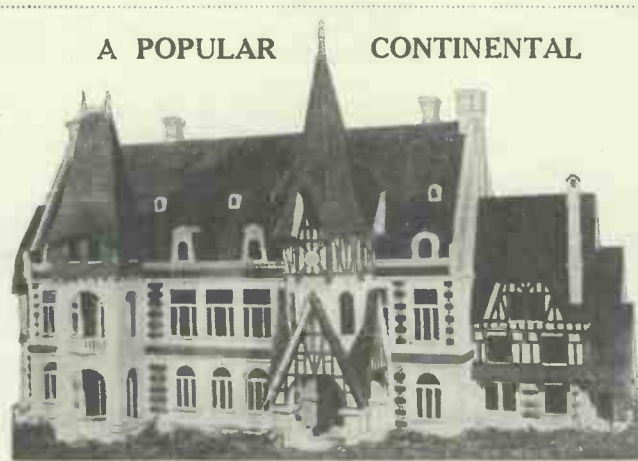
Solving Two Problems

If the "little Nationals" were shut down the engineers would partially solve two problems at once—the problem of raising the powers of the old Regionals to 100 kw., and the problem of finding another wavelength for one of the new Regionals.

Presumably, they would leave the Diesel engines and simply remove the old National transmitter panels—putting them up

with new power supplies as Regionals elsewhere.

One very good reason why the engineers hesitate to scrap the "little Nationals" is the knowledge that Droitwich suffers from a higher level of industrial interference. Another point—not often mentioned—is that the average set cuts off very badly on long waves, so that although Droitwich delivers the high notes just as well as the Regionals they are emasculated at the receiving end. And this effect often shows up most in distant reception.



The foundations of a new Radio Normandie have been started. Here is a model of the new building as it will appear when completed.

extremely disagreeable effect of causing a great increase in distant interference.

And that is precisely what we in this country are suffering from at the moment. Continental stations are overstepping the bounds of what the Lucerne Plan laid down as reasonable power, with the result that high values of indirect rays are coming down in this country—interfering with our own Regionals, which have kept to more modest powers.

Any increase in B.B.C. power is therefore to be welcomed at the present state of inter-

Television *Go-day*

PEOPLE are saying now that one of the first big public events to be televised in this country should be the Coronation ceremony to take place at Westminster Abbey in the summer of next year. I should think that by that time the television service will be in full swing, and there should be no difficulty so far as the actual transmission of films or close-up scenes is concerned.

Special Difficulties

But there are special difficulties in televising a scene inside a building like Westminster Abbey, where the lighting arrangements are far from what are required for television purposes. In making a cinema film it is important, as you know, to get as much light on the subject as possible, and the same applies in still greater degree when attempting to televise a subject.

It goes without saying that if the Coronation ceremony *could* be televised it would give the very greatest satisfaction to those who were able to receive it.

* * *

The King's recent broadcast from the B.B.C., which was heard by millions of his Majesty's subjects throughout Great Britain and the Empire, has given rise to suggestions that perhaps the King may be the first monarch to be televised. When you think how greatly the late King's Christmas broadcasts were looked forward to throughout the world, and how the present King's future broadcasts will be similarly waited for, you can easily imagine what a thrill it would be, to those fortunate enough to enjoy it, to see the King actually making his broadcast speech as well as to hear his voice.

Few "Lookers"

It is obvious that even when television gets going—and always assuming, of course, that his Majesty will consent to such televising arrangements in the near future—those who will be able to receive the television will be only a very small part of those

Comment on the latest aspects, rumours, and news about television in this country, and details of a 30-line transmission from Holland.

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



who will be able to hear the broadcast of the King's voice. But it is obviously one of the great things we would like to look forward to in the early months of the new broadcast service.

* * *

There are still a very large number of homes in this country which are with-

IN A MOSCOW STUDIO



Regular television transmissions have been started in Russia, where this photograph of a "gymnastic" turn was taken.

out electric light supply and are likely to remain so for a long time to come, notwithstanding the peaceful penetration of the new electricity undertakings. It can be taken for granted that the majority of such homes, nevertheless, have their radio sets in service, and

therefore they are bound to rely upon battery operation.

Providing "Radio" Mains

The much greater convenience of mains operation in these days needs no emphasis, and in this connection a very enterprising and excellent step has just been taken by the Birmingham Corporation, who have made special arrangements whereby houses in their area which are without electric lighting can have electric supply laid on just for radio purposes. In this way the actual wiring of the house for electric light need not be undertaken, and all that is necessary is a simple connection to the nearest electric mains, the connection having a current-carrying capacity of 1 or 2 amps. at the most.

According to the present scheme the charge will be ten shillings for laying on the power, and this can be arranged if the distance between the house and the nearest electric main is not more than 60 feet. The current is supplied at the "power" rate, not the "lighting" rate, and a minimum charge for current is to be made of five shillings per quarter.

Very Reasonable Price

I should think all the people in the Birmingham district who are affected by this scheme must regard it as a very reasonable one indeed, and it seems pretty obvious that the actual cost to the Corporation must be a good deal more than the initial charges which are being made to the consumer. However, it is a step in the right direction, and no doubt battery users in other districts will urge their local councils to follow suit, for battery operation of a television receiver is not likely ever to prove really practicable.

* * *

You hear some people say that no arrangements are being made for the manufacture and sale of television receiving sets, and that it is too early for manufacturers to get down to brass tacks.

Those of us who know a little bit more about what is going on behind the scenes know how entirely wrong these statements are, and just to illustrate the point I can tell you that the Bush Radio, Limited, who, as most people know, have commercial relationships with Baird Television, Limited, are actually preparing their television sets for the market, and these are being tested by the Baird Company at their Crystal Palace station, so that everything shall be ready for the large public demand which is anticipated when the service starts.

Trained Agents

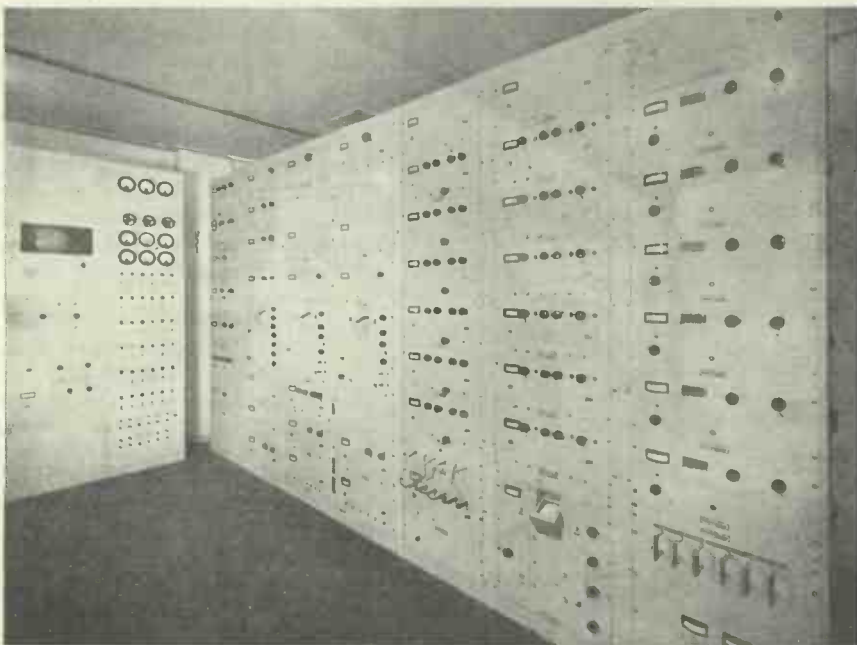
Not only this, but the Bush Company, who are so well known for their commercial enterprise, have a training system at the Crystal Palace, so that their selling agents and all those who are likely to be concerned in the handling of their television receivers can gain first-hand technical knowledge in the operation and maintenance of the same. Special engineers from the Baird Company are looking after this service, and the result will be that when the B.B.C. television is inaugu-

IS THE B.B.C. TOO SLOW?

B.B.C. television receivers? There must be quite a lot of these about, because I know for a fact that the 30-line service was very popular, and I have had numerous letters from readers complaining about the B.B.C. stopping the low-definition service and saying that it ought to have been kept on until the time that the new high-definition service started.

Anyway, without going into the reasons for all that—which for the moment we must put down to the inscrutable workings of the B.B.C.—those of you who have your low-definition sets still intact will be glad to know that a 30-line service, on 80 metres, is now being sent out occasionally from Holland. The characteristics of the transmissions as regards shape of picture and picture-frequency, as well, of course, as the line-frequency already mentioned, are practically identical with those of the old B.B.C. transmissions, and the scanning is vertical.

THE E.M.I. CONTROLS FOR ALEXANDRA PALACE



Complicated is the only word to describe the control panels which come between the E.M.I. television camera and transmitter. The panels above are similar to those to be used at Alexandra Palace.

rated, anyone will be able to go to one of the Bush Radio agents with full confidence that he will get reliable technical advice and the best possible commercial service.

* * *

I wonder how many people there are who still have their old 30-line

I have been making inquiries to try to find out whether this Dutch service is likely to go on for some time to come and, according to my information, there seems every indication that it will. At present the transmissions take place before breakfast on Sunday morning. Why this, of

all times, it is impossible to find out; but I have reason to believe that these transmissions will take place more frequently and, of course, at more sensible times.

* * *

Occasionally readers write in to say that they think the B.B.C. is terribly slow in its preparations for the television service, and can't something be done to speed-up things, etc?

I know that lots of people got so tired of waiting for television that they more or less put it out of their minds. They have been told for ages—years—that television was just around the corner, or that it was going to be next month or the month after.

Making Sure of Everything

Without in any way holding any brief for the B.B.C., one must recognise that the whole of the technique is totally new, and the apparatus which has to be installed, both by the Marconi-E.M.I. group and by the Baird people, is very elaborate. All this cannot be done in a few weeks, and, anyhow, it would be the greatest mistake to "rush" things and then to get the service a bad name. Whatever you may think about the B.B.C. and its programmes, you must admit that the efficiency of its technical service is second to none.

It is presumable that those responsible for the television arrangements are setting themselves a correspondingly high standard in this new department of public service, and therefore we must be content to wait until all preparations have been completed down to the last detail.

I can tell you, however that no time is being lost and work is proceeding at the Alexandra Palace at full pressure. The new television service will not be delayed due to any dilatoriness on the part of those responsible, but actually will be due to the most meticulous preparations being made so that every eventuality can be foreseen and provided for, so far as is humanly possible. In short, you may have to wait a little longer than you like, but you will get the benefit in the long run.

Opposed Interests

Whilst some people are impatient that the advent of television is so long delayed, there are others—in particular a certain section of radio manufacturers—who seem to be doing their best to discount television altogether, and to persuade the public that they may as well forget it and then, presumably, go in at once for

(Please turn to page 317.)

Do You Know Your DANCE BANDS?



BILLY MERRIN



JOE LOSS

ONE day I hope to see on the stage a dance band composed solely of leaders of well-known bands. Something of the sort was once broadcast some years ago, but I have the desire to see these popular figures all in a bunch together, and in action. Under the lively leadership of Jack Hylton or Harry Roy, it should be good fun. I commend the idea to some organiser of charity shows, for such a galaxy of names is unlikely to come to pass except in the interest of some charity.

Among the dance-band leaders we have players of pretty well every instrument. Who could wish for a better trumpeter than Nat Gonella, often known as the Louis Armstrong of Britain? Or what about Harry Roy with his clarinet or saxophone? Or Teddy Dobbs and the drums? Charlie Kunz would obviously have charge of the piano—one of

Some interesting facts about our broadcasting dance bands and their leaders.

By **K. D. ROGERS**

them and Carroll Gibbons the other. Violins would be forthcoming from Joe Loss, Maurice Winnick; Billy Merrin would be entrusted with the banjo or with one of the saxophones.

There are plenty of others who would be able to assist in the formation of quite a lively band, and they could all be taken from the bands who are to be heard on the radio.

I have been doing a little nosing around concerning the broadcasting

bands lately, with a view to finding out a few facts for the benefit of readers of WIRELESS.

I have set out some of them in the table, showing the names of the leaders of a few of our well-known bands, the vocalists employed at the time of writing (often they change, so I cannot be sure they will be right when you read this), and other details.

During the last month, as you probably know, the B.B.C. Dance Orchestra, under the direction of Henry Hall, has been augmented to twenty-one players—four more players. Probably Henry Hall uses the services of more vocalists than any other leader—just look at the table.

The largest band of all seems to be Jack Hylton's twenty-two, though I believe he ties with Jack Payne.

One of our smallest "radio" bands is that of Nat Gonella, the trumpeter, whose combination numbers six.



Billy Merrin's Commanders as they appeared in the British Lion production of "In Town Tonight."

Leader of Band.	Vocalists.	Signature Tune.	No. in Band	Pianist	Records for
Bert Ambrose (Violin)	Evellyn Dall, Jack Cooper, Jack McCarthy, Max Bacon, Rhythm Brothers	"When Day is Done"	19	Bert Barnes	Decca
Teddy Dobbs (Conducts)	Tommy Rose	"When Work is Through" and "Good-night, Good-night"	14	Tony Fones Claud Grant	Filmophone
Carroll Gibbons (Piano)	Ann Lenner, Brian Lawrence	"On the Air"	Varies	Carroll Gibbons	Columbia
Nat Gonella (Trumpet)	Nat Gonella and Jimmie Messini	"Georgia"	6	Harold Hood	Parlophone
Henry Hall (Conducts)	Dan Donovan, G. Elrick, C. Price, Burton Gillis, Elizabeth Scott, Jack Halsell, Bert Powell, Girls' Trio, Men's Trio, Bert Yarlett, Vivienne Brooks	"It's Just the Time for Dancing" and "Here's To the Next Time"	21	Bert Read	Columbia
Jack Hylton (Conducts)	Ken Smoothery and Tommy Sandilands	"Oh, Listen to the Band"	22	Billy Munn, Melle Weersma, Alec Templeton	H.M.V.
Charlie Kunz (Piano)	Vera Lynn, George Barclay	"Clap Hands Here Comes Charlie"	10	Charlie Kunz	"Rex"
Syd Lipton (Violin)	Chippis Chippendall	"I'll See You In My Dreams"	12	Fred Bretherton	Decca
Joe Loss (Violin)	Chick Henderson, Clem Stevens	"I Want to Dance"	11	Harry Kahn	H.M.V.
Billy Merrin (Conducts)	Billy Merrin, Ken Crossley, George Wright	"Troubles are Like Bubbles" and "Cheerio"	11	Roy Wallis	Crystalate "Crown"
Lou Preager (Accordion Specialities)	Ronald Hill, Gerry Fitzgerald, Miff Smith, Marjorie Stedeford, Lon Preager (monologue style)	"Dancing Time"	13	Revb Silver	Decca and Panachord
Harry Roy (Clarinet and Saxophone)	Norman Yarlett, Bill Currie, Harry Roy	"Bugie Call Rag"	14	Stanley Black, Norman Yarlett	Parlophone
Lew Stone (Piano)	Joe Ferrie, Alf. Noakes, Tiny Winters, Joe Crossman, Helen McKay	"Oh Susannah"	12	Monia Liter	Decca
Maurice Winnick (Violin)	Sam Costa, Judy Shirley	"Sweetest Music This Side of Heaven"	10	Alex Blackford	Parlophone



Vera Lynn, who is to be heard when Charlie Kunz broadcasts from the Casani Club.

One of the newest bands is that of Lou Preager, who formed his collection of thirteen instrumentalists in 1933 for Ciro's Club. After a month at Ciro's the band moved to Romano's, where it remained till June last year.

Played for the King

He was complimented and requested to play for the King (then H.R.H. the Prince of Wales) at Windsor during an Ascot week. First broadcast was in November, 1933, in one of those "First Time Here" programmes on a Saturday afternoon.

Lou Preager tells an interesting story about himself. In February, 1934, he had a football accident which necessitated an operation on his nose. He had broken it so badly that he had to have it remodelled by plastic surgery. The result was astonishing, so much so that his wife and the manager of Romano's did not recognise him when he returned.

It was during one of Lou Preager's broadcasts from Romano's that a Communist "mike-crashed" and shouted out some anti-Fascist propaganda.

A Varied Career

Lou Preager has had a varied career. Before forming his band, he travelled a good deal abroad as a pianist, playing in various bands in France, Belgium, Spain, Italy and at the famous and fashionable Shepherd's Hotel in Cairo, where he was for three years.

He has a son of nine, but I do not know whether he will follow in his father's footsteps.

Billy Merrin is one of the most energetic of dance-band leaders, and he has travelled almost all over

England and Wales during the last two years, concentrating on "one-night stands," and he has also worked in, and worked on, several films. One of his recently finished talkies is a short feature film called "Cheerio." Incidentally, Billy Merrin did the music for Sandy Powell's picture "Can You Hear Me, Mother?"

Hard Work

Those who consider that dance-band life is one of night clubs and the atmosphere of celebration are wrong in the majority of cases. Dance bands have to work hard all the time, and they have to be fit. Day-long rehearsals and travelling and night shows are the usual run of things, and there are many teetotalers among the leading dance bands. Billy Merrin himself is one, and a non-smoker too.

By now you will have formed your opinion of the new vocalists who have joined Henry Hall and the B.B.C. Dance Orchestra. One of them is Bert Yarlett.

some titles, don't they?) and he joined the B.B.C. brigade as a permanency on the sixteenth of last month.

Dark and robust looking, Bert Yarlett came direct to London from the Royal Hotel, Toronto, and he has had much experience of American radio, being well known to American listeners. Incidentally he has also appeared on the films, with Ruth Chatterton.

Another arrival in Broadcasting House as vocalist is Elizabeth Scott, who also joined the dance band on the same date. Miss Scott is an artist who for three or four years has sung at the Trocadero Restaurant, where she was known by the simple name of Elizabeth. She has recently broadcast and specialises in rhythm numbers.

With the new arrivals Henry Hall's band becomes one of the largest in the world as regards its vocalist section.

A Popular Singer

While on the subject of vocalists I must mention that popular singer attached to Ambrose, Evelyn Dall. You will probably remember that she took the place of Elsie Carlisle when that star decided to break away and go on the halls.

Evelyn Dall is a noted crooner and film actress in America, and was actually in the States when Ambrose cabled to her to join him at the Embassy on hearing of Elsie Carlisle's decision.

As a matter of fact, Evelyn had not very long returned to America from England, and she caught the first ship back again and joined up with the Embassy Club Band. Now she is off on a tour with the band, without Ambrose, and is taking his place as conductor as well as acting as lady vocalist. She has been singing to the microphone since she was sixteen, and appeared with Ambrose in his film, "Soft Lights and Sweet Music."

Geraldo's Band

It is difficult to gauge the popularity of the various broadcasting bands, but I do not think I am mistaken when I say that Geraldo is pretty near the top of the list. His famous hours such as "Dancing Through" and "Romance in Rhythm" apart from his tango orchestra, have marked him out as a broadcaster of no mean merit. And he loves broadcasting, too, although I believe he does not make it a paying game.



HARRY ROY.

(Right)
CHARLIE KUNZ.

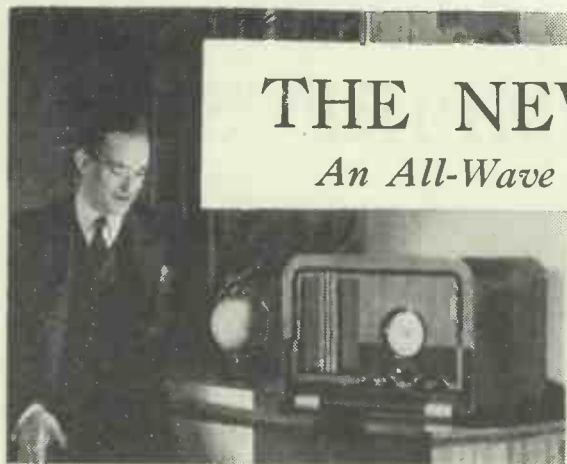
(Left)
KEN
CROSSLEY.

TEDDY DOBBS.

You may remember his first broadcast in December last year in one of Henry's famous hours. Bert is a Canadian, and was known as Canada's Romantic Tenor (they do get hold of

ETHER TESTS

THE NEW H.M.V. MODEL 480

An All-Wave Mains Super with a Fine Performance

How utterly impossible it is these days to endeavour to assess the probable performance of a set merely by looking at it! One might possibly glean some sort of idea from the number of station names that appear on the dial, or perhaps even the price might serve to give some clue as to what can reasonably be expected.

An Important Statement

But both of these considerations can be terribly misleading, and the discriminating listener would be unwise to attach any particular importance to them. And as I sat looking at the new H.M.V. Model 480 preparatory to making my tests, I could not help feeling that the utter simplicity of the design externally might not have led me to expect anything particularly out of the ordinary but for one thing.

In the printed instructions, which I was religiously following in order to acquaint myself with the functions of the various controls, I came across a statement to the effect that the Model 480 had been specially designed for the *more ambitious* listener. That, from a firm of such international repute as H.M.V., was good enough for me.

Instantly—and I say this in all sincerity—the intriguing-looking dial, which is such a distinguishing feature of this new all-waver, conjured up visions of something really exceptional in the way of performance. Nor was I disappointed in the light of my subsequent tests.

An "All-Embracing" Design

The new H.M.V. all-waver is, I think, the most all-embracing design that I have ever had the privilege of

trying. But first, just a word or two about the design in general and about the controls in particular.

The Model 480, in brief, is a five-valve (excluding rectifier) all-wave, all-electric design for A.C. mains. It

covers from 16.7 to 2,250 metres in four steps of from 16.7 to 51 metres, from 46 to 141 metres, from 185 to 560 metres, and from 750 to 2,250 metres.

The dial, which is particularly ingenious, is divided into five concentric scales, over which two pointers travel in a similar manner to the hands of a clock. The longer of the pointers is coloured black and travels over the scales, which are calibrated in wavelengths (and station names in the case of medium and long waves), while the shorter red pointer moves over the inner scale, which is marked in degrees, and acts as a vernier-tuning control.

Tuning is carried out by two

Well, that, in a nutshell, was the set that I was about to test, and after having switched on and waited for a moment or two for the heaters to warm up I adjusted the waveband switch to the medium waves and turned the tuning control until the long black pointer indicated the setting of the London Regional station, and then I turned up the volume control.

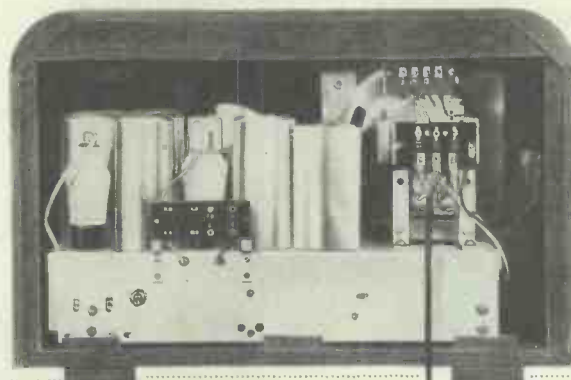
Startling Realism

I am not going to dwell upon the local station merits of this set except to say just this: The reality of the programme to which I was listening was not merely remarkable, it was *startling!* I could have listened to it for hours for the sheer joy of picking out the various instruments in the orchestra. Every one of them was there, and there were no "fading fiddles" up at the top end of the scale. I have rarely heard such perfect tonal balance. But I was out for distance.

So I started by going from the bottom to the top of the medium waveband. To be dead honest, I could not tell you how many stations I heard, and I don't know that it is very important anyway. But what I will say is that there was not a fraction of an inch throughout the entire tuning range at which a programme could not be tuned-in. There were the usual heterodyned and poor quality stations, of course, but in the main the quality of the stations received was of a very high order indeed, due, I imagine, to the extraordinary sensitivity of the set and the consequent reserve of volume available.

It is apt to make a great difference to the quality of distant stations if the set does not have to be used "all out," and I cannot imagine anybody wanting to sit in the same room with *this* set all out, even on the weaker stations. The amplification is simply terrific and, because of this, were it not for the provision of dual tone controls, the level of background noise

(Please turn to page 321.)

AN EXCELLENT CHASSIS

The circuit of the Model 480, the chassis of which is seen above, starts off with a pre-mixer H.F. Then follow the mixer, the I.F., the 2nd detector and output valves. The undistorted output is 3 watts and the range of the short-waves 16.7 to 51 metres. The price is 17½ guineas.

concentrically mounted knobs, the outer one giving normal adjustment and the inner one an extra fine vernier adjustment which is particularly useful on short waves. There are also two tone controls, a rotary waveband switch, and a volume control; the mains switch being on the side and the radiogram switch at the back of the cabinet.

ETHER TESTS

THE PHILCO "EMPIRE SIX"

SPECIFICATION

A six-valve, including rectifier, superhet for use on either A.C. or D.C. mains. A special barretter enables the set to be used on mains of from 190 to 260 volts without any adjustments. The valves are R.F., Frequency Changer, I.F., 2nd det. (also acting as 1st L.F. and A.V.C. valve), and pentode output. Covers short, medium and long waves. Short waves range from 16.6 to 52 metres. Eight-inch energised moving-coil speaker. Price of Baby Grand model is 17 guineas.

GOING on the ether with the Philco 290 Baby Grand is an immensely interesting experience. In the first place it is so easy. Being supplied ready for the mains voltage, and with everything in order for immediate use, only a few minutes need elapse before the world's programmes are "on tap."

The actual work of installation is merely to join up aerial and earth and to insert the mains plug. The aerial I used was nothing more than about seven feet of very thin wire strung across the room, and such is the sensitivity of the set that this proved completely adequate. There would have been no advantage in using anything more pretentious, in at least my own particular locality.

The controls are few in number. There are only the one tuning adjustment, a four-position tone control, a combined on-off switch and volume control, and a wave-change-switch having a radiogram position operative when the pick-up sockets are employed.

Alert Visual Tuning

There are a few stations printed on the long and medium wavebands, but for the most part one has to use the kilocycle markings as one's guide in station location. It does not take long to get used to these, but even so I feel that wavelength marking would be easier for the ordinary user to understand. However, this is only a minor criticism of an otherwise faultless piece of apparatus.

The visual tuning is unusually alert, so much so that Morse signals can be read by eye! And it is the first set I have handled in which the visual tuning is sufficiently sensitive to be

useful on many of the short-wave stations. And it is so plainly visible. It comprises a pair of bands of light which move out from the sides of a "window," and the stronger the signal the closer the two bands approach each other.

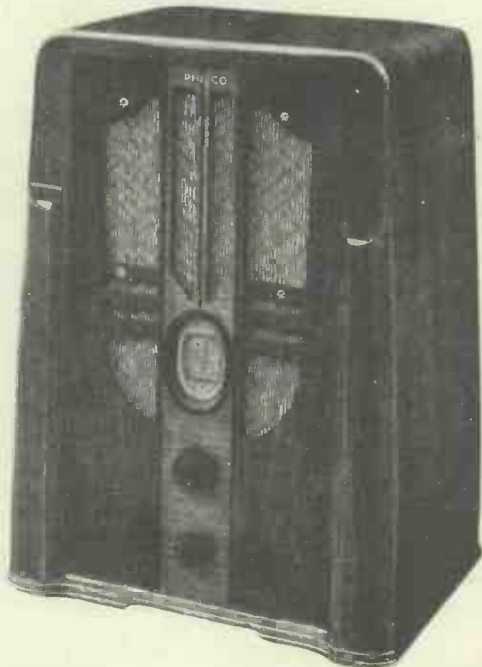
Incidentally, owing to the alertness and sensitivity of the system, correct tuning adjustments are quickly made and no doubt left in one's mind that they have been accomplished to perfection.

Scores of Stations

I started my ether test of this Philco set on the long waveband. Moscow (1,724 metres) usually fades badly and is never particularly good these days. But the Philco held it excellently, the A.V.C. providing as good a volume retention as I have experienced with this long-wave Soviet transmission.

Luxemburg, as is usual during the evening, was complete with his hetero-

IN WALNUT AND EBONY



This is the Baby Grand model described. Concert grand, radiogram and automatic radiogram models are also available with the same chassis.

dyne and sideband splash. And here the four-point tone control came into its own. From the position of "brilliant tone" I turned it down one.

A Baby Grand All-Wave Universal Superhet

This reduced the heterodyne squeal's volume, but did not eliminate it. Right down to the fourth position and it all but disappeared, although, naturally, the quality had to suffer to a certain extent.

Deutschlandsender, right next door to Droitwich, was beautifully clear, and that is a significant commentary on the set's really high-grade performance.

On the medium waveband I tuned-in all through sixty-three programmes at full entertainment value in less than two minutes! Due in large part no doubt to the pre-H.F. stage, the set as well as possessing a high degree of selectivity, is very "quiet" in operation and free from any undue tendency to collect extraneous noises from the ether.

The mains smoothing is also distinctly above the average, and on all three bands there was an absence of hum.

The A.V.C. was given a chance to show what it could do on the short waves, and I found it to be most effective. It could hold a signal in tranquil evenness of volume through really violent conditions of high-speed fading.

There would be the visual-tuning lights vibrating backwards and forwards, and the background rising and falling over a wide compass of intensity, but the signal would maintain an almost uncanny consistency.

Short-Wave Success

There is a slow-motion knob concentric with the main tuning knob to facilitate the short-wave tuning, and the scale is conveniently mapped out in bands: "Ships," "Amateurs," "Broadcast," and so on. Therefore, with the addition of the accurate calibration, it is a simple matter to locate the stations. At eight o'clock in the evening W 2 X A D on 19 metres was still to be

(Please turn to page 324.)

ETHER TESTS

PYE'S T.10 ALL-WAVER



Deferred terms are available for the set, being £2 down and 12 monthly payments of 31s.

The set employs six valves in all: R.F. multi-mu, octode frequency changer, multi-mu I.F. (465 kc.), double-diode triode, pentode output and rectifier. Double slow-motion tuning is provided. The S.W. range is from 13 to 80 metres, and the set is for A.C. mains. Price 18 guineas.

zontal luminous strip, the maximum length of the strip indicating that the set is correctly tuned to the desired wavelength. The importance of having some means of correctly determining the "dead-on" tuning position lies in the fact that when the tuning control is adjusted slightly off tune distortion is liable to occur, and the reason for this distortion is often quite unsuspected by the listener.

On the front of the Model T.10 there are five controls, but only two are used in the normal tuning-in of programmes—these are the tuning and volume controls.

Variable Selectivity

The tuning control has a rapid and a slow motion movement, and to facilitate the operation of this slow motion knob the makers have fitted it with a finger button. This is a practical point, and one which is instantly appreciated by those who handle the receiver.

The three controls remaining consist of a variable selectivity adjustment, the usual wavechange switch, which incidentally has a gramophone position, and a sensitivity control.

The variable selectivity control is a valuable fitment because it enables the listener to adjust the degree of station separation at will. For example, he

can listen to the local programmes on minimum selectivity, thus obtaining maximum high-note response. Or alternatively on a distant station he can turn the control into its maximum selectivity position and so cut down or eliminate any interference.

The sensitivity control is useful for inter-station tuning, or for cases where there is a noisy background on the local.

Of course, as its name implies, it reduces the volume, and so for distant stations it is cut out of circuit.

The circular tuning dial is divided into four segments, one segment being used for each of the wavebands covered by the set. These are clearly marked "Long," "Medium," "Short" and "Ultra-short," and the scale is calibrated in metres, kilocycles and megacycles, the megacycles being used on the short wavebands.

Wavelengths or Kilocycles?

There is also a pointer which rotates through a circle marked in degrees, so that, if desired, stations can be logged by their degree setting, instead of by wavelength or frequency, as the case may be. Actually the writer would prefer to see the wavelength scale made larger, and moreover it is questionable whether the average listener bothers much about kilocycles or megacycles. Wavelengths in metres convey more to the British listener than kilocycles, possibly because, rightly or wrongly, he has always learned to think in terms of wavelength rather than frequency. However, this is a minor point and doesn't affect the working of the set in any way.

(Please turn to page 308.)

THE Pye Model T.10 All-Wave Receiver is a recent addition to the firm's range. It is a console-ette employing a superhet circuit, and is designed for use on A.C. mains.

There are six valves altogether, one of them being a rectifier, and the voltage ranges upon which the set can be used are 100-150 and 200-250.

During the tests two different types of aerial were used. One was a perfectly ordinary L aerial some 20 feet above the ground, with a lead-in in close contact with the wall—by no means an ideal arrangement. The second aerial consisted of a short length of 28 gauge D.C.C. wire run along the picture railing in a downstairs room, the total length of the wire being about 20 feet. This is a type of aerial some listeners are compelled to erect through force of circumstances, but it is, of course, very inefficient. A normal water-pipe earth connection was employed.

Plenty of Stations

As is only to be expected with a good modern super-heterodyne, the range of reception on the medium and long wavebands was limited, in so far as the European stations were concerned, only by the amount of background noise and other interference. Even on the picture-rail aerial all the Continentals working on the ordinary broadcast bands could be brought in at the usual domestic listening volume without pushing the set unduly.

The makers have incorporated visual tuning, and in the writer's opinion this is an essential feature with any sensitive superheterodyne designed to give adequate station separation. The Pye visual-tuning device is a hori-

AT HOME WITH THE T.10



A photograph of Miss Evie Hayes, who acts with the well-known American comedian Will Mahoney, tuning her all-wave Pye receiver.



JOAN CARR

JOAN CARR

tells her Story

An interesting account of the experiences of a popular broadcaster who is now Lady Moore, though she will always be Joan Carr to her radio fans.

JOAN CARR, not to be confused with Jane Carr, lives in a delightfully modern house in Chelsea. As I walked down the pleasant little road towards it the other afternoon I said to myself, "Well, if I had to live in London again—which heaven forbid!—this is the sort of environment I should choose."

Very "Unaffected"

And then, when I had met Joan Carr and had talked to her about everything under the sun except broadcasting, I realised what nice people the B.B.C. manages to bring to the microphone. Joan, I must tell you, is now Lady Moore. She married Lord Moore last May—in America.

Very likely the sophisticated ones heard her recently in the "February Revue." Don't imagine that Joan is sophisticated, though. On the contrary, I found her very unaffected—considering the interesting life she has led—and the circle of society in which she must move.

As so often happens, Joan meant to be something entirely different from what Fate decided to make her.

"For years and years I practised to be a concert pianist," she confided. "When, at the vast age of sixteen, I gave a recital at the Æolian Hall, I felt my life's work must be beginning in earnest."

In America

"As a matter of fact, I soon discovered what a hard life it would be. I had to earn my own living, and the only possible way of doing so with concert work would have been by augmenting my fees for recitals by teaching—and I personally loathed that idea.

"Some kind friend said, 'Why not go to see Nigel Playfair—he might give you a chance on the stage. I was very young, very green and, I must confess, very silly in those days. But I did get some chorus work, and later, when one of the bigger artists fell ill, I was able to take her part.

"Without going into all the inner-

most details of my life, let me skip a little, and tell you that I went to America. I remember my first show, even. 'One, Two, Three!' it was called. But I soon migrated to Hollywood—and there I really did have a lot of fun, meeting all kinds of interesting people. I took a test with what was then 'RKO-Pathé'—doing a little telephone sketch.

"Seems to have been my lucky star, that telephone sketch. I apparently satisfied the film people, for the next thing I knew I was playing with Ann Harding in 'Devotion.'

"Again let's skip. I was in America doing all kinds of stage and film work for quite three years. While in Hollywood I met Eric Maschwitz, who had gone over there for a holiday.

"When I came back to England for a holiday I was rung up by Mr.

to

ALAN HUNTER

Revue.' The reaction was favourable, and then Eric Maschwitz started writing sketches for me—including, amusingly enough, another telephone affair.

"I did *not* go back to the States at once because, while over here, I met my husband, Lord Moore. And yet I was married in New York, as it turned out. My husband had some business to do there, so I went over to him.

Getting Married

"We were there only a fortnight, and got married in the sudden way the Americans have. I remember the hectic excitement. My husband discovered that

one did not have to wait, as in England, so we thought we would do it very quietly. We bundled into a taxi—one of those yellow taxis you see dashing all over New York—and then we had a sudden feeling that we were being taken the wrong way.

"Crowds!"

"So my husband

leaned out and said to the driver, 'Do you know exactly where we're going?' The driver grinned.

"Sure, you're going to get married. It's a great idea—I've done it myself.' And then the crowds when we came out—it looked like a street accident! I was hailed as a radio star marrying a young English lord, which was rather odd considering how negligible had been my microphone experience.

"All the same, I was asked to put on a show for the radio. I replied to the broadcasting people that we were

NELSON KEYS AT THE MIKE.



The popular Nelson Keys in characteristic microphone pose. He is seen broadcasting a sketch with Sylvia Leslie. In the foreground is Mark H. Lubbock.

Maschwitz, who said, 'Aren't you the Joan Carr I met in Hollywood once?' I said I probably was—and the result was that I went to Broadcasting House for an audition. I gave them my telephone sketch—a very amusing monologue.

A Microphone Voice

"It seems I had a good microphone voice. Not that I claim that as a very special virtue. Either you have or you haven't. And I, fortunately, have. So they put me in last year's 'February

sailing on the Bremen in two days. They 'phoned on the Wednesday, and we were leaving on the Friday. 'Oh, plenty of time for your broadcast,' they replied. 'Make it a half-hour show to-morrow, please.' I absolutely couldn't face the prospect of going on the air all that time—so I made it a quarter-hour.

"What a Trio!"

"Thinking to placate me, the broadcasting people asked what sort of accompaniment I would need for my act. So I told them I would have an orchestra, a trio, and someone to support me.

"They certainly gave me my orchestra and trio—and what a trio! Three of the huskiest men I have ever seen. But I like the Americans, they are so young and enthusiastic.

"And now? I am settling down to a quiet married life. I shall appear once or twice a month in broadcasting revues, I hope, but not oftener. I am old-fashioned enough, if you like, to believe that marriage is pretty well a whole-time career in itself."

A Charming Home

I don't blame Lady Moore. She has a charming little house, with everything just modern enough to be really contemporary, without in any way overlapping the limits of comfort by being "modernistic." The lounge, with its curved bookcases filled with a catholic choice of novels, biographies and—yes—tomes on economics and finance (for Lord Moore is director of a well-known financial newspaper) is relieved by a pleasing baby grand piano in the corner.

But for his lordship's tie with the City, they might have lived in the

POTTED BIOGRAPHY OF EDDIE CANTOR

Eddie Cantor, C B S comedian, who can be heard on the short-waves from America, was born over a Russian tea-room in the heart of New York's East Side, on January 31st, 1893.

At the age of two he became an orphan and was raised by his grandmother.

He learned his comedy on the sidewalks of New York.

First stage appearance was in an amateur night at Miner's on the Bowery. The prize was five dollars.

Later he was a singing waiter in a Coney Island beer garden.

His real start was in the vaudeville act of Bedini and Arthur at Hammerstein's Victoria.

In this act he was "spotted" by Gus Edwards.

In 1912 he joined Edwards' "Kid Kabaret," along with George Jessel, Eddie Buzzell, Georgie Price, Lila Lee and Gregory Kelly.

Cantor played a black-faced butler in the production.

Married his wife, Ida, in 1914—she was a childhood sweetheart.

He was the first artist to be starred in a Ziegfeld "Follies."

He gave George Olsen his start in "Kid Boots."

"Whoopee," his last musical comedy, broke every box-office record.

He is the author of an autobiography, "My Life is in Your Hands," and several short, humorous booklets.

He prefers radio to any other field of entertainment.

He insists that a dress rehearsal of each broadcast before an audience is imperative for a finished programme. "Like trying it on the dog," he says.

country. As it is, Lady Moore is compelled—I don't think that is too strong a word—by her Bedlington puppy to go walks every day in the Park. Most week-ends, too, find Lord and Lady Moore down in Sussex.

Lady Moore, or Joan Carr as you know her on the radio, is rather a "stay at home," preferring the delightful comfort of her Chelsea home to the somewhat demodé junketings of High Society.

PYE'S T.10 ALL-WAVER

(Continued from page 305.)

The A.V.C. action was fully effective on the medium and long waves, but naturally on short-wave stations, although it assisted considerably in maintaining a reasonably constant level, it could not be expected to cope with the extremes of fading (often to zero) which one always meets with on the very low wavelengths.

The first time the set was switched on and tuned to the 31-metre band the voice of President Roosevelt was heard speaking from the White House in Washington to the Boy Scouts of America. President Roosevelt's speech was being relayed via W 2 X A F, and it came over at a strength comparable with one of our own local B.B.C. transmissions. Likewise W 8 X K and W 3 X A L could be relied upon to come in very powerfully on most occasions. This reception was carried out on the normal aerial.

Always Receivable

As far as short-wave Europeans are concerned, the Model T.10 will bring these in at "any old time"—Zeesen, Rome, Budapest, Vatican City and Huizen are but a few of those which can be received with ease.

The wavelengths covered on the short wavebands are from 13-80 metres, in two steps. And between these limits there are a whole host of programmes to be picked up, although it must not be expected that they can be brought in just whenever one cares to switch on. Long-distance reception on the short wavebands depends on several factors: the time of day, the conditions existing at the time, and so on; all play their part in making or marring reception.

Although a good aerial is highly desirable the writer was able on more than one occasion to bring in W 2 X A F (Schenectady) on the picture-rail aerial at a strength that was too great for pleasant listening, and the volume control had to be used to cut it down.

AS FIRM FAVOURITES AS EVER

Clapham and Dwyer broadcasting during one of the new "floor-shows" from St. George's Hall.





THE forest was silent. Grim and green and sullen. It seemed to Antmore, treading the hard-packed game trail, as if the whole of his life had been spent in this eerie, noiseless twilight—walking, walking, walking, but never eating, never drinking.

Ahead of him on the narrow path he could see Barleigh, the khaki rags hanging despondently to his lean body as he plodded doggedly onward. Antmore knew that to him Barleigh represented life. He must never lose sight of Barleigh. If he did the forest would get him. The forest that was all about him, waiting and watching, unalterable, unconquerable.

What a fool he had been to embark upon such a mad enterprise—no, hardly a fool! After all, the diamonds were real enough. He clutched convulsively at the small buckskin bag which hung on a thin steel chain beneath the remnants of his stained shirt. Yes, the diamonds were real enough and worth how many thousands?

He brushed the clustering flies from his eyes and mouth, and shook the perspiration in a silver shower from his forehead. What did it matter how much they were worth? He would give them all—yes, all—for a pint of cold clean water and a crust of bread and cheese!

What was it Lemming had said before he died?

“Trust Barleigh, Antmore. Barleigh will be in charge when I am gone, and I’m going fast. Barleigh will get you out of this mess. He knows exactly what to do. He has the key to—” And then Lemming had died, the slender spear shaft in his chest quivering in the sunlight.

They had beaten off the attack in the clearing at the cost of their carefully husbanded ammunition, and the loss of their bearers, who had deserted in a body when the threat of the first distant war drum had throbbed through the violet shadows.

When it was all over Antmore had kicked the dead black warriors in his fury at having to pay such a price for his life. He did not realise that Barleigh, quietly watching him, despised in his heart something which was perilously near to hysteria.

The useless rifles had been discarded, and by a long, forced night march Barleigh had succeeded in leading him to the forest of ghosts. Here at least they were free from savage foes. The country through which they had walked was *taboo*. Barleigh had assured him that there was not a single native within twenty miles of them, and peculiarly enough he believed him.

... It seemed to Antmore, treading the hard-packed game trail, as if the whole of his life had been spent in this eerie, noiseless twilight—walking, walking, but never eating, never drinking . . . But there was a way out.

Barleigh knew what he was doing. Yes, he must stick to Barleigh. Lemming had been right. It was a pity though that Barleigh was such a taciturn, secretive devil—like the forest—

“Oh! Antmore!” Barleigh had stopped where the track divided, a small compass laid flat on the palm of his hand.

Antmore shuffled to a stumbling halt.

“Well,” he croaked hoarsely, “lost yourself at last?”

Barleigh shook his long head, a smile creasing the sweat-packed dust on his cadaverous jaw.

“Not on your life. But I thought it might buck you up to know that in about eight hours—ten at the most—we should hit the eastern bank of the Songi River. The river of lost hope. That is the boundary of the ghost country. Hostile natives are as thick as fleas on the western bank, but that need not worry us. If Lemming spoke the truth—and he was a man who never lied—we don’t have to cross—”

“You mean—you mean Lemming told you where to find a boat—a dugout?” Antmore tried to lick his cracked lips. “I know that last year he pushed up the Songi River—”

“No!” Barleigh eyed a great sombre butterfly which silently drifted by on heavy velvet wings. “A small boat

would not live for long on the Songi. When he made that journey up the river—and it was only a few months ago, remember—he knew that we should shortly be going on the expedition which has just ended so fatally for him. Poor Lemming! I wonder if he had any premonition of the manner in which it would end?”

Antmore smacked viciously at the mosquitoes on the back of his neck.

“For heaven’s sake, Barleigh, come to the point! What the devil did Lemming leave for us on the banks of the Songi?”

“I don’t know exactly.” Barleigh, who was a poor liar, seemed to be seeking inspiration from a cluster of great red orchids, motionless against the ever-green roof of the

□.....□
H. A. DOSSETT
writes this month's gripping story,
which will make you want to read
faster and faster.
 □.....□

ANTMORE LOSES GRIP ON HIMSELF

forest. He did not like Antmore, and he did not trust him. "Once or twice on the way up country, before we found the diamonds, Lemming hinted that should we for any reason be forced to seek refuge in the ghost country he had provided a way out. I argued that this belt of the forest, while sanctuary in itself because of the native *taboo*, was nothing better than a trap. Inaccessible mountains on one side, uncharted and impenetrable swamp on another, and miles of cannibal country and unfordable rivers on the other two. He only laughed.

"If anything happens to me, Barleigh, and you are cornered, make for the Songi. Find the point which is marked on my map with a little red cross. The river makes a sharp turn to the westward there, and most of the country in the elbow is swampland. But there is grassland there too, man. Several acres of level grassland. A natural aerodrome——"

Barleigh, whose thoughts had been with the dead man, stopped speaking, conscious that he had said too much.

Antmore's red-rimmed eyes were wide with amazement, and the dried saliva showed white at the corners of his gaping mouth.

"You're mad, Barleigh," he said shakily, his Adam's apple jerking spasmodically. "He couldn't have done it. No man could have got an aeroplane, even dismantled, that far up the Songi. It's impossible. You know it's impossible, Barleigh! He must have been joking."

Barleigh shrugged his gaunt shoulders.

"I can't imagine Lemming joking about a matter of life and death, especially when one of the lives happened to be his own. But I'm inclined to agree with you about the aeroplane. I don't imagine that we shall find any ready made get-away like that awaiting us——"

"I tell you Lemming was mad!" the remnants of Antmore's voice shrilled in panic. "And we're trapped in this hell of a country. Trapped—no food, no drink, no weapons. Nothing, nothing but death. Death in this damned forest. And it's your doing, Barleigh. You brought me here—brought me here to die. You——"

Barleigh gripped the arm of the babbling man in lean, brown fingers which bit like steel bands. His grey eyes were flecked with cold, green specks.

"I ask you, man, what alternative had we? Would you have preferred to lie beside poor Lemming with a spear in your throat, or perhaps taken alive for the slow torture? Don't give way to these silly bursts of self-pity. They only exhaust you, and they don't help me."

He dropped Antmore's arm and, turning contemptuously away, plunged once more into the never-ending green tunnel which led to the banks of the Songi.

Antmore slouched dejectedly after him, aware that the forest pressed a little closer. He was frightened of its green might, and of the unknown menace that for him always lurked within the gloomy shadows.

He gazed dully at his bruised arm. Barleigh was strong, very strong. But he was a mad fool, just as Lemming had been a mad fool. Between them they had signed his death warrant. There was no aeroplane waiting for them on the Songi. Even Barleigh admitted that much. But then Barleigh had an implicit faith in Lemming, and that was why they were here. Madman trusting madman. His life was in the hands of a madman.

He rubbed his aching wrist and a snarl twisted his burned lips. What could Lemming have left in the bend of the river? It couldn't be a boat. Barleigh was right about that. What then? Food, drink, arms, clothing? There

couldn't be a lot of anything, but whatever it was it would last one man just twice as long as two. He glanced furtively at Barleigh's tattered figure which steadily forged ahead into the verdant embrace of the forest. Barleigh

had diamonds—his own share and Lemming's, which he was taking back for Lemming's widow. Antmore tried once again to lick his broken lips. If only he wasn't so afraid of this cursed forest!

Towards sunset, the body-wide gap in the trees, through which they had progressed for hours, widened a little and gnarled roots like huge tormented serpents twisted blackly across a track no longer iron hard, but yielding in a spongy sickliness to the pressure of broken boots. In a little while black pools glistened between the gigantic interlaced roots, and a broad turgid band of oily water came into view, glistening like a purple wound cut into the broad bosom of the virgin forest. Barleigh had reached the Songi. In the last of the quickly failing light the two weary travellers edged the swampland and continued their journey towards the grass pocket indicated on Lemming's map.

Stolidly, determinedly, Barleigh led the way, Antmore creeping closely at his heels. Then as the swift night came down like a cloak, Antmore's hand dropped suddenly to the heavy hunting knife which swung at his belt.

When the rising sun licked the grey curtain of fever mist from the swamp, Antmore paused and looked back at the forest. Like a mighty green-skinned beast it loomed through the mist. Still watching him, still waiting, in a terrifying silence. He shuddered and turned away.

The hunting knife was missing from the sheath at his hip, and the little buckskin bag hidden on his breast now had another for company. In his hand he clutched Lemming's map.

He did not want to think of Barleigh. Like Lemming, Barleigh was dead. Yes, that was it, just—dead. He—Antmore—was the sole survivor, and to the victor the spoils!

Keeping as close to the river bank as possible, he slowly forced his way ahead, until he found the spot where Lemming had made portorage on his expedition up the river a few months before. The signs were old but unmistakable.

He located the caché easily enough. There were, among other things, tins of fruit and corned beef; some sealed carboys of fresh water; heavy boots; Winchesters and ammunition; a couple of sheath knives; a small medicine chest and some rolls of bandage; all carefully packed against weather, wild animals, and ants. Lemming had done the job well.

Antmore seated himself on a large chest heavily swathed in sacking and tightly roped. He ate and drank voraciously, his bloodshot eyes fixed on the forest which seemed to be held at bay only by the grassland.

He was nervous. There was nothing here even faintly resembling an aeroplane or a collapsible boat, unless it was inside the box on which he was seated. But it wasn't big enough! *It wasn't big enough!* In sudden, uncontrollable panic he leapt to his feet and, seizing one of the knives, slashed furiously at the ropes, tearing the protective covering away with his bare hands. As the last of the wrappings fell to the ground, a small white linen envelope fluttered to the turf at his feet. It was addressed to Barleigh. With trembling fingers he ripped it open and tried to read the words which danced before his eyes in the newly-born sunlight.

"Dear Barleigh—" Antmore gulped and shivered. He did not want to think of Barleigh! He went on reading.

"Dear Barleigh,—If and when you read these lines, I shall be dead, and our long-contemplated expedition to the Hazi Mountains for those legendary diamonds will have ended in disaster, or rather near disaster. This case contains a portable wireless transmitter and a small receiver. They are both quite simple to operate, and you will find an instruction book inside, together with a copy of the Morse code, if you don't already know it. I have made arrangements with Charlie Ormond at the Port Temple radio station to have his blokes keep a special ear open for you on 300 metres. Should they get your SOS, Rodstone will fly over and pick you up. It's barely two hundred to the coast, and those uncharted swamps and impassable mountains don't exist for aeroplanes, old boy! So although I can't be with you, except maybe in spirit, here's luck and happy days.

Yours,

PETER LEMMING.

P.S.—When you get back to England you might give my wife my love as well as her share of any booty that may have resulted from our venture."

Antmore ripped the paper into shreds and scattered it across the grass. Lot of snivelling, sentimental humbug! But what an idea—what a truly magnificent idea! Only a cautious, cunning fox like Lemming would have gone to so much trouble to make provision against a calamity which he could not possibly have foreseen. Yet in his shrewd, clever way Lemming *had* anticipated what might happen, and the hundred-to-one necessity for using the caché had come off.

Well, the sooner he fetched that plane from Port Temple the better. Wonderful thing, wireless. Wonderful things,

THE KEY WAS MISSING

scheming and plotting. The country that had taken him, and shaken him, and beaten him; the forest that had subdued and frightened him, would lie beneath him, impotent and cheated, flattened into a mere patchwork of meaningless colours by the giant hand of science.

There would be no awkward questions when he arrived at Port Temple. There could be none. He had only to tell the truth about Lemming. Barleigh could so easily have been killed at the same time.

He kicked the remnants of sacking away from the case and stooped to lift the lid.

It was locked. Breathing heavily, he inserted a knife blade into the thin crevice above the tiny keyhole and prised it downwards. With a sharp snap the knife blade broke off close to the haft. Muttering an oath, he dropped the useless hilt and, snatching up the remaining knife, cut deeply into the tough leather about the lock. The hide stripped away under the keen blade, and for the first time Antmore realised that the chest beneath was made of steel—tough steel. It was as good as a safe; a locked safe, that could not be opened without the key.

What was it Lemming had said? "Barleigh has the key—!" Fool! Fool! He had not taken Lemming literally. He had not dreamed that Lemming meant a real key, a little key of steel. And Barleigh had had it. Barleigh, whose body lay buried in the ooze somewhere under the twisted roots that fringed the banks of the Songi.

Antmore's nerve broke. He tore at the unresponsive lid with clawing nails, and kicked wildly at the heavy case with his broken boots. He must open it—he must—or die!

It was hours later before the pain in his bleeding fingertips restored him to consciousness. The day was waning. He rose shakily to his feet and glared at the forest, which in some intangible, subtle way had advanced a little nearer as he slept.

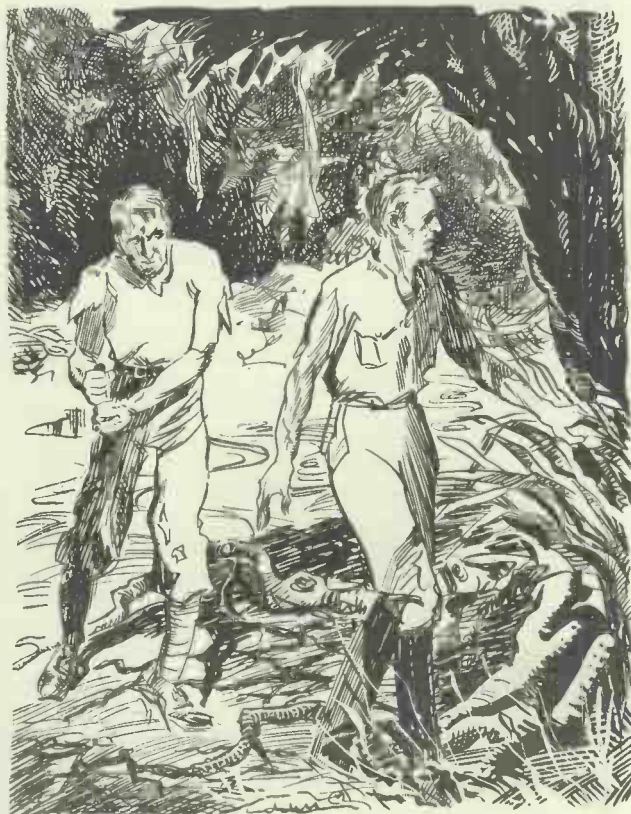
The two small bags of diamonds slung about his throat seemed to be choking him. He dragged them off and flung them down before him on the top of the case. Useless! Useless! What he wanted was a key. Just a little key.

Once again the short twilight of the tropics began to close, and a faint breeze from the river caused the forest to sigh, like a sleeper awakening.

Antmore heard it. He snatched frantically at a Winchester, loaded it and pointed the barrel at the darkening mass of foliage. Night fell. Antmore, standing in the dark, strained his aching eyes towards the heavily massed trees. The forest was coming for him at last. The forest on stealthy rustling feet; reaching out long, writhing grey-green arms— He couldn't fight hundreds of square miles of forest. No man could. The idea was preposterous! Ridiculous! Absurd!

The rifle slid from his nerveless fingers, and suddenly the silence of the night was broken by peal after peal of maniacal laughter which went echoing and ringing down the river of lost hope.

The two small bags of diamonds lay where they had been thrown on the top of the steel case, unheeded and forgotten. Among the rough stones in one of them, where Barleigh had placed it for safety, lay a small steel key.



ANTMORE'S HAND
DROPPED SUDDENLY
TO THE HEAVY
HUNTING KNIFE.

How to Listen During

APRIL

—By W. L. S.—

APRIL has hitherto been one of the most interesting months of the year for short-wave enthusiasts, and there is no reason to suppose that the coming month is going to be an exception.

The waves below 30 metres are "alive" for sixteen hours of the twenty-four, and many interesting things seem to happen during April that don't occur at other times in the year.

America and Japan

Among these are the regular reception of the West Coast of America and of Hawaii in the early mornings on 20 metres, and the breaking-through of the "Japs" on both the 20- and 40-metre amateur bands. There is every reason to suppose that the Japanese broadcasting stations will also follow suit. Unfortunately there aren't any in Hawaii or on the West Coast of the States.

That elusive Fiji station, V P D, on 22.94 metres, should, however, be heard between 6.30 and 7.30 in the mornings, and makes an interesting "bag" for those who have never yet heard it.

The table accompanying these notes is based on the logs of many previous

	0000-0200	0200-0400	0400-0600	0600-0800	0800-1000	1000-1200	1200-1400	1400-1600	1600-1800	1800-2000	2000-2200	2200-2400
CANADA AND U.S.A. (EAST COAST)	31,40	31,40	40,49	40,49	-	-	16	16,19	10,13, 16,19	20,25	19,20	19,20
CANADA AND U.S.A. (WEST COAST)	-	-	-	10	10	20	-	-	20	-	-	-
CENTRAL & S. AMERICA	31,40	40	49	49	-	-	-	10	10	20	20	31
S. AFRICA	-	-	-	-	-	10	10	10	10,20	10,20	-	-
INDIA	-	-	-	-	-	10	10	10,20	10,20	-	-	-
AUSTRALIA	-	-	-	10,20	20,31	-	31	20,31	20,40	40	-	-
NEW ZEALAND	-	-	-	10,20	10,20	20	20	-	-	-	-	-
JAPAN	-	-	-	10,20	20	-	-	20,40	20,40	-	-	-
HAWAII	-	-	-	10,20	10,20	-	-	-	-	-	-	-
FIJI	-	-	-	20	-	-	-	-	-	-	-	-
N. AFRICA AND EUROPE	← ALL BANDS →											

Choose the country you wish to hear from the left-hand column, then note the time of day along the top, and the "resultant" square will tell you the wavelength to listen on in order to stand a chance of hearing the country you want.

years, with the exception of the details for 10 metres, which, I must admit, are pure guess-work except with regard to the East Coast of the U.S.A., and Australia.

The West Coast Americans have never yet been heard on "ten" in the mornings, but I am fully prepared to eat my metaphorical hat if they do not come through this year. I may be premature in mentioning April in this connection, but by May they should certainly be there.

You will note that the dullest hours of the day occur, as always, between 8 a.m. and 2 p.m., between which times there is usually little to listen to except the activity on the amateur bands.

The 49-metre band becomes less useful as the summer approaches, owing chiefly to the increase in atmospheric up there, and to the fact that it does not become really lively until an hour too late for the liking of many listeners.

Best Bands

The 31-metre band is fascinating during the late evenings; and the 25- and 19-metre bands will probably be the mainstay of the broadcast listener. The amateur bands are always interesting, and the use of telephony is becoming much more common, so that you do not need to be able to read Morse to derive a good measure of amusement from them, although a knowledge of it is useful.

At the last moment before going to press, I have noticed that American amateurs on 20 metres are coming in after midnight, and even as late as 2 a.m. This has never happened before, and may mean that April conditions will be abnormal.

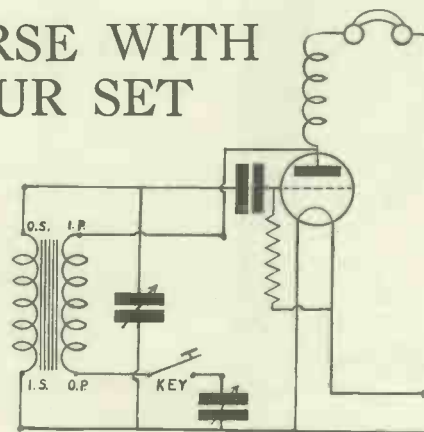
Plan your listening during April, and write and tell me if my prophecies have erred on the conservative side.

W. L. S.

LEARNING MORSE WITH YOUR SET

KNOWLEDGE of the Morse code is of great advantage to any listener, more especially if he is interested in the short waves. The usual way of learning is by means of a buzzer and key. This is quite good, but is apt to annoy the other members of the household, and it does not give the exact sound of a continuous-wave wireless station. A much better way is to use a small low-frequency oscillator which will provide a good signal in a pair of headphones. The only real objection to this method is the cost of the necessary parts and the trouble of connecting up to batteries and phones each time the oscillator is to be used.

The simplest way of overcoming



How to connect the transformer

this difficulty is to make use of the short-wave receiver as an oscillator—with the aerial removed. The only alteration necessary is to connect an old low-frequency transformer in place of the detector-tuning and reaction

coils. Almost any kind of transformer will do. Most sets use plug-in coils, so it is a simple matter to mount the transformer on a valve base and connect as shown. The connections to the valve base—which will be plugged into the coil-holder instead of the short-wave coil—will vary with different sets, of course.

Changing the Note

It will be found that altering the reaction and tuning condensers will vary the note in the headphones. Should the set not oscillate at the first attempt, try reversing the connections to either the primary or the secondary of the transformer.

Just one word of warning: Please remember to disconnect your aerial from the set or you may cause much annoyance to your neighbours, for the set will act as a small transmitter.

A. H. C.

JUGGLING WITH ELECTRONS

By K. BANFIELD



The name of Zworykin is to-day probably one of the best-known and most interesting to radio engineers, for it identifies a man whose laboratory is in the very forefront of radio research, and who has recently announced new developments which bid fair to revolutionise radio, television, audio-frequency amplification, and a host of other electro-technical sciences. In this article details are given of Dr. Zworykin's two latest productions: the "electron telescope" and "electron multiplier."

THE first item we are going to consider in this article is the aptly termed "Electron Telescope" produced by Dr. Zworykin.

The science of electron-optics is quite old, as electronic research goes, and it was known from the earliest times that electron streams could be regarded as analogous to light rays in many respects, as they threw shadows, could be reflected and refracted. But not until recently has research produced satisfactory methods of achieving their control.

Focusing the "Stream"

It has been found that the glass lens used for focusing light can be replaced in the case of electrons by a series of symmetrical radial fields, the "focal length" of which is calculable. It is possible in this way to produce "lenses" having any required convergent or divergent characteristic.

In the practical form of "Electron Telescope" now available, the "electron lens" is produced by a number of rings (Fig. 1) placed between the cathode from which the electrons are emitted and the screen on to which they are to be focused. These rings have been applied to them progressively increasing voltages, determined by the focal length required and the electron velocity.

The object to be viewed is focused by a lens system on to the photo-electric cathode, from which an "electron picture" is emitted. This process will be clear to all who have even an elementary knowledge of the photo-electric cell, since they will realise that as light falls on such a surface each

A happy picture of Dr. Zworykin, holding one of his latest electron multipliers, chatting with two officials of the R.C.A. Company.

point of the surface emits electrons proportional to the intensity of light upon it.

The composite electron stream is directed through the rings by the

what the value of such a device may be, as it is certainly a most complicated substitute for an ordinary telescope!

First, the cathode may be made sensitive to infra-red and ultra-violet radiation, so that when used with suitable filters it enables the observer to see through haze and fog. That is an astonishing development, the importance of which is incalculable.

We have a glimpse of its possible value in the wonderful long-distance photography already carried out with infra-red plates, and it is easy to see that to ships, aeroplanes, and many other forms of transport it may

AN ELECTRICAL "TELESCOPE"

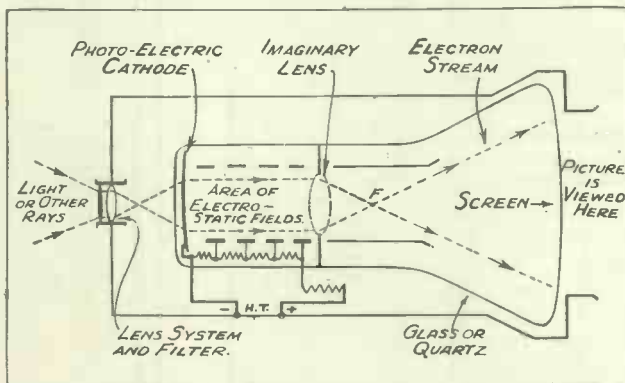


Fig. 1. The device which makes it possible to look at things electronically.

graded positive voltages, and converges to a point, F, beyond the final ring, much as a light stream would be concentrated by a convex lens. Then from F it diverges again and reaches the screen, which is of the type used for cathode-ray tubes and therefore reproduces a visible image of the picture.

The cathode is curved in order to avoid a certain spherical distortion of the picture, which arises with a flat surface. It consists of a glass or quartz disc on which is a semi-transparent photo-electric layer.

Now it becomes possible to consider

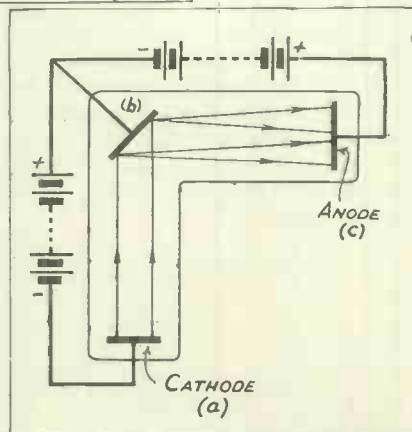
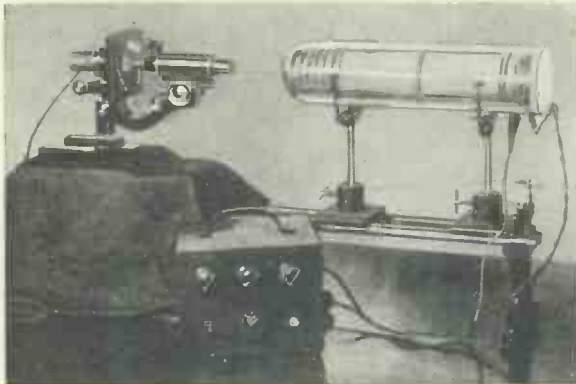


Fig. 2. A diagram explaining the principle of electron multiplication.

easily become as indispensable as head-lamps or searchlights are to-day, particularly in winter climates such as ours.

The electron microscope is another natural step forward, and has great value to biologists, because many living organisms which cannot be seen by ordinary light are killed by the

FOR MICROSCOPIC WORK



By working with infra-red rays, Dr. Zworykin has made it possible to view electronically specimens which would normally be destroyed by the stain required for ordinary microscope work.

stain which must be used to render them visible. If infra-red light is used these organisms are easily distinguished without the need for staining, and may be watched for the first time through this new invention.

Although nothing has been said on the subject, one is led to expect possible applications of the principle to improvement of the iconoscope itself, thus greatly widening the scope of outdoor television transmissions.

Secondary Emission

A new electron multiplier is the second recent device which Dr. Zworykin has produced.

Fundamental principles are quite simple. All radio engineers know the phenomenon of secondary emission which occurs when electrons hit the positive electrodes of a valve or other thermionic device. The energy liberated by the impact shakes up the atoms of the material and sets free other electrons, which are in general a distinct nuisance! In fact, great precautions against secondary emission are always taken in ordinary valve manufacture.

It is possible, however, to make surfaces from which secondary emission occurs to the extent of several times the number of electrons which arrive on it.

To illustrate a simple case: Consider the tube in Fig. 2 with three flat plates treated in this manner. We liberate from the cathode (a) some

STRAIGHT-LINE AMPLIFICATION

electrons and attract them to the first anode (b), by applying a positive voltage to it. As the surface of (b) is highly emissive, the impact of the arriving electrons liberates a greater number, which are pulled off to a second, more positive anode (c). The process can be repeated several times to give a very high degree of multiplication.

One very important feature of the tube is that it will multiply a steady D.C. electron emission as well as one which is varying at frequencies of many megacycles. It is thus a really "straight line" amplifier of the kind we have all dreamed about for years!

In practical form the multiplier is made up as shown in Fig. 3, with a series of emissive anodes faced by

accelerating plates. A beam of light focused on the cathode (c_1), sets up an electron emission, which is attracted towards the opposite accelerating plate (a_1) owing to the fact that this has a positive voltage of 200-400 volts applied to it.

But over the tube is placed a powerful permanent magnet which produces a strong magnetic field and so forces the electrons over to the next cathode, c_2 . This process is repeated at each stage, the electrostatic pull of the accelerating plates acting as a means of increasing the electron velocity and producing greater impact energy on the cathodes.

A Screen Employed

At the end of the chain is the anode or collector, which may have a screen in front of it, in which case the characteristic resembles that of the thermionic screen-grid valve.

A ten-stage tube will give an overall magnification of several million, and needs for its operation a high tension supply of 2,500 volts and upwards. The current taken depends on the gain and final output, and may be many milliamperes, as in the case of an equivalent valve amplifier of modern design. There is, in fact, little gain in efficiency, as measured by performance for a given wattage consumed.

Real Advantages

The real advantages can be summarised thus:

- (1) An improvement of roughly 100 times in signal-to-noise ratio.
- (2) The remarkably flat frequency characteristic.
- (3) The simplicity and ease with which the very high gains are obtained.
- (4) Saving in size of amplifier.
- (5) Probable saving in cost.

There is no doubt that the radio industry will watch the development very closely, for it promises to solve some of the most worrying problems of high definition television receiver design.

MULTIPLICATION

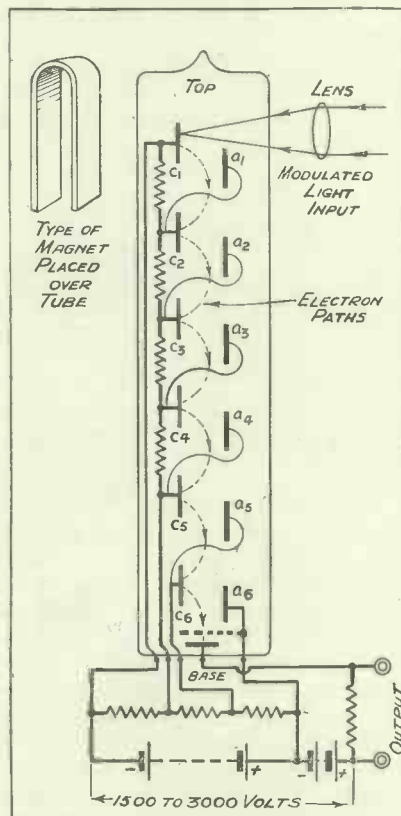


Fig. 3. A diagrammatic representation showing the path of the electrons in Dr. Zworykin's multiplier.

NEXT MONTH

SOMETHING NEW FOR CONSTRUCTORS

All home lovers and those with a liking for the modern will welcome the special design in the May "Wireless."

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The SINGLE SIDEBAND Method of BROADCASTING

Details of P. P. Eckersley's New System of Transmission



The inventor of the method of broadcast transmission described in the article on this page.

MANY suggestions have been made from time to time with the view of easing the present ether congestion and of preventing it from getting worse too rapidly, and I have before me an excellent paper by Captain P. P. Eckersley, formerly Chief Engineer of the B.B.C., and so well known to all readers of this journal, in which he sets forth a scheme for limiting the frequency band width of transmission by methods which he claims are neither elaborate nor costly and which could easily be incorporated in existing transmitter circuits. Moreover, it is shown that the adoption of the suggested technique would not cause service dislocation.

Loss of Top Notes

The ideal conditions for transmission are far from fulfilled in modern broadcasting practice and, consequently, the designer of a home receiver, capable of receiving distant as well as local programmes, has no alternative but to make his receiver so selective that it must cut off the upper audio frequencies of modulation and so give a quality of reproduction which is below the best. The commercial receiver, as generally sold to the public, cuts off at audio frequencies around 3,000-3,500 cycles per second.

Basic Problem

It is obvious that nothing can be done to improve these conditions until transmission technique is changed, because if the sidebands of a wanted station are coincident with the sidebands of an unwanted station, there is no possibility whatever of eliminating the one in favour of the other—at any rate, if they are similar strengths. The basic problem, therefore, which must be solved before we can have

conditions favourable to high-fidelity reproduction from distant as well as from local stations concerns the technique not of reception but of transmission.

It is obvious that reception conditions would be much improved if either transmitter power were reduced or carrier-wave frequency separation were increased. This seems simple at first sight, but on looking into it you find that it is not quite so easy as it looks. A proposal to limit either the power or the number of stations working in an area containing, say, the whole of Europe and including the Near East and Northern Africa, even though it would be desirable in the interests of high-fidelity reception,

accepted, since these are some of the factors which oppose any change which might result in limiting the effective service areas of existing stations. Furthermore, it is obvious that present broadcasting stations would not be willing to spend large sums of money to bring about changes which seemed to have a purely technical consequence, and they would need to be persuaded that such changes were of sufficient ultimate importance.

Again, it is essential that any changes in transmission technique, however great the ultimate benefit may seem to be, must not cause present dislocation. One of the outstanding features of the broadcasting situation is that any change in the process affects not only a considerable number of

transmitting stations, of an enormous aggregate capital value, but also many millions of home receivers.

The Technical Aspect

Having considered the general situation, let us turn to the technical aspect of the system which Captain Eckersley sets forth in his paper.

It is obvious that spectrum overlap

Broadcasting is hampered by lack of sufficient wavelength channels and, as everyone knows, the congestion gets worse instead of better. Broadcast engineers and experts have for some years been striving to find methods of relieving the congestion and alternatively of permitting more stations to get on the air. In this article our Scientific Adviser, Dr. J. H. Roberts, describes a new system which has been worked out by Captain P. P. Eckersley, formerly Chief Engineer of the B.B.C., which is designed to relieve the ether congestion and at the same time to give equal quality of transmission and reception.

would certainly be rejected by those who use wireless broadcasting as an instrument of propaganda—whether the propaganda be national, international or commercial.

Indeed, any proposals to modify transmission technique must take into account the factors of this kind, which we may call “non-technical” factors, if they are to have any chance of being

could be prevented if the carrier-wave and only one set of sidebands were radiated by each transmitter and if the carrier-wave separation (at any rate, between powerful stations on adjacent wavelengths) were greater than the highest frequency of modulation chosen as desirable.

Some Difficulties

There are, of course, various difficulties which prevent the scheme, wherein the carrier and only one group of sidebands are radiated, being easily put into effect. For one thing, the removal of one sideband reduces the maximum possible modulation of the carrier-wave amplitude to perhaps 50 per cent, with a corresponding apparent decrease in station power. Note that the word "apparent" is important, and this difficulty would be of little or no importance if receivers could be adapted to take account of this different transmission technique.

From the point of view of the communication engineer, the change from double sidebands and carrier transmission to single sideband and carrier transmission need not reduce overall efficiency of communication, because a receiver could, with its reduced band width of reception, be made more sensitive without increasing the noise level. From the point of view, therefore, of the ordinary listener, the signals would just be weaker and the increase of receiver sensitivity to compensate for the weakened signal, even if possible, would result in an increase of noise level—since it would be impossible to adapt millions of receivers to the changed technique.

Another point which makes the scheme difficult for broadcasting practice at present is concerned with the question of the design of a bandpass filter having suitable cut-off frequencies.

A Practical Test

It is interesting to note that an experiment was devised by the author in order to test, under practical conditions of asymmetric sideband broad-

COMPARING THE SYSTEMS

casting, whether phase-modulation distortion was noticeable with even a high-fidelity receiver. A superheterodyne receiver was used for this purpose and switches were arranged to throw out the filter which produced the effects of asymmetric sideband transmission and throw in the full spectrum, so that the two conditions, asymmetric or double sideband broadcasting, could be directly compared.

As was expected from the nature of the circuits used, the resulting quality was extremely good, but it was chiefly interesting that, of the many competent observers who compared the two conditions, over long periods of transmission, none could distinguish the least shade of difference between them.

The receiver was arranged to pick up only the British Broadcasting Corporation's London Regional transmission; obviously, therefore, all the conditions of modulation, programme

THE LEAD-IN AT DROITWICH



The aerial-transformer house at the B.B.C.'s high-power Droitwich station. The object of P. P. Eckersley's new transmission system is to enable present high-power stations to give better quality, and not necessarily to make room for still more stations.

service, microphone technique, etc., were those of the best broadcasting practice.

The conclusions which can be based upon the results of these careful tests are (1) that phase-modulation distortion is a second-order effect; (2) that, if phase-modulation distortion is indeed present in asymmetric sideband transmission and if it could be analytically shown to exist, nevertheless, in the actual practice of high-fidelity reception, it gives no offence even to a critical ear.

Captain Eckersley states in his paper that he has had neither the time nor the opportunity to conduct experiments of a more fundamental character than that described above, at frequencies commonly used for the purposes of wireless broadcasting. On the other hand he has proved the practicability of the method described in his paper in the practice of high-frequency wire broadcasting.

American Conclusions

On a recent visit to America, he tells us, he was able to inspect the apparatus developed by the engineers of Wired Radio Inc., for use in connection with their high-frequency wired broadcasting system, and he found that they, from long experience, had arrived at exactly similar conclusions, and had adopted the same methods as those independently developed by him. The quality of reproduction in these high-frequency systems is of a very high order.

A curious criticism of Captain Eckersley's proposals, which he received from several quarters, took the form of a suggestion that the system should not be disclosed, owing to the possibility that some European authorities might take advantage of it not to adapt their transmitters for better quality reception, but rather to crowd even more stations into the already overburdened ether!

An Important Point

If station carrier-waves were moved closer together, however, the audible heterodynes produced by these waves would present a serious difficulty for the receiver designer. If the proposals set out in the paper are ever adopted, it is to be hoped that responsible engineers and all those concerned in the design and marketing of radio receivers will use their endeavours to prevent the basic idea of asymmetric sideband transmission from being used merely to pile more stations into the ether.

Captain Eckersley's paper, entitled "Asymmetric Sideband Broadcast Transmission," is extremely interesting and suggests many new lines of thought; you will find it in full in the Journal of the Institution of Electrical Engineers, Volume 77, No. 466.

Are you interested in
TELEVISION ?
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NEXT MONTH

TELEVISION TO-DAY

—continued from page 300.

a new radio set. I think most sensible people will be able to judge suggestions of this sort at their true worth.

Most of you will not have forgotten the fiasco which took place just about a year ago, immediately the Postmaster-General's announcement of the new arrangements was made. Opinions are still divided on the attitude which a section of the radio manufacturers then took up, and many people think that they did radio—and, incidentally, television—a great disservice. There are signs now of an attempt to create a similar scare, but it is on a very much smaller—in fact, a comparatively feeble—scale, and is not likely to come to anything.

The Other Extreme

On the other hand, there are some people who go to the other extreme and tell you that television is going to be as easy as radio, and that we shall all be able to see one another in our own homes—without going there, I mean—the music-hall version being concerned with the husband's late nights at the club. Apparently husbands, as a class, are going to have a thin time, and there is going to be a boom in new excuses.

* * *

The B.B.C. is said to be considering a plan for making its own films for televising purposes. The question of making its own films arises out of a decision, which is stated to have been come to by the British film industry, not to permit the televising of ordinary productions until three months after the last date of exhibition in the cinemas.

An Expensive Matter

Some of the film people, however, say that it is not at all likely that the B.B.C. will contemplate competing with commercial film producers, because of the cost, which would render such a scheme impracticable. It would, presumably, be necessary to make a picture every couple of days in order to keep up the interest. An ordinary commercial film takes weeks or months to go the round of the cinemas, whereas the B.B.C. film would be shown to all possible "viewers" within a day or two at the most.

However, there is considerable possible scope in the making of short "interest" films. The Post Office Film Unit, which comes under the control of the P.M.G., just as the

B.B.C. does, has already made a start with the official B.B.C. film.

There are also any amount of propaganda films made by such bodies as the Canadian Government, the South African and Australian Governments, and so on, as well as by various commercial interests. It seems, therefore, unlikely that the B.B.C. will go to the expense of setting up a news-reel organisation, and it seems more probable that they will go in for suitable short interest pictures, with such propaganda and commercial films as are readily available.

In addition to ordinary films, the new station at Alexandra Palace will employ direct pick-up by the "television eye"—that is, direct transmission of moving subjects—and also the "delayed" television which consists in photographing the matter on to a film which passes through a compound machine and is developed, fixed and transmitted all within the space of a few seconds.

HOW TO BE WELL-INFORMED

There are people who leave off learning directly their schooldays are over, but these can be reckoned today as an ever-increasing minority.

More and more do most of us realise that to hold our own in the world, either in business or social life, it is necessary to keep fully abreast of modern thought and the advance of knowledge. And knowledge in all its branches is advancing so rapidly that it is difficult to keep pace with it.

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| 2 B.T.S. 4-pin coil formers | 4 6 |
| 1 J.B. 00015-mfd. Midget USW condenser | 3 9 |
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SHORT-WAVE DEVELOPMENTS

BY W.L.S.



A DEVELOPMENT of real importance to short-wave listeners has recently been announced by the technical staff of the American Radio Relay League. We all know about the "Single-Signal Super," one of the most interesting receivers that has yet been designed.

Now the A.R.R.L. people have gone still further, and introduced an intermediate-frequency circuit for superhets which does no less than *eliminate man-made static!* Yes—I know that is a tall claim. But the A.R.R.L. receivers are said to substantiate it completely, and really marvellous results are claimed.

"Machine-Gun" Static

One of the most prevalent noises associated with man-made static may be described as the "machine-gun" variety. Whether it comes from motor-car ignition, or, in fact, from a make-and-break contact of any kind, its wave-form is more or less well defined, consisting of a series of sharp pulses of extremely high amplitude and short duration.

Oscillograph tests have shown that the actual duration of the peaks of such interference may be of the order of one thousandth of a second, or less. The properties of sharply tuned, low decrement circuits, however, make them "ring" and give them a far more considerable duration.

Building Up

Before they completely ruin the reception, their amplitude may be twice as great as that of the received signal, and here is the loop-hole! Why not devise a circuit to cut off some of the "peaks," without interfering with the wanted signal? And, furthermore, why not rectify these "peaks," apply the rectified current to a later stage in the form of an instantaneous volume-control which will suppress the noise

□.....□
AT LAST A SET WHICH WILL NOT RESPOND TO MAN-MADE STATIC HAS BEEN INVENTED! THIS AND OTHER INTERESTING "HAPPENINGS" ON THE SHORT WAVES ARE DESCRIBED BY OUR S.W. EXPERT.
 □.....□

still further, again without upsetting the signal?

This, very briefly, is what the A.R.R.L. wizards have done. They also point out that after the low-resistance circuits of a modern receiver have done their work in changing these short, sharp impulses to nice long wave-trains, the telephone receiver, or the loudspeaker, also does its worst to them.

By its very nature, they say, it responds with a reverberating boom to an impulse of the very shortest

to more than a hundredth of a second.

This trouble must be attacked early in the receiver, and the method employed is simply to amplify the noise peaks extending above the desired signal, rectify them and use the rectified voltage to control the gain of a later stage.

A Vast Improvement

All the work is thus done fairly early in the receiver, before we reach the stages that are most susceptible to cross-modulation and overloading troubles—for overloading is a very important aspect of this interference business.

Actual performance figures are given for the first of the A.R.R.L.'s experimental receivers, and show, in some cases, a signal-noise ratio of 1/3 without the "silencer" in action, and of 10/1 with it—an "improvement-factor" of 30!

* * *

S.W. RECEPTION IN HOTEL



A New York hotel has installed short-wave reception for all the residents. Anyone who desires is able to plug-in to the central receiver and listen in his own room to one of five programmes at will.

duration, and goes on doing its own stuff long after the electrical jolt has stopped.

In actual tests interference wave-trains of a thousandth-of-a-second duration have been shown to increase

A new branch of the R.S.G.B.'s Research and Experimental Section has been formed to investigate "Propagation"—a term which includes the work formerly done on fading, atmospheric, "conditions," and, in fact, everything that happens between the transmitter and the receiver.

Several Groups

The "Propagation" section is divided into several groups: studying conditions, aerial systems, 10- and 5-metre problems, thunderstorms, phases of the moon, and innumerable other subtiles.

Sunspot activity is, of course, another important matter, and it is hoped that by sheer weight of numbers the new section will be able to collate valuable information that has hitherto not been available in bulk.

* * *

Duplex telephony can hardly be

SHORT-WAVE DEVELOPMENTS

—continued from previous page.

described as a recent development in radio, since it has been carried out by amateurs and commercials alike for several years.

Some amateurs, however, are now doing the thing in style, and have so designed their apparatus that they are able to listen to stations transmitting on wavelengths extremely close to those of their own transmitters.

An American amateur was recently heard coupling his superhet to his transmitter and tuning right round the 20-metre band with it, re-broadcasting practically every signal that he could hear, including the fringe of his own transmission!

It is becoming quite common to hear five or six stations linked up simultaneously, each one of them putting out, on his own wavelength, the replies received from each of the others in turn. This makes things a little bewildering for the poor listener, but shows that amateur transmission is becoming too modern for the days of "over to you, old man," and a wait of twenty seconds!

USING THE PIEZO PICK-UP

—continued from page 291.

When R_2 is at its maximum position the high note output is not reduced, but is determined by the value of the condenser C_1 , which incidentally may also be made variable if desired.

Reducing the value of R_2 reduces the bass if R_1 is set in the zero position, but as R_1 is increased the bass steadily increases. The values of the components recommended are:

R_1 0.5 megohm R_2 3-5 megohms
 C_1 0.002 mfd.

It might be thought that provision for reducing the bass is unnecessary, particularly as it has just been pointed out that the pick-up tends to make up for the deficiency in bass on the record, but it often happens that bass boost is already incorporated in the amplifier to which the pick-up is attached.

Avoiding Boom

With such an amplifier the additional rise in output may produce an intolerable boom on some heavily recorded passages, and it is always advisable to suit the reproduction to the type of record played.

The crystal does not wear out as many have thought—in fact, some experiments have shown that it improves slightly with ageing. But it is not proof against mechanical violence any more than any other instrument, so don't wrench the needle screw hard when putting in a new needle or the crystal may be overstrained.

A last suggestion for those who do not like too much top-note response—try the piezo pick-up with a Burmese Colour needle. The softness of the fibre takes the edge off the top notes, and the output of the pick-up is ample to compensate for the reduction in volume due to the use of fibre material.

THE ULLSWATER REPORT

BELOW we give the gist of the recommendations of special interest to all ordinary listeners, which were contained in the report of the Ullswater Committee that has been considering the future of the B.B.C.

The Charter of the B.B.C. should be extended for ten years from January 1, 1937.

The Governors should not be representatives of special interests, and the outlook of the younger generation should be represented by some of the appointments made.

The number of Governors should be increased to seven.

The policy of decentralisation and of including a large proportion of regional programme material should be continued, and as soon as possible Wales should attain the status of a region.

A Minister responsible for broad questions of policy and culture should be selected from Cabinet Ministers in the House of Commons. He should be free from heavy departmental responsibilities, and preferably be a senior member of the Government.

The licence fee should remain at 10s.

The percentage of licence revenue allocated to the Post Office to cover their costs should be reviewed every two years.

Share of remaining revenue to be allocated to B.B.C., for purposes other than television, should not be less than 75 per cent.

Balance should be regarded as potentially available for broadcasting. Any final surplus could equitably be assigned to the State.

The broadcast news service should be unbiased and dispassionate. A free choice should be given to the B.B.C. as to sources and methods of obtaining news; existing arrangements are satisfactory, but there should be no bar to variations to meet future demands.

One of the two Sunday programmes should appeal to serious listeners, and the other should be of a light and popular character.

The Empire service should be fostered and developed, and appropriate use of languages other than English should be encouraged.

The television finance for two years ahead should be reconsidered by the Television Advisory Committee in the autumn of 1936.

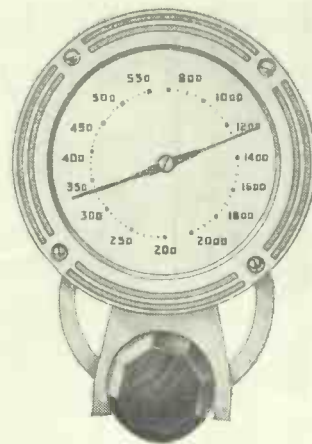
Television should have a claim upon a proportion of the surplus remaining after deduction of 75 per cent of the licence revenue.

Ownership and operation of relay exchanges and technical development or wired broadcasting should be undertaken by the Post Office, and the control of relayed programmes should be by the B.B.C.

No change is necessary in respect of B.B.C. publications.

Technical investigation of interference with broadcast reception should be expedited, and compulsory limiting powers sought if necessary.

B.B.C. and wireless trade together should examine possibility of putting on sale at a low fixed price a standard receiving set.



FOR THE U.S.W. ADAPTOR

For this useful set, by means of which you can make any ordinary home-built or commercial receiver bring in the Ultra Short Waves, has been chosen the J.B. Airplane Dial, Dual Ratio Model, Cat. No. 2131.

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Price 3/9.

FOR THE S.T.100

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NOTE: On page 277 there is an illustration of our famous 12F. Stand Microphone which costs only 21/6.

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Our CONTACT PAGE

Conducted by the Assistant Editor

THIS little corner where we all get together—reader with reader, and reader with the staff of WIRELESS—is really getting into its stride. Letters on all subjects are reaching us and proving very helpful in enabling us to mould the paper on just the lines that readers want.

To the thousands of readers who never write to us, I would say: "Drop us a line, we shall be pleased to hear from you," and, who knows, you personally might win that ten shillings offered in the announcement on this page for the best letter.

This month the award goes to Mr. L. H. Cheeseman, who has returned to "his old love" after a spell of absence. His letter, one of the most sensible and well reasoned we have ever received, is as follows:

The Editor, "Wireless."

Dear Sir,

Having returned to wireless set construction after a lapse of several years, I am constrained to write in retrospect on the improvements and developments made during the period that has elapsed.

In the old days, if I may call them such, I seem to remember that it was only necessary to buy a few components, mount them on a board, couple them together with odd pieces of flex and bare copper wire. No care appeared to be necessary in the disposal of the components or in the actual wiring. In addition, the choice of valves in those days was so limited that one type of valve seemed to cover three or four functions.

However, during the period that has elapsed since the building of these old sets, I have been interested in model engineering, which has instilled in me the necessity of working to precision limits, knowing full well that if this was not so the job, when finished, would not function correctly. Since returning to this hobby of wireless construction it is quite apparent to me that with modern sets and modern methods, this precision which I have learned is equally necessary in radio as in other forms of construction.

I have found from conversation with others that people who are building a modern radio to published instructions very often deviate from the information given by the publisher, and in nine cases out of ten the inevitable happens, and the set fails to function in accordance with the specification.

In my opinion, with the highly sensitive sets that we are building nowadays any variation in the disposition of components and method of wiring is inadvisable, and in my case the care and precision necessary to make a success of small engineering has taught me that radio construction must be dealt with on the same lines if good results are to be obtained.

Therefore, whenever my opinion is asked I have no hesitation in stressing the fact that specified components should be used, and positions of components and method of wiring should not be changed, and I feel sure that if this policy is pursued a set cannot fail to function satisfactorily.

Yours faithfully,

L. H. Cheeseman.

16, Westfield Road,
Mill Hill, N.W.7.

The next item on the agenda is a letter from Messrs. Dubilier Condenser Co. (1925), Ltd., to give them their full name. It concerns the 50-mfd. electrolytic condenser used in the "All-Mains All-Wave Superhet" described in the last number of WIRELESS. The type number of this condenser is given as 3001.

Actually, we are informed, this particular type number is now obsolete, and those ordering this condenser should specify type 3013 which replaces it. The 3001 type is, of course, quite suitable, and anyone who happens to have one on hand need not go to the extent of getting a new one. The difference is but slight.

And now for a letter from Mr. H. W. White, who writes:

TEN SHILLINGS FOR A LETTER

There is no doubt that every reader of "Wireless" has some information, ideas or opinions which would interest other readers. So we are going to offer ten shillings for the reader's letter which, in the opinion of the Editor, is the best of the month. And the sender of every other letter we publish will receive 2s. 6d. So get your pen out and "drop us a line." Anything connected with radio—programmes, sets, experiences, tips—is legitimate material. And length is by no means a necessary feature of a "winner."

The Editor, "Wireless."

Dear Sir,

I enjoy reading my copy of "Wireless" every month, but should appreciate an article dealing with the construction of television sets, that is, starting at the beginning so that an amateur could build up a set to suit various pockets.

Yours faithfully,
H. W. White.

"Chesterfield,"
Foley Road,
Streetly,
Sutton Coldfield.

Thank you, Mr. White, we welcome this type of "request letter" particularly. Actually we have the matter well in hand. We have reserved the services of a really hot-stuff practical television technician, and with a bit of luck readers will begin to reap the benefit of his experience next month.

Incidentally, Mr. White receives 2s. 6d. for his letter in accordance

with our offer, already mentioned, that is described in the centre of this page.

As a result of my reference last month to a midget portable short-waver, I have had many letters on the subject, and we hope to offer you something very tangible in this nature next month.

I must specially thank Mr. G. B. Hunt of Bearwood, however, for the offer of details of his set of this type which he has had going for several months. If you care to send us a photograph, Mr. Hunt, I have no doubt other readers would be interested in the picture. As a matter of fact, readers' photographs are always welcome, and if used are always paid for.

Using a Pick-Up

Referring again to the "All-Mains All-Wave Superhet" we published last month, I find that our Query Editor has had a number of requests for details of how to use a pick-up with it. So, for the benefit of others who have not written and who may be similarly interested, I reprint below the details as described in our replies to the letters mentioned above.

A pick-up can be used with this receiver, and, providing a sensitive pick-up of the piezo-crystal type is employed, satisfactory results should be obtained. A Bulgin type S.86 type switch should be mounted on the top side of the chassis and close to V3.

Disconnect the lead from the grid of valve (cap) and connect the grid direct to the centre terminal of this switch.

One side of the switch is connected to the point previously connected to the grid, and the remaining contact of the switch to the slider (centre terminal) of the pick-up volume control. The remainder of the wiring will be found in this issue of "Wireless," page 279, in a special article dealing with the use of pick-ups. The value of the volume control for use with a piezo-electric type pick-up should be 500,000 ohms. See also the article on pages 290 and 291.

I could go on quoting interesting letters and explaining the points concerned, but must keep strictly to those of general interest. But, remember, you can always get help from our Query Dept., whose full address is, Radio Queries Dept., WIRELESS AND TELEVISION REVIEW, Fleetway House, Farringdon Street, London, E.C.4.

And even if you have no queries to ask drop us a line; we like to be "pally" with readers, and anyway it might pay you well!

THE NEW H.M.V. MODEL 480

—continued from page 303.

might be a little disturbing. As it is, by the careful use of these controls, it can be effectively subdued.

On the long waves the sensitivity seemed to be well maintained, and the usefulness of the pre-mixer H.F. stage as an aid to long-wave selectivity was strikingly evident. The Droitwich giant which, on my large aerial, usually spreads over several hundred metres, was certainly put in its place, and but for a bit of "splashing" on its German next-door neighbour it was easy to keep in check. The 14 stations actually marked by name on this band represent a somewhat modest indication of its long-wave performance.

Almost Like Locals

But it was when I finally turned to short waves that I got, I think, the biggest surprise of all, for although the extreme sensitivity that had been so apparent on the medium and long waves led me to expect something good, I hardly anticipated being able to tune-in some of the American stations on a par with such stations as Fécamp and Belfast. But I *could*; in fact, I am not sure that two or three of them were not better!

I realised then the full significance of the abnormally efficient A.V.C. circuit incorporated, for I am convinced that that was largely responsible for the astonishingly good short-wave performance. Bound Brook (N.J.), Pittsburg (Pa.), and Schenectady (N.Y.) without any exaggeration, would have filled the house if I had let them! They simply romped in, and although in the case of the two first-mentioned stations their 49-metre waves were rather noisy and prone to interference, the transmissions on the 31-metre band were, in my opinion, almost up to the B.B.C. "Five Hours Back" programme standard.

Easy To Tune

I was particularly impressed, too, with the remarkable ease with which these far-off short-wave stations could be tuned-in. I always feel that tuning is half the battle with short waves, and that H.M.V. should have reduced it to such simple terms is, I feel, an achievement for which they are deserving of every credit. Anybody could have tuned-in these distant short-wavers as easily as I did, for there was absolutely nothing in it.

As I now view my tests of this set in retrospect, I am almost amused at the modest way in which the makers

describe the instrument as being intended particularly for the "more ambitious" listener. I think if they had substituted the word "more" with "most" they might have been nearer the truth! The "480," in my opinion, is radio at its very best—no matter from what angle it is considered.

G.T.K.

ULTRA-SHORT-WAVE ADAPTOR

—continued from page 267.

On 10 metres many American telephony stations may be heard. The best time to listen is between 2 p.m. and 7 p.m. Very little will be heard after dark, although the time of fade-out will naturally be getting later and later as the longer days approach.

In conclusion, one or two constructional points are worth mentioning. It will be noticed that the panel is too big for the baseboard, overlapping it by about an inch at each end. I did this solely for the sake of appearance, bearing in mind the fact that many readers will probably have 14-inch cabinets into which they can insert this adaptor.

Actually, the baseboard need not be more than about six inches in

width, since all the components are grouped about the middle. There are, however, three controls to be accommodated on the panel, and this, therefore, has to be of a reasonable width. At the same time, you may use a 12-inch panel if you prefer it, and still house the three dials without altering their relative positions.

The band-spreading condenser is rigidly mounted on a bracket, and the two-ratio dial is also screwed down to the baseboard by means of the little bracket provided along its bottom edge. It is held above the baseboard, however, by two ebonite tubes about $\frac{1}{4}$ inch in height, or a small piece of wood may be used as packing.

Keep To Specification

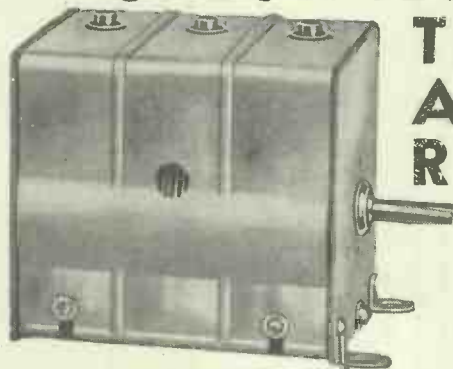
Do not deviate from the layout suggested, which was evolved after considerable time and thought, and has certainly justified itself. The adaptor, as it stands, works very well indeed, but I can't guarantee that it would do so after various "original" ideas had been incorporated into it!

Almost any average outside aerial should give good results, and the aerial coupling may be roughly varied by altering the length of the two twisted wires between the aerial terminal and the top of the grid coil.

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DI-POLE AERIALS

—continued from page 286.

2 inches has an impedance of roughly 450 ohms, and a great increase in efficiency can be secured by coupling to two points as shown, instead of breaking the aerial in the centre.

The actual optimum distance from the centre of the tapping points works out at approximately 11 inches for a 5-metre aerial, or 15 inches for a 7-metre aerial. In other words, the feeders are tapped on at two points, either 22 inches or 30 inches apart.

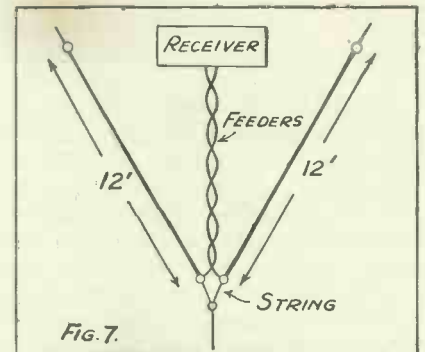
The Length is Critical

The length of wire A between the aerial and the close part of the feeders is also critical, and is about 2 ft. 6 in. for 5 metres, and 3 ft. 4 in. for 7 metres. These distances are proportional when dealing with longer aerials for other wavelengths; but it is obviously impracticable to do this with an aerial intended to operate all over the short-wave bands.

When the feeders are not twisted or transposed, they have to be of a definite length to secure the proper operation of the system. Whereas the total length of the aerial is half a wavelength, the feeders, if they join it at the centre for a current-feed

arrangement, must be a $\frac{1}{2}$ -wave, or some multiple of a $\frac{1}{2}$ -wave, in length; if they are taken to the end for a voltage-feed arrangement, as in Fig. 2, they must be a $\frac{1}{4}$ -wave or some odd multiple of a $\frac{1}{4}$ -wave ($\frac{3}{4}$, $5/4$, $7/4$, etc.).

As a proof of the wide divergence between theory and practice, at the present stage, it may be mentioned that a doublet aerial arranged as in Fig. 7, which has practically everything wrong with it that possibly could be wrong, operates quite well in one known case. It gives good signals and almost complete freedom from interference, although the two halves of the aerial are indoors and are not in the same plane!



An interesting di-pole aerial which works well in practice, although in theory it is "all wrong."

NEWS FROM THE SOCIETIES

Southend and District Radio and Scientific Society.

A comprehensive plan of activity has been prepared for the spring and summer months, including some Field Days in which the society's portable transmitter G 5 Q K will take part. Prospective members are asked to get into touch with the Hon. Secretary, Mr. F. S. Adams, Chippenham, Eastern Avenue, Southend-on-Sea.

The Radio, Physical and Television Society.

Recent activities of this society have included lectures on "Home Recording," "Quality Reproduction," and a demonstration of the Voigt loudspeaker. A full programme has been arranged for the coming months, and meetings are held on Fridays at 8 p.m. at 72a, North End Road, West Kensington, W.14. A course for beginners is one of the features, and a Morse class is also conducted on alternate Fridays.

Full details may be obtained from the Hon. Secretary, Mr. M. E. Arnold, 12, Nassau Road, Barnes, S.W.13.

The Bradford Short-Wave Club.

The above club holds its meetings on Friday evenings at Bradford Moor Council School, and new members will be welcomed. The Secretary, from whom particulars may be obtained, is Mr. G. Walker, 33, Napier Road, Thornbury, Bradford.

The International 6,000-12,500-Mile Broadcast Short-Wave Club.

A club has been formed with the rather startling title given above, and the British representative is Mr. John Taylor of "Hollinwood," Ridge End, Marple, Cheshire. To become a member one must provide verifications from at least five stations more than 6,000 miles distant. Only broadcast stations are considered. Full particulars may be obtained from Mr. Taylor.

Old Morganians' Association.

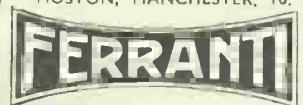
Mr. Hugh W. Hodges of 42, Taunton Road, Bridgwater, Somerset, would like to hear from other members of the Old Morganians' Association living in his district, on the subject of the formation of a radio club.

THESE FERRANTI BOOKS SHOULD BE IN THE HANDS

- R.102 Ferranti Mains Components. A mine of information. 1½d. post free.
- R.104 Ferranti Audio Transformers. 1½d. post free.
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All four will be sent for 8d. post free from Dept. W.R., FERRANTI LTD., RADIO WORKS, MOSTON, MANCHESTER, 10.



OF EVERYONE INTERESTED IN RADIO CONSTRUCTION

PARS FOR PURCHASERS

Hivac S.W. Valves

HERE you are, short-wave fans: Special standard short-wave valves in addition to their midgets have been made by Hivac. The former consist of S.G., detector, and power valves at 12s. 6d., 5s. 6d. and 12s. respectively. The midgets comprise S.G., Det., L.F., Power and Pentode types. Costs vary from 10s. 6d. to 15s. 6d. The latter valves are particularly suitable for the ultra-short wavelengths.

British Rola Speaker

A long way from short waves to large speakers, perhaps, but from thinking about efficient valves I suppose it is not unnatural for the mind to switch over to the output side of the set. Anyway, the next item on my list is the Rola P.M. model of the G.12 speaker. Following the introduction of the mains energised G.12, Rola have produced a P.M. model with similar characteristics. These include a specially provided high note "lift" to counteract the usual high note losses in modern superhet sets. The price of the new speaker is £6. If you want to make a big noise with your set, and a noise that is good to listen to, try one of the new G.12 P.M.'s.

Mervyn Converter

Listen to America or Australia on your present set. That is the possibility offered by the new Mervyn short-wave converter-adaptor, which can be used as a plain detector-adaptor or as a superhet converter. It covers from 13 to 55 metres, is available in battery or A.C. versions, and costs 42s. less valve.

Halcyon Unit

Here's another short-wave converter unit, the Halcyon, at 3 guineas. It is an A.C. job and covers 16 to 65 metres, while with special coils it will let you listen to the 7-metre band and (in the more or less near future) to the television sound programmes. You can also listen to the vision being sent out, if you wish, but you can take it from me it won't sound nice.

Regentone, Too!

And while we are on the subject what about the Regentone converter? This covers an even wider range of wavelengths—from 6.5 to 80 metres in two steps. You can get either a universal model at 5 guineas or an A.C. type for £4 19s. 6d. These prices include the valves.

Faraday All-Waver

If you want something more ambitious, why not the Faraday All-Wave superhet which has been reduced in price to £25 in cabinet, or £21 in chassis form? That is complete with valves and loudspeaker, to say nothing of a whole host of improvements.

Kabi Commutator Switches

I once knew a radio fan who was simply switch mad. Everything to which he could fit a switch had one or more of these devices on it, with the result that his set was a mass of knobs, enabling him to control almost everything by pressing or pulling a knob. At least that was the intention, but owing to the inefficiency of the switches of his day (some years ago now) and to the fact that his enthusiasm and imagination were far in advance of his technical ability, things did not often work out as he hoped.

That was some years ago. To-day, in spite of increased circuit complications, I think he would do better. The problem of the efficient switch has

NEXT MONTH

UNIQUE HARRY ROY COMPETITION

Practical Articles for Short-Wave and Television Enthusiasts

General Contributions of Interest to All, etc., etc.

been solved at any rate—witness the Kabi series made by F. W. Lechner & Co., Ltd. Some new types have been added to this famous range of switches recently, including 1,500-volt commutator switches having from 21 to 30 contacts, and some 2 to 20 contact click-action switches with the same voltage rating. Ideal for sure operation of all classes of circuits.


The Wayfarer Portable

Get out your packs and your shorts, the hiking and cycling season is on us again. And while you are making lists of those things that you are going to take with you on your next hike or "bike" don't forget the Wayfarer Senior Portable. This portable is one of the smallest ever. It weighs only ten pounds, has four valves and measures 9 in. by 9 in. by 6 in. It will pack away in a haversack, suitcase, on the carrier of a bicycle, in fact almost anywhere, and it costs but 6 guineas. It uses a speaker, by the way, but its voice is not of the small variety. It is made by the London Electric Appliances Co., Ltd.

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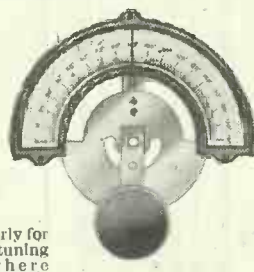
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THE TELEVISION- 'PHONE

Details of Germany's latest television development.

AFTER preliminary and successful tests by the German Post Office laboratories of long-distance high-definition television over a new type of co-axial cable, a regular public television-telephone service was opened between Berlin and Leipzig on Sunday, March 1st.

A number of German and foreign Press representatives were given free facilities to use and acquaint themselves with the possibility of the service. Ordinarily a three-minute communication costs 5s. to 6s., a sum which includes the notification of a desired correspondent at the other end of the line. This notification is necessary, as at the present moment the television-telephone is obviously limited to persons who go to public call-offices.

115 Miles

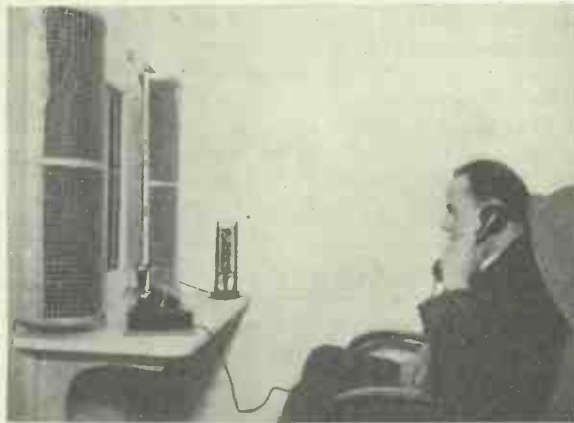
Two of these have been opened in Berlin, one in the centre, the other in the west end of the town, and another two are at Leipzig. As the crow flies the distance between the two towns is roughly 90 miles, but following the route of the cable the distance is in the neighbourhood of 115 miles; 180-line definition and 25 frames per second are employed. This gives an excellent head-and-shoulder image of the person sitting at the other end of the line.

Accurate focus is all-important, and so the German Post Office has provided comfortable armchairs of the "grandfather" variety and focus is automatically obtained by leaning back comfortably in them. The image of the other person appears in an aperture immediately above the scanning light.

Much Longer Distances

The service remained open to the public until March 7th, and was then closed for a short period for further tests by the engineers. German Post Office engineers state that the new type of cable makes it possible to satisfactorily bridge distances of up to 500

"SEEING IS BELIEVING"



In the television-telephone booth the chair is so placed as to ensure accurate focusing.

miles without distortion. The cable is capable of handling a frequency-band of up to two million cycles. It is manufactured in two models—one co-axial and the other consisting of a dual line which produces a symmetrical circuit. From a practical point of view the importance of the new German television-telephone is perhaps not so great as the fact that the new cable has been proved satisfactory. **A.A.G.**

BRITISH BROADCASTING NEWS AND VIEWS

—continued from page 289.

An Opera Committee

The B.B.C. is getting more and more like a real Government of a democratic state. I mean that when it gets into difficulty about any subject of a main policy character, it throws the problem at a committee, just as a Government does. This is what is being done with opera. The B.B.C. and its Music Advisory Committee have decided to ask for guidance.

A committee of all the "talents" is being gathered, and will be invited to say precisely what it considers the public duty of the B.B.C. towards opera to be. In other words, the B.B.C., as I have forecast, is not going on with opera subsidies on its own authority. I expect there will be a return to studio opera with an abridged system of contributions to the various recognised opera organisations throughout the country.

Money Shortage

Mr. Wellington, the Director of Programme Planning at Broadcasting House, has had to do some heavy pruning of programmes lately to keep expenditure within the budget, which actually provides nearly £150,000 more for programmes this year than last. More rehearsals are eating up resources, and are certainly necessary if the improved standards are to be maintained.

THE PHILCO "EMPIRE" SIX

—continued from page 304.

heard at full loudspeaker strength, and the 31-metre W 2 X A F needed to have the "wick well turned down," so loudly was it coming through.

The Bostonian W I X A L was a further American station which I had no difficulty in locating at first-class volume, while that other 25-metre transmission from the U.S.—W 8 X K—came over on this Philco set with great gusto.

Needless to say, such European short-wave stations as Zeesen, Rome, Moscow, etc., were present in fine strength, and tango-playing Rio de Janeiro surprised me by assuming the volume of a local station.

My final impressions of this Philco were that it gives as good a performance on all three wavebands as the most modern methods of design could possibly achieve. **G.V.D.**

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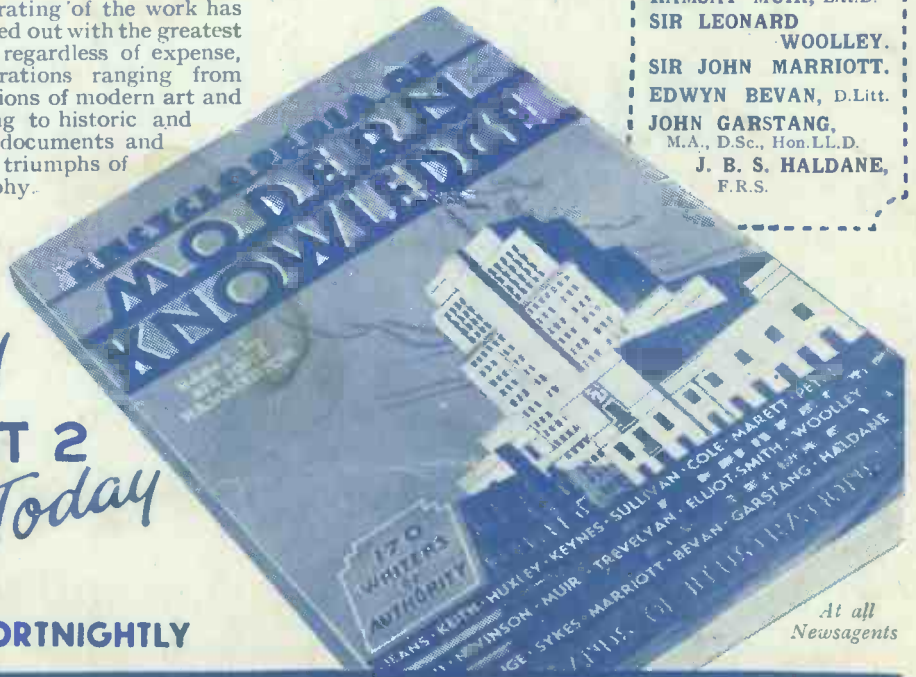
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