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Vol. XIX. No. 73. MODERN WIRELESS. JANUARY, 1933.

As some of the arrangements and specialities described in this Journal may be the subject 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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RANGE *and* SELECTIVITY

Superhet Ten Autoradiogram

- Ten Valve Superheterodyne Radio-Gramophone. Marconi Valves.
- Reproduces Wireless or Records.
- Super Moving Coil Speaker for Tonal Quality.
- Single Wave Change Switch for "Gramophone," "Medium Wave," "Long Wave" and "Off."
- New Tone or Brilliance Control.
- Improved Record-Changer, playing eight records in succession without attention or repeating.
- New device to dispense with record-change at will, making the instrument an ordinary gramophone.
- Price 80 gns. With De Luxe Cabinet 95 gns.

Superhet circuit on both instruments—great range—practically every important station obtainable at full volume without overlap.

Superhet Portable Six

- Six Valve Superheterodyne Portable Radio. Marconi Valves.
- Balanced Armature Speaker.
- Built-in Aerial.
- Low H.T. current consumption 11 ma.
- Compact and Handsome Cabinet in Beautifully Figured Walnut.
- Price 17 gns.

BY APPOINTMENT TO H.M. THE KING

On Superhet Portable Six or Superhet Ten Autoradiogram, let "His Master's Voice" show you how to get the utmost in foreign reception to-day!

Throughout the wide series of "His Master's Voice" radio sets and radiograms on sale to-day, range and selectivity—the two foremost essentials for long-distance wireless reception—are present in the same high degree. At the lower end of the price scale is the "Superhet Portable Six." People are getting America on this remarkable little set. Douglas Walters (radio critic of the "Daily Herald") describes its selectivity as "excellent" . . ." a station at every few degrees of the scale." And Captain Robinson (radio critic of the "Observer") says it is "the finest portable radio on the market." At the top of the series is the "Superhet Ten Autoradiogram." All that you could ask for in wireless or gramophone is provided—the same keen selectivity and even greater range, plus an automatic record-changing gramophone with all the very latest improvements, giving radio or records with a tone absolutely unapproached by any other instrument in existence. Superhet Portable Six, price 17 gns. Superhet Ten Autoradiogram, 80 gns. (De Luxe Model, 95 gns.) or by hire purchase.

"His Master's Voice"

True-to-Life

RADIO AND RADIO-GRAMOPHONES

The Gramophone Co., Ltd., London, W. 1 *(Prices do not apply in I.F.S.)*

Modern Wireless

Vol. XIX. No. 73. BRITAIN'S LEADING RADIO MAGAZINE JANUARY, 1933.

This Month's Designs—Station Separating—Result of Madrid Conference.

IN this month's issue of MODERN WIRELESS we have endeavoured to cover the needs of a great many of our readers who wish for something more than what may be termed "ordinary" loudspeaker reproduction. The Research Department have for some time past been working on the production of two mains amplifiers which will provide pure and faithful reproduction plus full volume, and readers will note in this issue full descriptions of these two interesting units.

The first of these amplifiers is designed for use with D.C. mains to deliver some 2·5 watts of undistorted output. The second amplifier has been designed specifically for A.C. and gives up to 6·5 watts, thus allowing ample margin for household purposes and sufficient power for loudspeaker reproduction in small dance halls, etc.

There is yet another product of the Research Department's work which we feel will interest many readers—a battery four-valve receiver. This set has several outstanding features, not the least of which is the automatic wavechanging and variable-mu volume control. Readers will find this set quite easy to operate and capable of bringing in a very satisfactory number of programmes. In short it is an ideal household multi-station receiver.

An Invention Worth Watching

THE Radio Research station at Datchet under the Department of Scientific and Industrial Research has recently perfected a device which may, without exaggeration, be described as having very far-reaching possibilities. In brief, the device successfully eliminates all wireless signals—even on identical wavelengths—which come from different stations in different directions from the actual transmitting station which it is desired to receive.

On test it has been found that any number of local stations may work on a standard wavelength and, provided not more than three of them are geographically situated in a straight line, by the use of the device perfected by the Radio Research Station at Datchet there is no difficulty in working them all at once. With the ever-increasing seriousness of the problem of jamming, the sorting out of different signals becomes more and more essential; and we understand that this new invention makes use of a stream of electrons which instantaneously changes its form in accordance with incoming waves for reception. The signals from any required station, for example, are "caught" and the current which they produce is amplified, so as to light a small lamp, flashes from which can easily be read by the operators in charge.

An official explained that, in order to demonstrate the practical advantages, a model has been designed in which a green light shows the signals to be received, while a red light registers the confusion which would otherwise result when several stations were operating on the same wavelength at the same time.

We shall await further information regarding this device with considerable interest, for any instrument which is capable of eliminating all wireless signals on identical wavelengths which are not desired, while picking out signals from the particular station required, is certainly worthy of the very closest investigation.

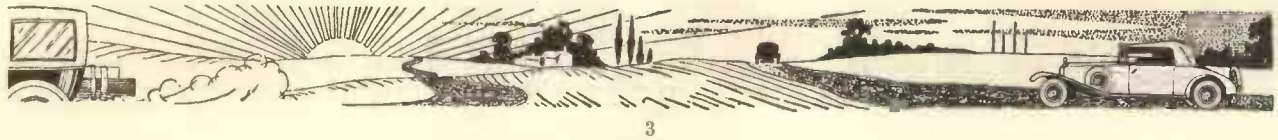
More Waves for Broadcasting

A SHORT time ago the Radio Telegraph Conference at Madrid ceased its labours. For fourteen weeks the Conference has been in session, and perhaps the most important result obtained is that of securing Russia's decision to accept the Conference's findings—even with reservations.

The most important wireless change which will result from the Conference is the increase in long waves for broadcasting services. The new wavelengths will start from 1,131 metres instead of 1,340 as under the present agreement, and will go up as far as 1,875 metres.

Incidentally, it is worth while remembering that at the moment there are already a number of long-wave stations operating above and below the limits prescribed by previous Conventions. The new wavelengths available will be allocated to various countries at a European Conference which will be held in May next, when it is likely that it will be agreed that medium-wave stations will not exceed 100 kw. in power, and long-wave stations 150 kw.

This new Conference, which will be held in Lucerne, will have further problems to tackle in connection with the dearth of available wavelengths, for European countries are increasing their broadcasting services very rapidly, and are constantly crying out in competition with older established radio services for more available wavelengths.



IN THE ANNOUNCERS'

What does an announcer do while a programme is on? What are the mysteries of the announcing and listening rooms, which, for his benefit, are built at the side of each main studio in London?

OUR SPECIAL CORRESPONDENT spends an evening with a well-known announcer and tells you the answers to these intriguing questions.

ANNOUNCERS are still anonymous. A great pity! An old lady friend of mine, who listens for nearly twelve hours a day, thinks they are "such dears"—and I think she's right. As they are anonymous they can blush unseen under my pæan of praise.

A man who has been on the announcing staff since the early days of broadcasting was one of my firmest acquaintances at Savoy Hill, and one evening last week he helped me to elucidate the mystery of where announcers go 'twixt programmes.

Old Order Changed

If you have ever been lucky enough to see a programme through in the old Savoy Hill days you will know why the matter is now a mystery of almost A. J. Alan status!

There were sometimes only two announcers on duty at a time in the old London studios. The lift was slow. The studios were on many floors. It was a common thing for an announcer to be thoroughly out of breath, having covered three storeys in thirty paces.

Announcers in those days had to be masters of sign language. Everything had to be done in the studio; no opportunity to get through on the house 'phone and make studio arrangements for the next broadcast; no way of knowing that after the next breathless dash up or down stairs to another studio everything would be just ready and waiting for the broadcast. It might even be the wrong studio!

Now the express lifts and the special padded listening and announcing rooms of Broadcasting House have changed the old order. There is a popular idea that all the announcers have to do now is to twiddle thumbs in between intervals of breathing their golden voices softly against the condenser mikes!

It really isn't quite so simple as all that. My announcer friend invited me to see the inner workings of the listening and announcing rooms of each main studio. The new gadgets certainly give announcers plenty to do!

"Now here is a typical studio," said the announcer, whisking me out of the lift on to I know not what floor of Broadcasting House. "There are two microphones, you see, and a plug for an additional gramophone turntable.

Baffle-Box Speaker

"Here are the two signalling buzzers, one wired through to the control room and the other to the band room. We have a code here so that by flashing the control-room buzzer we can signal to the man at the desk when to switch on.

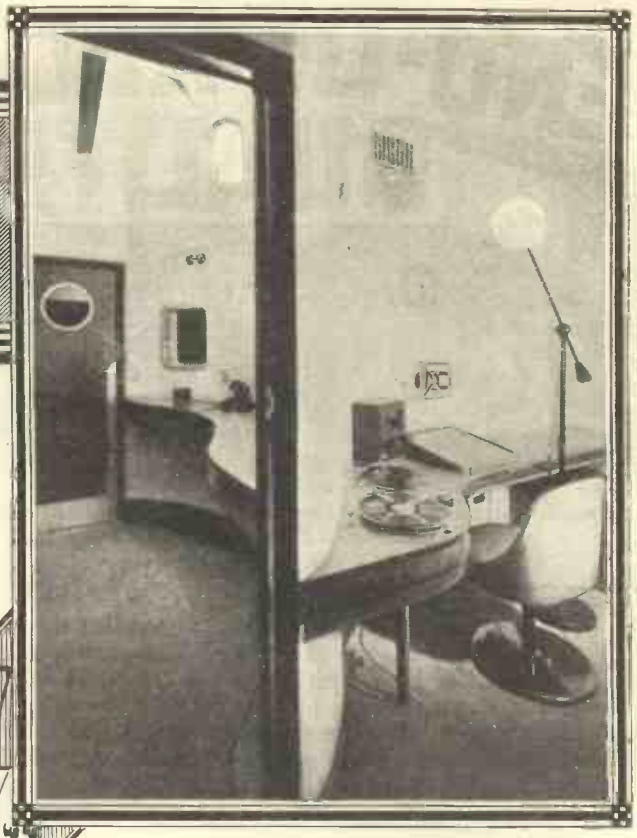
"In the corner, you see, there is one of the new reproducers—a mains-driven two-valve amplifier and a

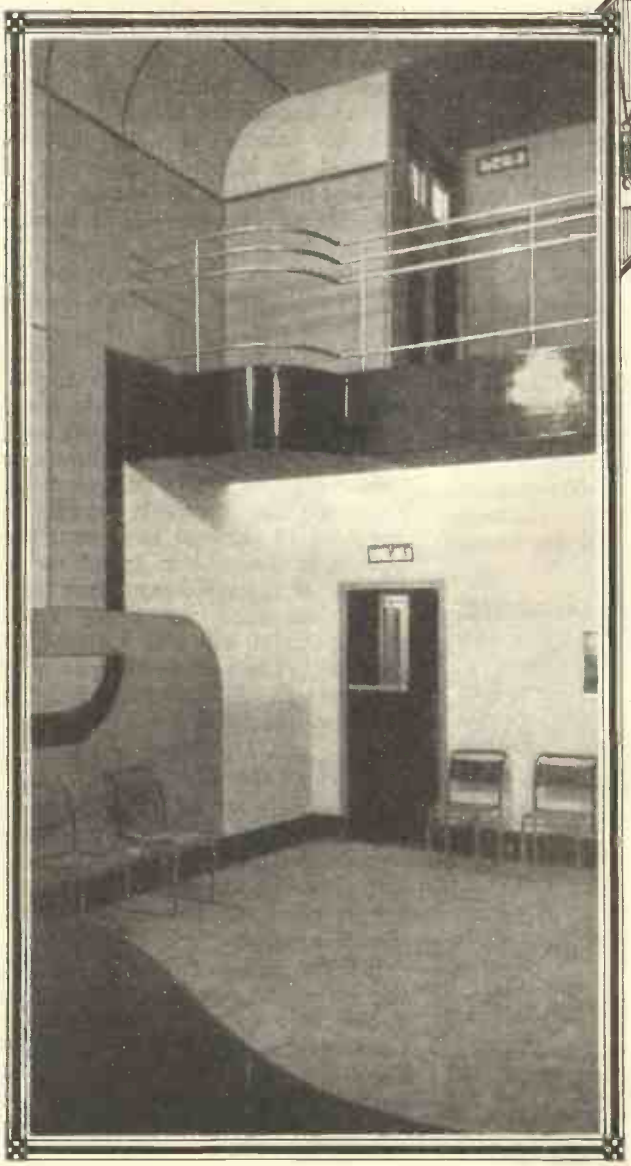
ROOM

moving-coil speaker in a baffle box. By pushing in this plug and flashing through to the control room, I can have the speaker equipment wired up to the dramatic control room. Anybody up there conducting a rehearsal can speak back to the artistes in the studios."

"It doesn't look difficult," I ventured.

"Pushing a buzzer button—no, it's not very difficult," he said, in the manner sarcastic! "Come into the listening and announcing rooms next door. *Then* you will see something."





The announcer's desk is at the right of this picture—note his easily adjustable lamp and the gramophone turntables. The adjoining room is the News Editor's office, while the lower picture to the left shows the "BB" Studio where the dance bands usually play.

In the listening room I saw a six-way "mixer." This is simply a bank of six potentiometers. They can be wired up in several different ways, so that the inputs can be faded from one to the other. There is a house 'phone and a special 'phone wired through to the control room. In the corner is another mains-operated amplifier and moving-coil speaker.

"When I have made the opening announcement," said my friend, "either from the main studio or from the announcing room next door, I can at the touch of the switch connect up the amplifier and speaker with the studio line and hear what is going on. I can also see, of course, through the double glass window."

Uncannily Pure Reproduction

He switched on the speaker. Some people were talking in the main studio before a rehearsal and it so happened that they were standing close to the mike. The announcer slowly turned one of the six-way "mixer" controls, fading in the microphone close to the group of people.

The effect was uncanny. Although we were entirely sound-insulated from the studio, and could only see the artistes through the small glass windows, the loudspeaker reproduction in the listening room was so good that it seemed as though we were actually in the main studio and listening to the people talking!

"You see, I don't have to go into the studio to get an accurate idea of what the programme sounds like," commented the announcer, as I stood bewildered at the purity of reproduction.

(*Continued on page* 97)

END-OF-RECORD QUALITY

Have you ever wondered why there is a falling off in tonal quality towards the end of a record? The reason is lucidly explained by

F. N. GANDON.

THAT the quality of reproduction falls off towards the end of a record has been noticed by every radiogram enthusiast, but the reason for this trouble is not so obvious as it appears at first sight.

The generally accepted explanation is that the point of the needle wears and does not follow the variations in the sound-track as it should; but while this assumption is correct up to a point, it is only a half-truth. The needle fails to follow the track not so much because it is worn, but because of an inherent difficulty in the recording process.

Frequency Fixing

If a record is examined with a lens or low-power microscope the waviness of the grooves is easily seen, and it is clear that if the point of the needle is passed through a groove at a fair speed it will be thrown from side to side or vibrate.

The speed of vibration or the frequency of the note will be governed by the number of wave-crests passed over per second, and this in turn will depend on the surface speed of the needle and the distance between the wave-crests.

At a given needle speed, the farther the wave-crests are apart the slower the vibration and the lower the note—or vice versa. It will be seen from what follows that the wave-crests tend to become closer and closer together towards the inside grooves, and it is this fact which is the main reason for the falling-off in quality.

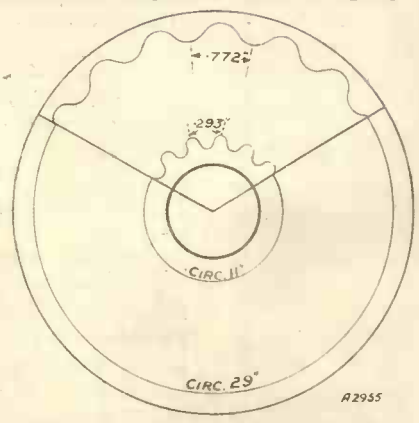
The circumference of the outside grooves of the average 10-in. record is approximately 29 in. and the turntable speed 80 revs. per minute (approx. 1·3 revs. per second). This means that the needle passes through these grooves at a speed of 29 in.+ 9·6 in.=38·6 in. per second.

For the sake of example we will assume that a 50-cycle note is being reproduced, which means that the needle must vibrate 50 times a second. As we know that in a second it also travels 38·6 in., it follows that the distance between the wave-crests must be 38·6 in.÷50=·772 in.

Needle Travel

When we come to the end of the record, however, it is a different story for here the circumference may be only 11 in. This means that at 80 revs. per minute the needle only travels 14·66 in. per second, so that the distance between the wave-crests is only about 14·66 in.÷50=·293 in., as against ·772 in. on the outside—in other words, they tend to become cramped together.

COMPRESSED RECORDING



In the first groove of a record the crests of a 50-cycle note are widely spaced, but not so on the last groove. If a high note could be shown, it would be seen that the cramping on the last groove would prevent the needle following the "waves."

This cramping does not do much harm on such a low note as 50 cycles, for the needle-point can easily follow these comparatively large waves, but it is a very different matter with the high notes.

Calculating in the same manner, it will be found that in the outside grooves the wave-crest distance for a note of 3,000 cycles is approximately ·0128 in. or 1/80 in. Small as this is, the needle-point will follow it fairly well, and it is not until the inside grooves are reached that trouble sets in.

Feeble Vibrations

Here, owing to the small circumference, the wave-crest distance of a 3,000-cycle note may be only ·0048 in., or, roughly, 1/200 in., which is scarcely as large as the needle-point itself. The consequence is that it simply passes through these grooves without vibrating at all, or, if it does, only in a very feeble and distorted manner.

It is clear, then, that the chief reason for the falling-off in quality at the end of the record is due to reduced volume or total loss of some of the higher notes, owing to the fact that the needle cannot follow the cramped wave-form. It is only exaggerated but not caused by the fact that the needle-point is worn by the time it reaches the last grooves.

Incidentally, the above figures show very conclusively the importance of having the turntable speed correct. We know that at 80 revs. per minute the needle will vibrate 50 times per second for a 50-cycle note. Suppose the turntable speed is increased 10 per cent to 88 revs. per minute (a fault often found owing to wear of the speed regulator), then it is clear that the whole range of frequencies will also increase 10 per cent. The normal 50-cycle note will become 55 cycles, and 3,000 cycles will be 3,300 cycles.

Upsets the Tone

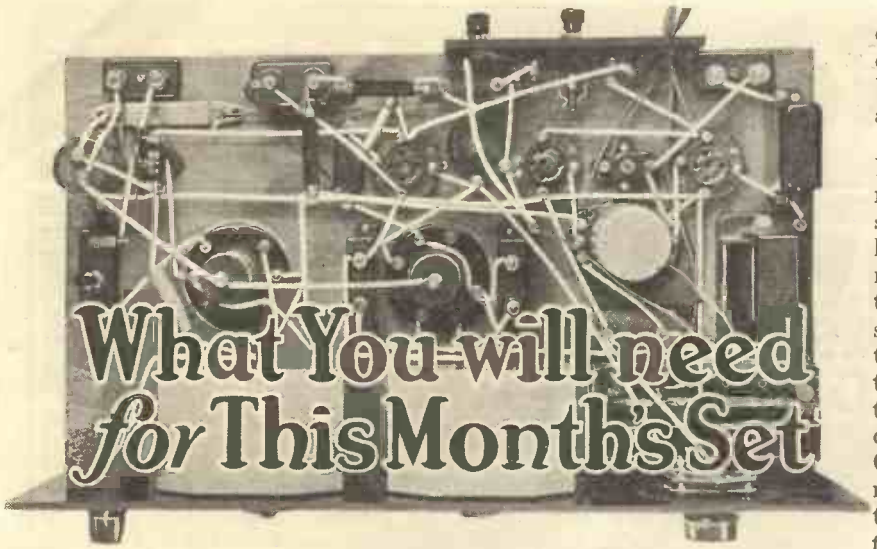
The aural effect of this increase in turntable speed is that orchestral reproduction will appear thin and high-pitched, and, what is even worse, a male voice will almost seem to be that of a female.

It is due to this difference between the inside and outside groove of the record, that when for some reason the amount of recording on a special disc is somewhat less than usual, it is started at the usual distance from the outside of the disc; leaving the blank part inside.

For the CONSTRUCTOR

THE M.W. "VARI-FOUR"
AN EASY-TUNE SET FOR FOREIGN PROGRAMMES

PURE POWER AMPLIFIERS
FIRST CLASS INSTRUMENTS FOR A.C. and D.C. MAINS—
FULL CONSTRUCTIONAL DETAILS



What You will need for This Month's Set

THE main features of the "Vari-Four" are the automatic tuning controls and the variable-mu screened-grid valve, and this is the first time that these two great advantages have been coupled together. Added to other worth-mentioning points, they make a very strong group which place the receiver well in the forefront of modern set designs.

We shall have more to say specifically about the various circuit arrangements later, but we here want to stress the most important point in the design of every set, and especially those wherein some outstanding features are included. This is the necessity of choosing the component parts with the utmost care and accuracy.

In many receivers it does not matter what parts are chosen, as long as they are of the correct value. For instance, variable condensers are variable condensers, no matter what the make, and often it does not matter whether they come from the factory of A, B or C. Similarly, L.F. transformers and coils can be chosen with a certain amount of latitude.

The use of the correct components is very important if the best is to be obtained from any set design, and in some cases no alternatives can be given. So be warned, and do not light-heartedly use non-specified parts.

Alternative Components

In this set, however, it is important to keep to the specified list, if the full value of the method of component combination is to be obtained. There is no substitute for the automatic wavechanging condensers—Extensers, as they are called—and the Telsen Telexors must be used, for their screening plays a large part in the success of the set.

Similarly, the coils must not only be screened, but if other types and makes are used, either the tuning will suffer or the wiring diagram and the layout of the set will have to be modified in order to accommodate them. That is the reason why we say "see text" against the alternative in the list of components, for the Goltone coils can be used if the following alterations in the connections are carried out. In the G G R coil the following terminal number substitutions for those in the wiring diagram should be made, the coils being turned round so that the wiring is most conveniently arranged. 1 and 2 remain, 3 becomes 5 on Goltone coil, 4 becomes 6, 5 becomes 4, and 6 becomes 3.

The parallel-fed transformer coupling unit, too, stands alone in our list, not because it is the only one that would be satisfactory in the set, but because, as there are no standard terminal markings and positions on these components, such substitution would tend to cause confusion unless diagrams for every possible combination of alternative parts were available.

Other components are interchangeable to some degree, but it will be seen from these remarks how important it is to keep to the list given, and where no alternative type or make is listed, to desist from using an alternative.

ALL ABOUT ALL THE PARTS AND ALTERNATIVES

PANEL
18 × 7 in. (Goltone, Peto-Scott, Permcol, Wearite, Becol, Direct Radio, Lissen).

BASEBOARD
18 × 10 in.

CABINET
For 18 × 7 in. panel and 18 × 10 in. baseboard (Peto-Scott, Camco, Marco, Osborne, Lock, Gilbert, Direct Radio. Pickett).

VARIABLE CONDENSERS
2 Telexors (Telsen W180).
1 ·0003-mfd. differential reaction (Lotus, Telsen, Polar, Ormond, Ready Radio, Keystone, Bulgin, Utility, J.B., Graham Farish).
1 Preset ·0001-mfd.—·00015-mfd. max. (Goltone, Telsen, Polar, Formo, Igranic, Graham Farish, Colvern).

FIXED CONDENSERS
1 2-mfd. (Dubilier type B.B., T.C.C., Lissen, Igranic, Ferranti, Telsen, Sovereign, Peto-Scott, Formo, Goltone).
1 2-mfd. (Lissen type LN134, or see above).
1 2-mfd. (Igranic "Nondu," or see above).
2 1-mfd. (T.C.C. type 50, or see above).
1 ·25-mfd. (Dubilier type 9200, or see above.)
1 ·01-mfd. mica (T.C.C. upright, Dubilier. Graham Farish).
1 ·01-mfd. (T.C.C. type O.F. with wire ends).
1 ·0001-mfd. (Dubilier type 670, Goltone, Graham Farish, Ready Radio, Telsen, T.C.C., Lissen, Ferranti, Igranic, Watmel, Sovereign, Peto-Scott).

VARIABLE RESISTANCE
1 50,000-ohm potentiometer (Watmel wire contact type, Sovereign, Wearite, Colvern, Igranic, Tunewell, Varley, Lissen, Lewcos).

FIXED RESISTANCES
1 1,000-ohm (Colvern strip, Graham Farish Ohmite, Dubilier, Watmel, Sovereign, Bulgin, Ready Radio).
1 1-meg. grid leak with wire ends or terminals (Dubilier 1-watt, Goltone, Igranic, Ready Radio, Graham Farish Ohmite, Igranic).
1 ·25-meg. grid leak (Graham Farish Ohmite, or see above).
1 ·5-meg. grid leak (Graham Farish Ohmite, or see above).
1 25,000-ohm (Graham Farish Ohmite, Watmel, Sovereign, Dubilier).
1 50,000-ohm (Graham Farish Ohmite, or see above).

COILS
2 Dual-range screened coils (Lissen LN 5101, Goltone G G R—see text).

H.F. CHOKE
1 Lewcos type M.C., or small Keystone, Telsen, R.I., Ready Radio, Varley, Lissen, Lotus, Wearite, Watmel, Sovereign, Graham Farish, Tunewell, Slektun, Goltone.

SWITCHES
1 3-point toggle shorting (Bulgin type S.87).
1 Radio jack-switch (Lotus No. 9).

VALVE HOLDERS
1 5-pin horizontal (Lissen type LN789, W.B., Bulgin, Telsen, Wearite).
3 4-pin (Lotus, Lissen, W.B., Igranic, Bulgin, Telsen, Clix, Tunewell, Benjamin, Junit, Wearite, Formo, Ready Radio).

L.F. CHOKE
1 Ferranti type B8, R.I., Igranic, Lissen, Varley, Wearite, Bulgin, Telsen, Tunewell, Lotus).

L.F. TRANSFORMER
1 Benjamin Transfeeda.

MISCELLANEOUS
1 Fuse holder (Bulgin type F5, Goltone, Telsen).
1 Terminal strip, 6 × 2 in.
2 Indicating terminals (Belling & Lee type R, Bulgin, Clix, Igranic, Goltone, Eelex).
2 Terminal blocks each with two terminals (Lissen type LN308 and LN347, Belling & Lee, Sovereign, Goltone).
9 Plugs (Clix, Bulgin, Igranic, Belling & Lee, Eelex, Goltone).
2 Accumulator connectors (Belling & Lee, Goltone, Eelex, Clix).
1 60 m.a. fuse (Belling & Lee "Scrufuse," Goltone, Bulgin).
5 yds. of systoflex and 6 yds. of 18 gauge tinned copper wire (Goltone).
2 sets of bias battery clips, Bulgin No. 1.
Flex, screws, etc.

BUILDING THE M.W. "VARI-FOUR"

AFTER the components have been chosen, the set must be built. In this case, though the baseboard is fairly well packed, there is no real difficulty in construction, provided it is done methodically and not in a haphazard fashion.

Baseboard Layout

When the panel has been drilled and the parts mounted on it, it is best to put this aside and lay out the components on the baseboard before attempting to wire up any of the panel parts, holding the panel against the baseboard every now and then to make sure that none of the components on the latter will foul those on the former.

Then, with the panel still detached, wire up such things as the valve filaments and all leads that run along between baseboard components close to the panel. Such leads as those between terminals of the coils and other baseboard components, that long lead from the output choke to the 1-mfd. condenser between the coils, and so on.

Panel Components

Then take the panel components and connect any wires that go between them. In this case there are only two. One from the slider of the potentiometer to the earth terminal on the first Extenser, and the other between the on-off switch and the right-hand terminal of the potentiometer.

A set that "minds its own business"! What is its business? Why, bringing in stations loudly and clearly—and only the stations you wish—as and when you want them. The set will not interfere with other people's stations, and unwanted stations will not interfere with it.

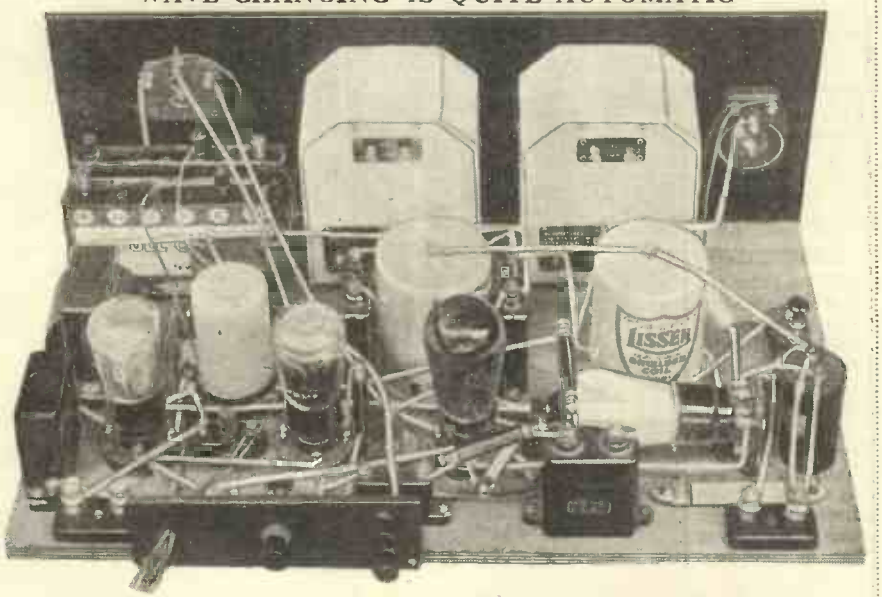
But there are several leads between the Telexors and the baseboard components, and if longish leads are taken to the Telexors now, it will be easier to connect them to their respective points later on.

A similar method is best employed later on when the connections to the radiogram jack-switch are made, for this is not an easy switch to connect up when in position, for it projects fairly closely towards the other components, though the diagram shows it flat down so as to give a clear indication of the actual connections.

Start Low Down

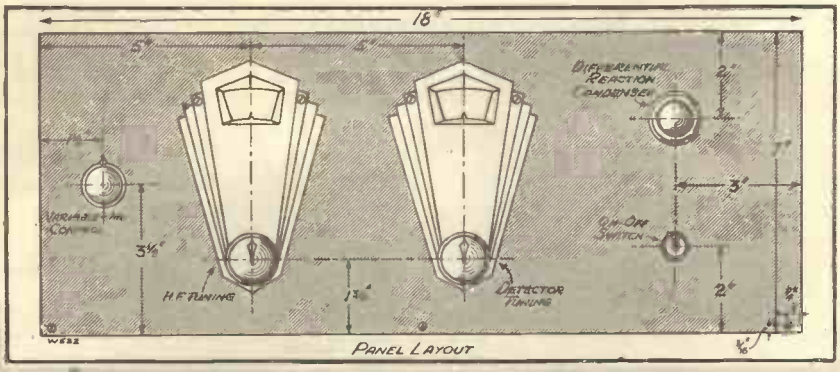
Always do those wires that come from the feet of vertical components

WAVE-CHANGING IS QUITE AUTOMATIC



You can turn from a station on the medium waves to one on the long as easily as you can turn from one local medium-wave station to another on the medium waves. Every station has its own dial reading, one dial serving for both bands.

SIDE-LIGHTS AND POINTERS



TO GOOD RECEPTION OF MANY STATIONS

VARIABLE-MU VOLUME CONTROL

Provides a smooth and wide range control of volume before the detector valve, and since it works on the S.G. valve, both this and the detector are prevented from the quality-spoiling effects of overloading.

HORIZONTAL MOUNTING FOR SHORT WIRING

By mounting the S.G. valve horizontally, it is possible to keep the lead to its anode very short, and short wiring is always a great aid to efficiency. Note how the valves are all arranged in a row.

AUTOMATIC WAVE-CHANGE

These Telsen screened Extensers provide an automatic change from medium to long waves as their knobs are rotated. Not only does this simplify operation, but each station has its own individual dial reading.

DUAL-RANGE AND SCREENED COILS

are important items in the achievement of efficiency. Their screening (which is removed to show the coils in this photograph) in conjunction with the Extenser screening makes possible the simple layout of the receiver.

SERIES GRID-BIAS BATTERIES

The grid bias for the variable-mu must have a fairly high voltage, and because they are so easy to obtain, use is made of two nine-volt batteries joined in series. These batteries supply the L.F. valves as well.

L.F. COUPLING AND DE-COUPLING

This component in conjunction with the 2-mfd. condenser to its left provides decoupling for the 1st L.F. valve as well as parallel-fed coupling between the last two valves of the set, thus ensuring good quality amplification.

Variable-Mu—Invariably Successful

or low down on others before tackling those at the tops. This helps a great deal in keeping the set tidy, and note how the wires connecting terminals of the coils remote from the side nearest the components from which they come are taken round the coils *inside* the cans. This adds to the screening of the set, and is a small but important point. A good example of this is the lead from G of the second Telexor to terminal 1 on the second coil. Note how it curves round past 3 and 4 inside the screen.

Unusual Terminal Placing

You may wonder why the terminals for the aerial and earth are differently placed from usual. This was done for two reasons. The first is because it is easier to run the aerial lead between the S.G. valve holder and the ·25-mfd. condenser than to run it round; and, secondly, it corresponds with the terminal marking of the Lissen terminal block as viewed from the back of the set—the way you would look at it when wiring, and probably when connecting up for test.

A similar state of affairs is seen in the case of the loudspeaker terminals. Although there is no real positive and negative loudspeaker connection when an output filter is employed, for the D.C. is prevented from entering the speaker leads, yet there is an earthed side, and we have kept things logical by making the terminal stamped L.S.— on the terminal block the one that is connected to the earth circuit of the set.

Connecting Dial Lights

The batteries are connected by means of cords, thus doing away with the necessity of terminals, and we find that a great many of our readers prefer this to the alternative method of using terminals.

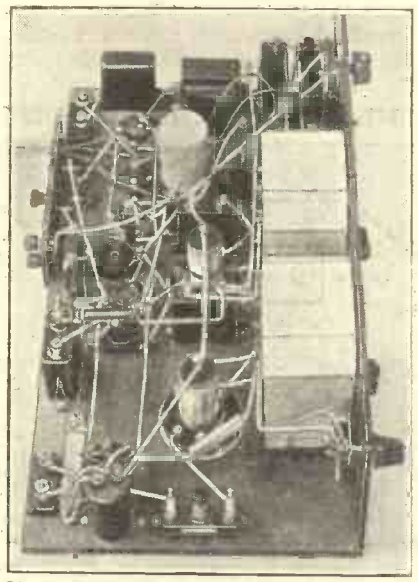
The rest of the construction is perfectly straightforward, and you will find no difficulty in it. It should be noted that the dial lights on the Telexors have been left unconnected.

This is done advisedly because many constructors will prefer not to add this extra drain on the accumulator, for naturally the lights make no material difference to the working of the set. If it is desired to use the lamps, the connections are as follows:

The two terminals of each light are joined to the corresponding terminals on the other; thus placing them in parallel. Then take a lead from the left-hand terminal of the light on the second Extenser and connect it to the filament terminal of V_4 nearest the back of the set.

The other terminal of the second Extenser dial lamp is joined to the moving vanes of the reaction condenser, or, if more convenient, to the right-hand terminal (looking from the back of the set) of the 2-mfd. condenser, which in its turn is already connected to the reaction moving vanes and to the L.T. circuit on its negative side.

"AT YOUR SERVICE"



Here it is—completely wired and ready to fulfil your every wish where foreign stations are concerned.

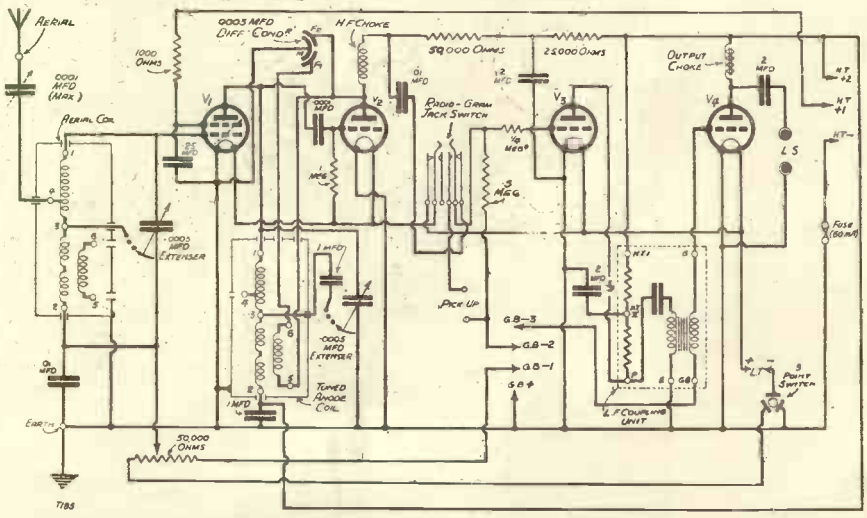
You will note that the bias batteries—there are two placed side by side—run across the leads from the on-off switch. This is easily carried out if it is remembered to run the connections from the left-hand and the centre terminals of the switch low down along the surface of the baseboard. Then, as the batteries are held in position by the battery clips, they will be raised sufficiently above the baseboard to clear those leads.

Switching Grid Bias

A three-point switch is essential, by the way, to break the circuit of the grid bias through the potentiometer as well as the L.T. negative. Without such a switch there would be a constant though admittedly small drain of current from the bias battery through the 50,000-ohm potentiometer even while the set was not in use.

It may be that some constructors will prefer not to use a pick-up, though we expect that most of them will decide to include the jack-switch which allows the set to be used as a radiogramophone. This jack-switch cuts off the L.T. supply to the screened-grid and detector valves

STUDY THE CIRCUIT—IT'S WELL WORTH IT



At first glance you might think—"Just another Four"—but don't! Just look into it and you will spot such features as automatic wave change, variable-mu volume-control, parallel-fed L.F. stage, and other modern refinements of receiver technique.

while the pick-up is being used, but it can be quite easily omitted if it is decided to use the set for radio only.

Omitting the Pick-Up

In this latter event it would be unnecessary to have the small ebonite strip, the battery cord would be stapled down to the baseboard, and the ebonite strip, the jack-switch and the two pick-up terminals would be done away with.

The alterations in connections would be these. The filament connection of V_3 (side farthest from panel) would be continued along to V_2 and V_1. In other words, the connections between filament of V_4 and the jack and between V_2 and the jack would be omitted, and V_2 and V_3 filaments would be joined instead.

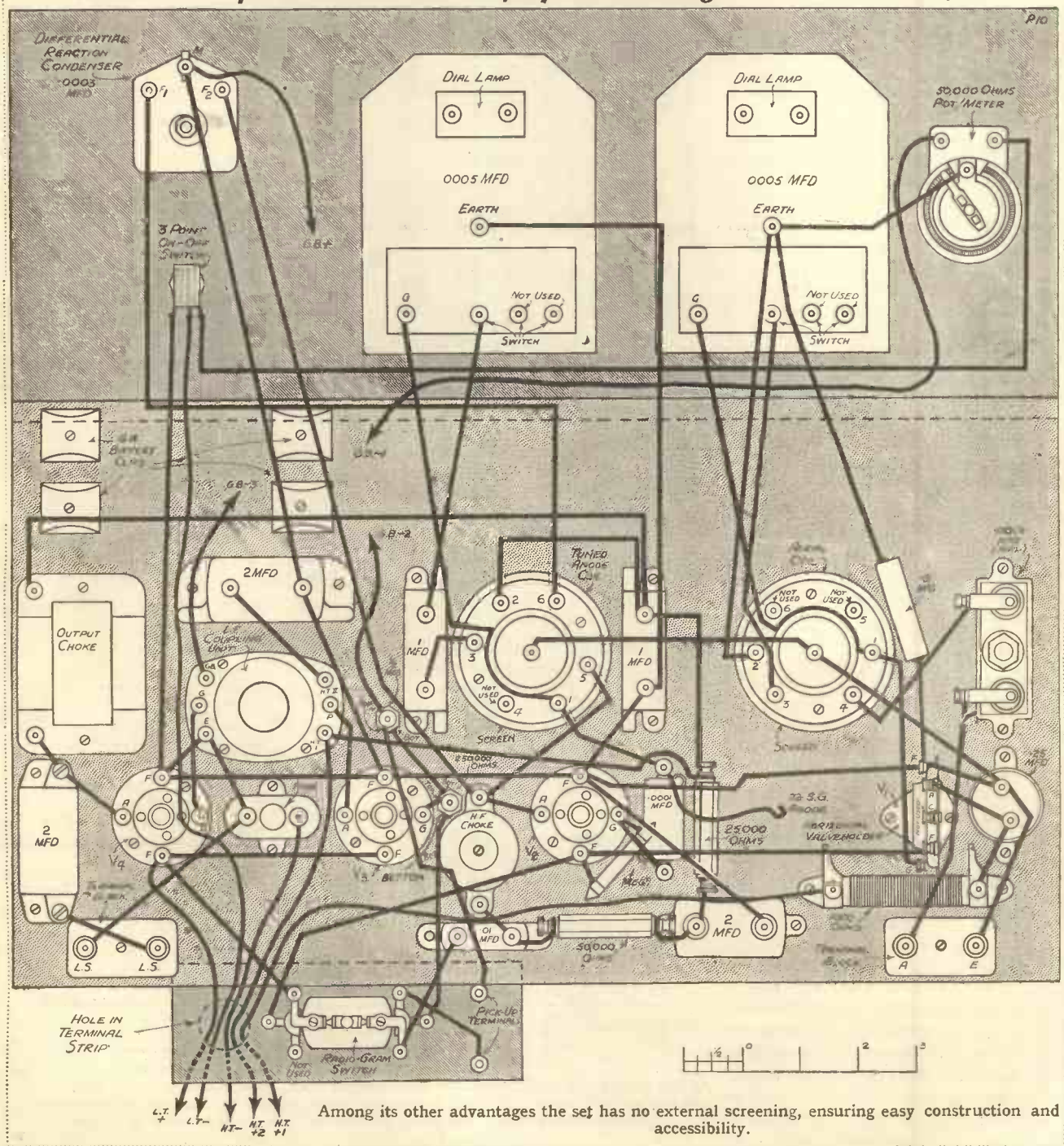
Then the connection between the ·01-mfd. condenser and the switch would be removed, and the ·01-mfd. condenser would be taken direct to the bottom of the 250,000 Ohmite resistance close to the grid of V_3.

There would then be no connection between the ½-megohm grid leak and the pick-up terminals (the latter being removed), though the other connections to the leak would remain.

Moving-Vane Connections

It may seem strange to some that there are apparently no moving-vane connections to the two Telexors. Actually, the moving vanes are

Record Reproduction—Simplified Tuning—Filtered Output



Among its other advantages the set has no external screening, ensuring easy construction and accessibility.

common to the frame, and the "earth" terminal acts as the moving-vane connection.

Note how the connections to the L.F. coupling unit are made. The H.T.1 and H.T.2 terminals are used in conjunction with the adjacent 2-mfd. condenser to provide a decoupled H.T. supply to V_3, and it is important that these connections be rightly made.

Circuit Details

The connection between the two centre terminals of the coils and to the ·25-mfd. condenser is made last of all, when the cans have been placed over the coils, and is for the purpose of earthing the cans.

So much for the construction of the "Vari-Four." You will have seen from the theoretical circuit diagram what manner of set it is, but in case there are one or two points that are not clear, we will briefly run through the circuit.

The aerial is coupled through a preset condenser (to allow variation in selectivity) to the tap on the first coil. This coil is tuned by a Telexor (Extenser), which also acts as an automatic wavechange switch by virtue of the contacts shown on the theoretical diagram, and connected to the three terminals marked "switch" in the wiring diagram.

Avoiding Shorts

Of these switch points only one is used in each case, the "other side" of the switch being integral with the moving vanes of the Telexor and therefore at earth potential.

That is why in the tuned-anode circuit (second coil and Telexor) a 1-mfd. condenser is placed between the coil and earth, and another between the switch contact of the Telexor and the No. 3 terminal of the coil. By this means there is no danger of shorting the H.T. to earth when the medium waveband (switch closed) is used. Obviously, these condensers *must not be omitted.*

The coils used have completely free reaction windings, and, therefore, we can so arrange our differential reaction condenser that the moving vanes are at earth potential. This does away with any possibility of hand capacity even when the most critical reaction adjustment is being made.

The detector valve is resistance-capacity coupled to the 1st L.F., a jack-switch being interposed between the two valves to enable a pick-up to be used on the grid of the 1st L.F. valve. This jack-switch throws the detector and the screened-grid valve out of action while "gramophone" is being used, and by disconnecting their filament supply saves any waste of L.T. or H.T.

Volume-control for the gramophone side should be arranged externally, as the radio volume-control—by variable-mu valve—cannot be used for the pick-up as well.

This external volume-control is easily fitted to the motor board on which the pick-up is mounted.

It is important that the connections to the volume-control be correct, or when the control knob is rotated in a clockwise direction the volume will be *decreased.*

It can usually be seen to which of the two outside terminals of the three on the volume-control potentiometer is the one to which the slider arm is likely to go when the knob is turned clockwise, but if there is any doubt, a trial will soon show whether you have things right or not.

Here are the connections. Two ends of pick-up to two outside terminals of the volume-control (which should have a value of about 50,000 ohms). The centre terminal of the volume-control is connected to the top pick-up terminal of the receiver.

Nothing Freakish

It now remains to connect the bottom pick-up terminal of the set to one or other of the outside terminals of the volume control. It should go to the one which is approached by the slider on the knob being rotated anti-clockwise, but if there is any doubt, try one and then the other!

After the 1st L.F. valve we come to the parallel-fed L.F. transformer unit and thence to the output valve and its output choke system.

There is, therefore, nothing freakish about the circuit—everything is carefully thought out and is the result of a great deal of experience.

VARI-FOUR ACCESSORIES

RECOMMENDED FOR PURE POWER SUPPLY

Loudspeaker.—B.T.-H., Blue Spot, Baker's Selhurst, G.E.C., Ferranti, Marconiphone, H.M.V., W.B., Lanchester, Ormond, Igranic, Clarke's Atlas.

Batteries.—H.T.: This should be of ample size to deal with the requirements of the valves chosen. Pertrix, Magnet, Ediswan, Lissen, Ever Ready, Drydex, Marconiphone.

L.T. Accumulator.—Ediswan, Exide, Lissen, etc.

G.B.: Two 9-volt units linked. See above list.

Mains Unit.—This should have two plus tappings with output to suit valves chosen. Atlas, Ferranti, Regentone, Ekco, Tunewell, Heayberd, R.I.

Aerial and Earth Equipment.—Electron "Superial." Graham Farish "Filt" Earthing Device.

THE VALVES TO USE

	H.F. Stage	Detector	1st L.F.	Output	Output Mains Unit
Mazda	S.215V.M.	H.L.2	L.2	P.220	P.220A.
Mullard ..	P.M.12V.	P.M.1H.L.	P.M.2D.X.	P.M.2A.	P.M.202
Cossor	220V.S.G.	210H.L.	210L.F.	220P.A.	230X.P.
Marconi ..	V.S.2	H.L.2	L.210	L.P.2	P.2
Osram	V.S.2	H.L.2	L.210	L.P.2	P.2
Tungsram ..	—	H.210	L.G.210	P.220	S.P.230
Lissen	S.G.2V.	H.L.2	L.210	P.220	P.X.240
Eta	—	B.Y.1814	B.Y.1210	B.W.604	B.W.602
Six Sixty ..	SS.215V.S.G.	210H.L.	210D	220P.A.	220S.P.
Clarion ..	—	H.2	H.L.2	P.2	—

ON THE AIR with the "VARI-FOUR"

WITH the set completely built and the accessories to hand, it is a matter of only a few minutes before the first tests can be carried out. The valves are the first things to be placed in position, the variable-mu valve going in V_1, the detector in V_2, the L.F. valve in V_3, and the power valve in V_4.

Bias Connections

The two 9-volt bias batteries are placed in the two pairs of clips under the reaction condenser, and they are joined together with a length of flex bearing two plugs, the plus end of one battery being connected to the negative end of the other. This leaves a plus and a minus free. If only one battery is used (see previous page) there is no need for this piece of flex and the two plugs.

Place the bias positive plug into the positive free end of the battery, and then place the three negative plugs in as follows: G.B.1 goes into the free negative end. G.B.2 goes into 1·5 volts from the positive end, and the third G.B. goes into whatever bias is required by the particular output valve you have chosen.

H.T. Voltages

The H.T. battery is now connected up with the H.T.— in the minus end, H.T.1 in 80 volts, and H.T.2 in the full maximum of 120 or 150 volts. The L.T. battery connections are obvious. It should be noted that in the case of the mains unit being used the taps are the same as for the H.T. battery, except that probably you will have the two taps marked "screen" and max. In this case H.T.1 goes to "screen" and H.T.2 to max.

There's nothing whatever bothersome about the operation of the set, and with these details to assist you, you will have no difficulty in getting the remarkably fine results of which the "Vari-Four" is capable.

Connect aerial and earth and loudspeaker in the usual way and switch on. The jack-switch at the back (if you have included it) should be pulled out.

Then, with the pre-set condenser screwed right down, turn the tuning dials to the same reading between 0 and 100. Keep them in step until you hear your local station (we assume you are testing the set one evening, or when the local is on), and then adjust the tuning on the dials until you are full in tune. We should add that the variable-mu control should be turned full to the right for this, and the reaction knob to the left.

Probably you will overload the valves, and so the variable-mu volume-control should be turned to the left until the volume is at the right strength for comfortable listening. You are on the medium waves and should now try to get other stations on that band (between 0 and 100 on the tuning), getting the hang of the controls before any attempt is made to adjust for better selectivity if this is required.

Adjusting Selectivity

Reaction is applied in the usual way, by turning the reaction condenser knob to the right, and you should try your hand at getting some foreigners.

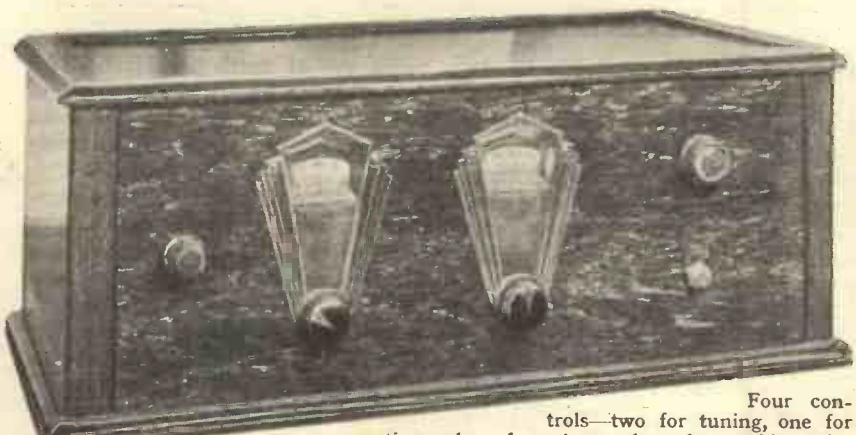
Next alter the setting of the pre-set condenser by unscrewing the knob, testing on your local or some other station for the change in selectivity that will occur. As you unscrew the condenser knob so will the tuning of the set get sharper, and though this will also have the effect of weakening the distant stations, this loss can be made up either on the variable-mu control or by the use of reaction.

Long Waves

Eventually you will find a setting that will give you the best selectivity for your particular conditions, and then it is time to try the set on the long waves.

To do this you do not have to operate any switches, just turn the tuning dials till they read between 100 and 200. This is a definite indication that you are now on the long waveband.

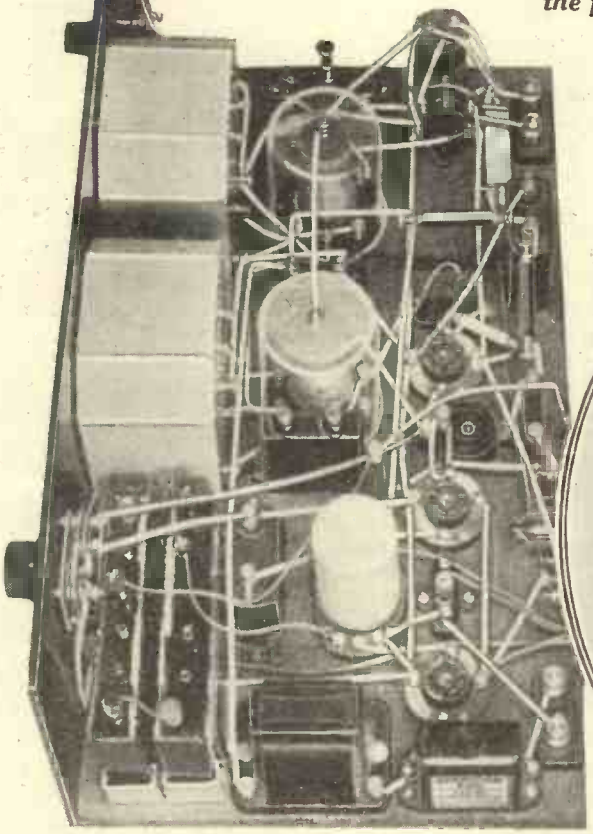
VARIABLE-MU FOR VARIED ENTERTAINMENT



Four controls—two for tuning, one for reaction and one for volume—but what a wide choice of programmes they offer you. And if the radio fare does not take your fancy you can change to turntable and pick-up for your entertainment.

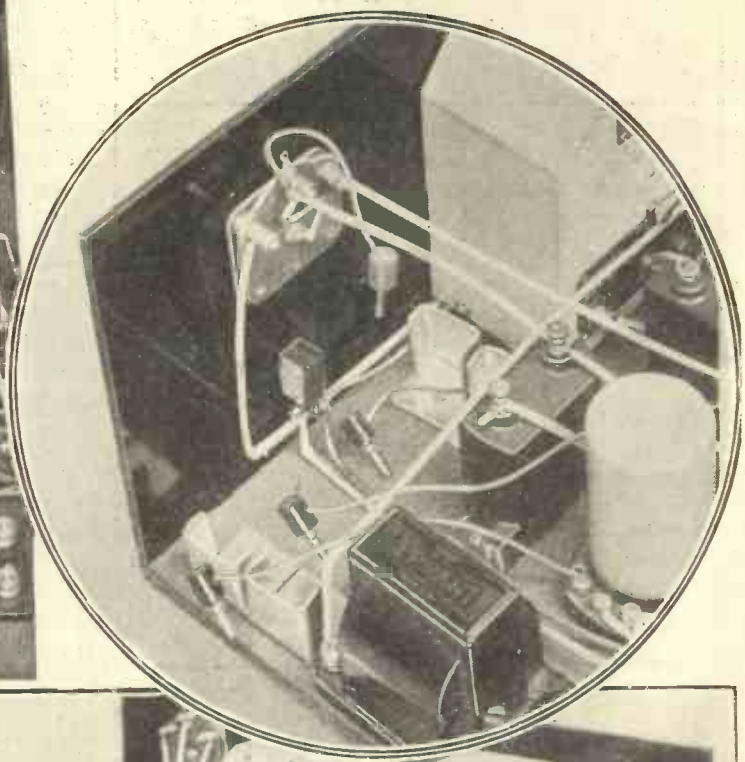
SEEING THE "SIGHTS" OF THE "VARI-FOUR"

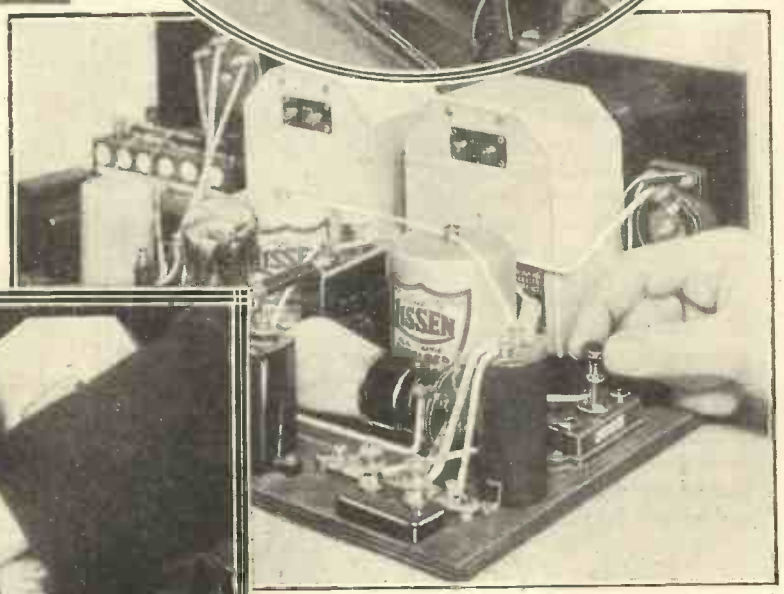
Showing some of the details of design and construction which mean so much where the final results are concerned.

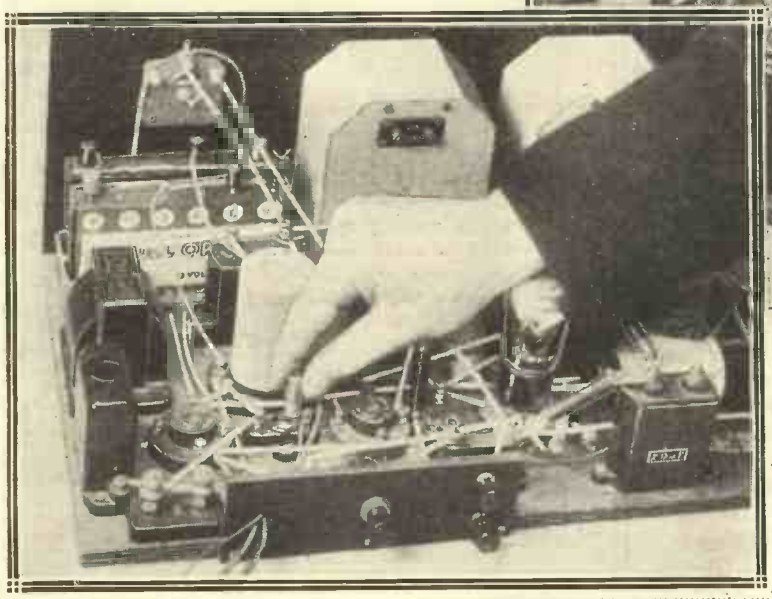


Seen as a whole it is the main features which strike one, but the small refinements, that are there for the looking, are really quite important and all do their share in making the receiver into a harmonious whole. A point which will immediately appeal to discerning constructors is the entire absence of complicating partition screening. The use of components comprehensively screened in themselves serves to endow this sensitive receiver with a degree of stability rarely found in sets built from unscreened components.

Metal clips placed side by side hold the grid-bias batteries for H.F. and L.F. stage. G.B.+ is the lead attached to the differential condenser.



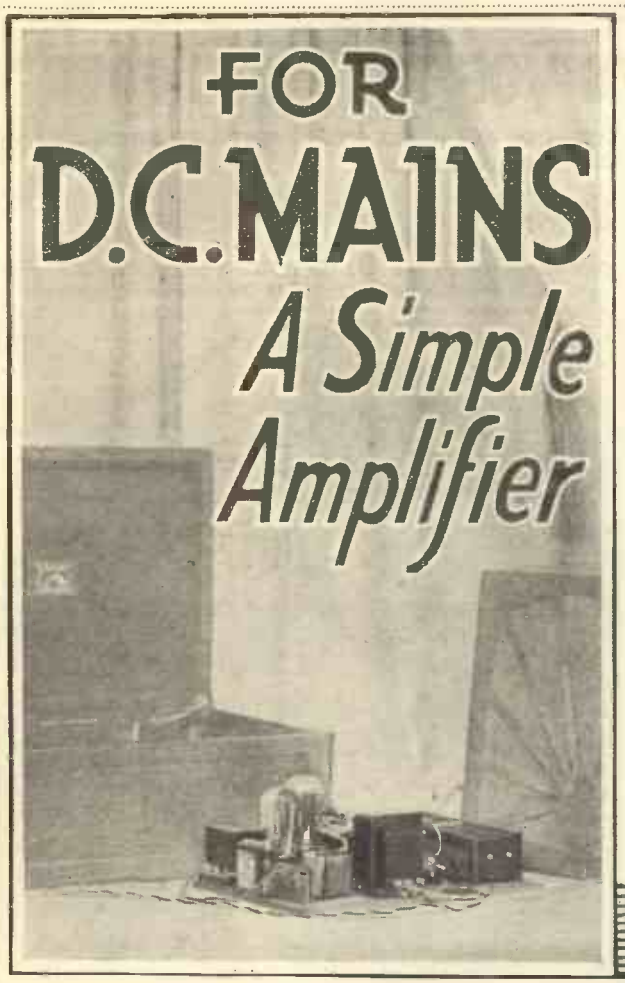




Above you see adjustment of the aerial series condenser being made. It has to be carried out only once, and adapts the set to varying sizes of aerial and selectivity requirements.

To the left is the fuse being put into place. It is screwed into its small holder and plays an important part as watchman for any mistakes made with H.T. connections.

FOR D.C. MAINS
A Simple Amplifier



BANISHES OVERLOADING WORRIES *and is* TROUBLE-FREE IN OPERATION

Just a few components mounted on a simple wooden baseboard and then wired up. There are no controls on it, so that it can be installed in the bottom of a gramophone cabinet or out of the way elsewhere.

Two indirectly-heated valves of the ·5 variety are employed, the output being a pentode valve, which has a tapped transformer for the purpose of matching up with any loudspeaker.

The construction is sufficiently straightforward to be made quite clear in the diagrams. In the circuit diagram, pick-up and mains switch connections are shown, and these will not be found in the wiring diagram. Their significance, however, is explained later.

The baseboard is 14 in. by 10 in., and the exact positions of the various parts can be worked out instantly with the aid of the scale. The two primary terminals of the pentode transformer are permanently wired up, but which two secondary terminals are employed depends upon the speaker used. They provide a wide choice of ratios, the various terminal combinations being explained in a leaflet given with the component.

Keep to the Valves Mentioned

Note the flex lead with a spade tag at its end, which is joined to the terminal on the side of the pentode valve. Keep to the 350-ohm and 600-ohm resistances, as these are for providing grid bias and are calculated to give the right voltages for the valves employed.

WE all like plenty of volume, so long as it does not involve distortion, although battery users have to be content with much less than those who have mains if their running expenses are to be kept within reasonable limits. But that is one of the ways in which the user of the mains scores.

It is nice to have an amplifier capable of handling a large output, even if only to be sure that there is no possibility of peaks causing overloading when working at moderate volume. But it is not possible to get more power, in the form of volume from the loudspeaker, than the power that is put into the last valve as H.T. Mains users, whether they have A.C. or D.C., have what is practically an unlimited supply of H.T. current at a very low cost.

Where voltage is concerned the D.C. supply is not flexible like A.C., for the voltage cannot be stepped up just as desired. That is why the amplifier described here is designed for mains around 200 volts.

Ideal for the Clubroom

We are not concerned with A.C. mains at all, a powerful amplifier for them being described in other pages of this section. What we are concerned with here is describing a powerful amplifier for D.C. mains.

It has an output of around 2½ watts of undistorted power—quite enough for dancing in the largest of rooms, and ideal, for instance, for use in that clubroom. It is suitable for radio or pick-up input.

Its simplicity is perhaps the most outstanding feature.

COMPOSED OF THESE COMPONENTS

SWITCH
1 on-off double-pole toggle switch (Bulgin type S.104).

CONDENSERS
3 2-mfd. (Dubilier type L.E.C., Ferranti, Telsen, Lissen, T.C.C., Igranic, Formo).
1 4-mfd. (Dubilier type L.E.C., or see above).
2 2-mfd. (Igranic type 700 D.C. test, or see above).
1 ·01-mfd. (Dubilier non-inductive, or see above).

BASEBOARD
14 in. × 10 in.

RESISTANCES
1 10,000-ohm (Graham Farish, Dubilier, Colvern).
1 mains resistance (Bulgin type M.R.1).
1 15,000-ohm (Graham Farish, Dubilier).
1 350-ohm (Graham Farish, Dubilier).
1 600-ohm (Graham Farish, Dubilier).

L.F. CHOKES
2 smoothing chokes (R.I., Dux, Ferranti, Varley, Bulgin, Formo, Heayberd, Telsen).

OUTPUT TRANSFORMER
1 output transformer (Varley D.P.32, Telsen, Ferranti).

VALVE HOLDERS
2 5-pin valve holders (Bulgin, Lissen, Telsen, W.B., Lotus, Benjamin, Graham Farish, Magnum).

L.F. COUPLER
1 transcoupler (Bulgin).

MISCELLANEOUS
1 terminal block (Sovereign, Belling & Lee).
2 terminals (Eelex, Clix, Bulgin, Belling & Lee, Igranic).
1 combined mains plug and fuses (Bulgin type F.15).
2 yds. of systoflex and 3 yds. of 18-gauge tinned copper wire.
2 spade soldering tags.

And now we can deal with the extra connections shown in the circuit diagram. These are not included on the wiring diagram because they are quite separate from the amplifier itself and may be wired some distance from it.

First of all, the leads from the mains are taken direct to a double-pole mains switch on the motor board. From the other side of this switch two sets of wires are taken, one direct to the electric motor for the turntable, and the other to the " socket-plug " for fitting to the mains adaptor and fuses on the amplifier's baseboard.

COMPLETE THE OUTFIT WITH THESE

Valves. Mazda D.C./H.L., D.C./Pen.
Pick-up. Marconiphone, Zonophone, Lissen, Celestion, Bulgin, Ready Radio, Cossor.
Gramophone Motor. Garrard Universal, or H.M.V. Playing Desk (which includes pick-up).
Loudspeaker. Baker's Selhurst, Marconiphone, G.E.C., Ferranti, Blue Spot, W.B., R. & A., Epoch, B.T.-H., Ormond, H.M.V., Igranic, Lanchester, Celestion, Clarke's Atlas.

This switch thus controls the whole outfit, but a start-and-stop switch is incorporated in both of the recommended motors for stopping the turntable by itself.

The volume-control has its outer terminals connected directly across the pick-up itself, and the two wires that go to the input terminals of the amplifier come from one of the outer terminals and from the slider of the potentiometer. The value of the volume-control will depend upon the pick-up, but 50,000 ohms will generally prove quite satisfactory.

When plugging in the adaptor on the amplifier, see that it is so inserted that the plus pin is in the socket which is also joined up to the positive of the motor.

Keep it the Right Way Round

If the plug which connects switch to mains is not inserted in the mains socket the right way round, the set will not work because the anodes will be made negative instead of positive.

But it is a simple matter to find out whether the plug is the wrong way round, because if it is, the set will be quite dead, whereas the right way round you will hear something, even if everything else is not quite as it should be. So if on plugging-in you get nothing, just reverse the plug.

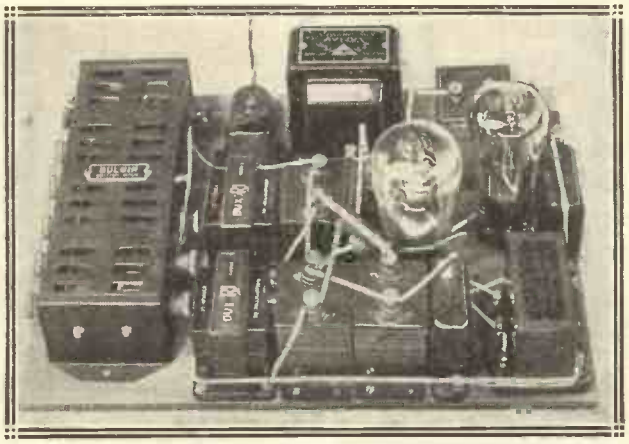
It is a good idea once you have found the right way, to mark the plug which goes into the mains so that it can always be put in the right way first time. The plug can be a 2-pin plug or bayonet adaptor plug, according to what mains point it has to be attached.

The connecting up of the mains resistance is quite easy. As you see from the wiring diagram, one wire goes to the terminal marked 2— because two valves are employed.

The other connection is via the flex lead with spade tag that is joined to the + terminal of the fuse and mains connector.

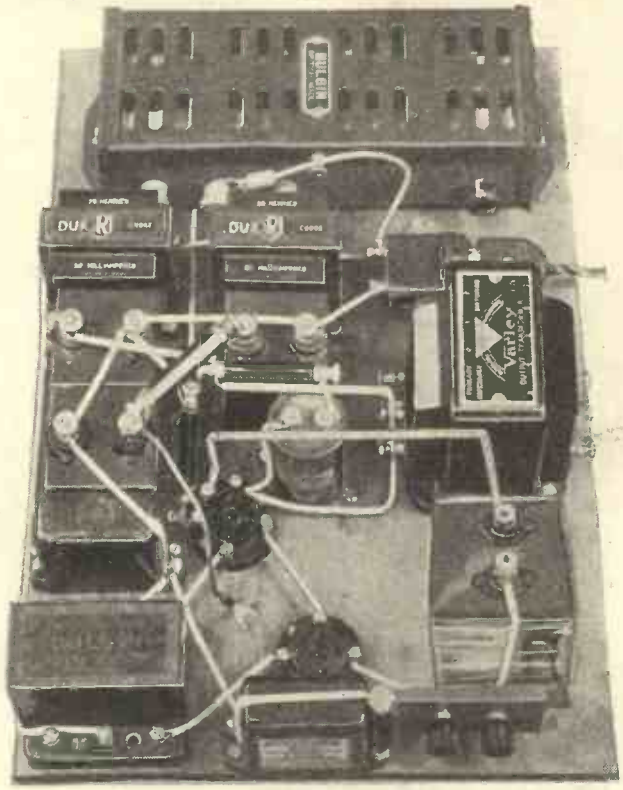
This tag is taken to one of the three terminals marked in mains voltages. Choose the terminal with the marking nearest to the voltage of your mains. The two black terminals are ignored.

ALL READY FOR YOUR MAINS



The pentode output valve is the larger one, to the left, and is connected up to a special tapped output transformer that enables correct matching up with the speaker to be obtained.

MOUNTED ON SIMPLE BASEBOARD



The straightforward construction will appeal to all, and makes the construction as simple as any amplifier could possibly be.

Can Follow a Battery Receiver

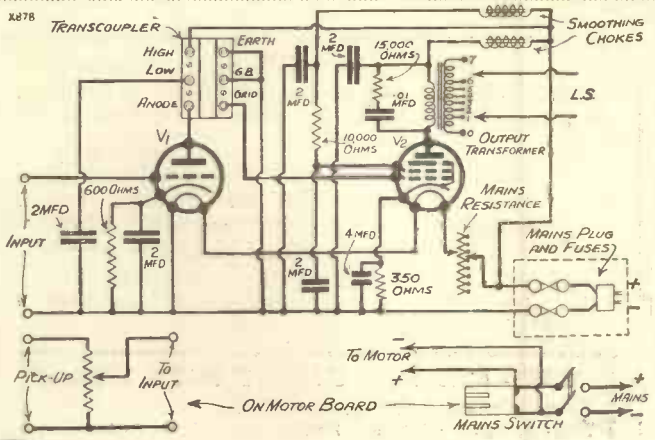
When using the amplifier for radio work it should follow the detector valve. The method of coupling set to amplifier being by means of an ordinary intervalve transformer or resistance capacity coupling device, the transformer secondary or the grid leak being wired across the input terminals.

With a grid leak, the end joined to the coupling condenser should go to the input terminal joined to the grid of the amplifier valve V_1. It is quite permissible for the amplifier to follow an ordinary battery-driven set.

Remembering the super-power which the amplifier is capable of providing, it will be appreciated that simplicity of construction, and also of operation, is a

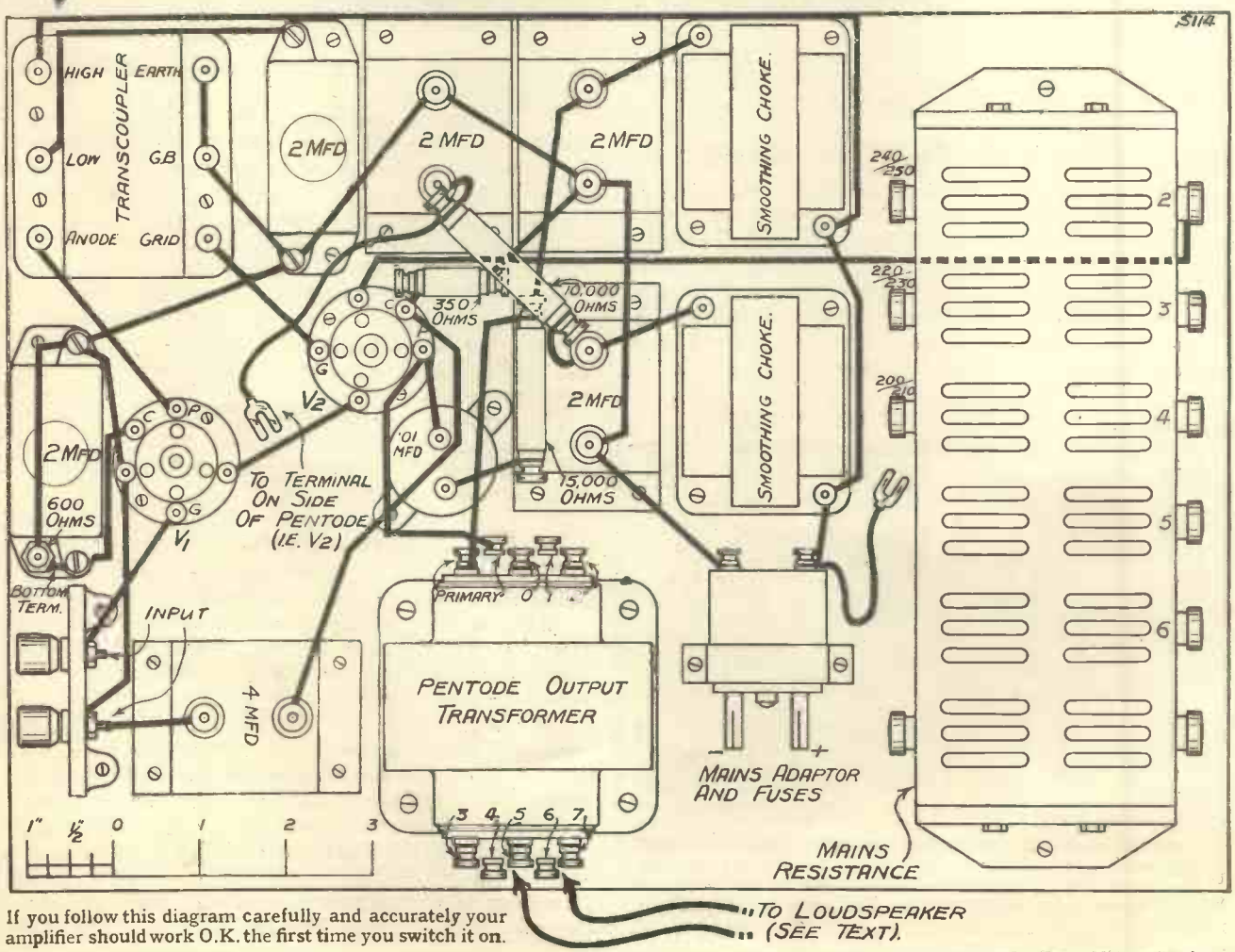
most outstanding feature in the design of this amplifier. And for this reason, it is necessary to guard against the impression that after all it is just an ordinary sort of amplifier, and not one with super power and first-class quality.

Choose components recommended, keep to the design as shown in the diagrams and photographs, and you will be assured of really fine reproduction.



From the above circuit you can see at a glance the features of the D.C. amplifier, while to the left you can see, also at a glance, how the circuit is made up in a simple practical form. Incidentally, the H.M.V. turntable outfit and this D.C. amplifier make an ideal pair.

WHEN WIRED WILL WORK WITHOUT WORRY



If you follow this diagram carefully and accurately your amplifier should work O.K. the first time you switch it on.

Getting the Whole World on the "WHOLE-WORLD" FIVE

Last month the construction of this set, which strikes a new line in set design, was described in detail. This month you are told how easy it is to operate.

By A. S. CLARK.

WELL, here we are, with two pages in which to talk about operating the "Whole-World" Five, which I described in last month's MODERN WIRELESS. And I think it's ample room, because, in spite of the set's nine controls, it's really very easy to tune. Here goes!

Dual Controls

It doesn't matter whether the cabinet is in position or not, although it is, perhaps, a little more convenient to try the set out before putting on its "shell." (It is then easier to get at the ganging wheels, valve holders and grid-bias plugs.)

To avoid any misunderstanding, and to save frequently writing "in a clockwise direction" or "in an anti-clockwise direction," I intend to write "turn left" or "turn to the right." "Turning left" is turning in an anti-clockwise direction.

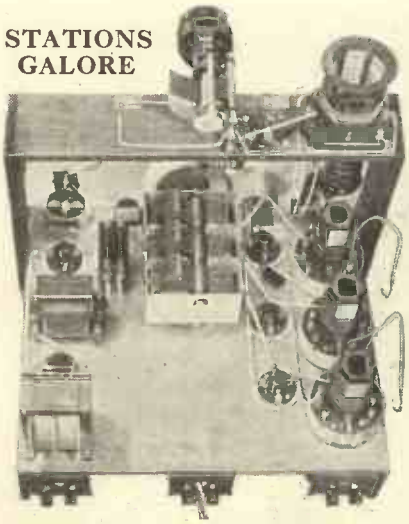
First of all, you want to get firmly fixed in your mind that there are two complete sets of tuning controls, one for short waves and the other for what is usually known as "broadcast" waves—long and short. An imaginary line drawn horizontally through the dial-viewing escutcheon of the gang-condenser will separate the two sets of controls nicely.

Above and Below

Those above are for short waves, and those below for "broadcast." When one lot is in use, the other is completely out of use, except for the on-off switch, the centre one of the three lower knobs. This always turns the set on and off, no matter whether it is set for short waves, medium waves, long waves, or record work; and you push it into switch-off.

The next item to consider is the "transformation" switch that transforms the set from a broadcast one to a short-waver. This is the upper left-hand one, and you turn it left for broadcast waves and right for short waves.

STATIONS GALORE



If you have never before had a thrill out of radio, you will get one when you first turn the controls of this receiver! The number of stations will stagger you.

At the same time as this change is made, it is necessary to change over the aerial lead from one aerial terminal to the other. The aerial terminal for broadcast waves is on the terminal block at the back of the receiver, and the short-wave one is on the left-hand side of the cabinet (or is terminal 1 on the short-wave coil when the cabinet is not in position).

Investigating Carriers

When you are on short waves everything is plain sailing. You have just two controls, the slow-motion condenser and the reaction condenser to the right of it.

The handling of these two controls is just the same as for any ordinary simple short-waver. You must remember to tune very carefully and slowly, and to keep the reaction so that the set is just—or nearly just—oscillating.

Everything that sounds like a station or carrier should be investigated intently. As soon as you have logged a few stations you will know where to look for various wavelengths.

Now, putting the transformation switch over to the left and the aerial on to the terminal at the back of the set, we can go down below for broadcast waves. Before getting down to their operation we will consider the radiogram switch.

Turning to Pick-Up

This is the bottom right-hand one, and is turned to the right for pick-up work and to the left for radio. This switch and also the transformation switch have central positions which are not used. So be careful to turn them *fully* in either direction.

Turning Round the Knobs and Tuning-in the Stations

When the radiogram switch is over to "gramophone," none of the controls, with the exception of the on-off switch, is operative. Even the volume-control will do nothing, for a separate volume-control should be mounted on the turntable board for the pick-up.

Normally, its value should not be less than 50,000 ohms, and it should be of the three-terminal or potentiometer type. The two terminals joined to the ends of the resistance (usually the outside ones) are joined across the pick-up, and leads are taken from the slider and one end—it does not matter which—of the resistance to the two pick-up terminals of the set.

Volume Control

And that leaves us with the five controls that perform the duty of bringing in literally dozens and dozens of foreign stations. Of these we have already dealt with the on-off switch, so that there are only the tuning, reaction, wavechange and volume-control knobs to cover.

The wavechange switch we turn to the right for long waves and in the opposite direction for medium. That finishes with that.

Then the volume-control—this is turned to the right to increase volume and to the left to reduce it. In a similar way the reaction condenser is turned to the right to increase reaction and to the left to reduce it.

An Easy Job

The tuning knob of the gang-condenser is a double one—that is to say, there are two concentric spindles, the outer one carrying the main knob and the inner one a smaller knob for making fine adjustments in the tuning setting. The tuning reaction and volume controls are used in just the same way whether the set is set for long- or medium-wave reception.

The small tuning knob adjusts the capacity of an extra condenser across the front section of the gang-condenser, namely, the section that tunes the detector circuit. It therefore enables one to adjust for the slight alterations in tuning produced by the use of reaction on this circuit.

We have first of all to balance up the trimmers on the side of the gang condenser, and this should be done on the medium waves. It is an extremely easy job because the wheels can be turned by the hand without any fear of their desired setting varying as the hand is removed.

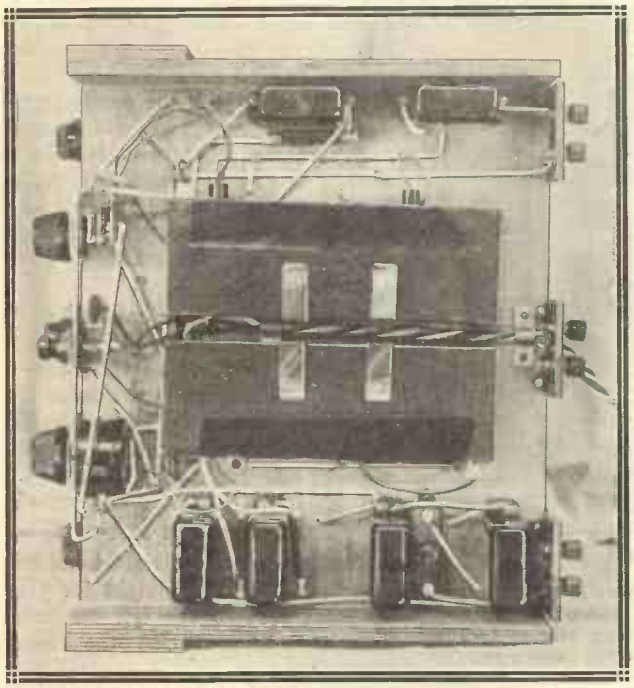
While doing this trimming, set the small tuning knob fully to the left, and also the reaction condenser. You should trim on weak stations, if you can find any that *are* weak! Otherwise you should reduce the volume of the station by means of the volume-control until its strength is low enough for the effect of the trimmers to be marked.

Full Sensitivity

As I warned you last month, after a certain point (maximum volume) the set may start oscillating when the volume-control is turned further to the right. The idea of this is to permit the H.F. valves to be brought up to full sensitivity and magnification, no matter what H.T. voltages are used, and whether they are lively valves or not.

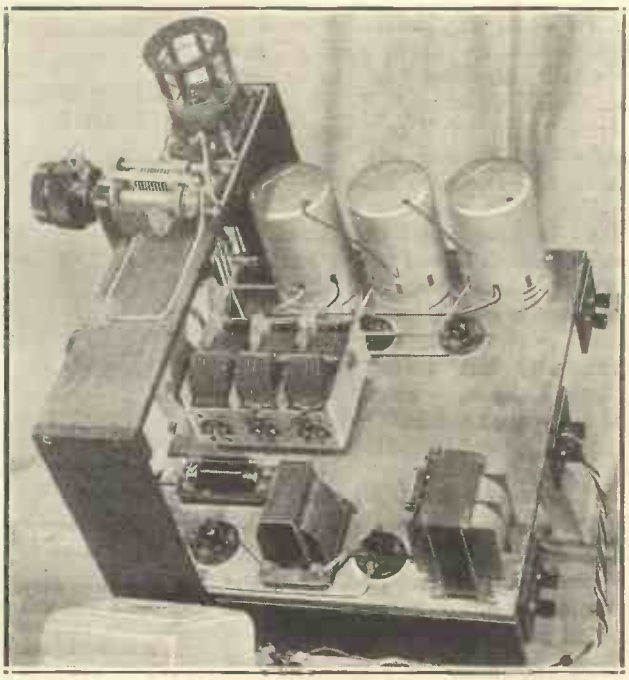
Work just a little below this oscillating point, assuming you do have to go as far as this to get enough volume on a certain station. If you want still more volume you can always get it by turning the reaction condenser to the right a little.

FOR BIG AERIALS

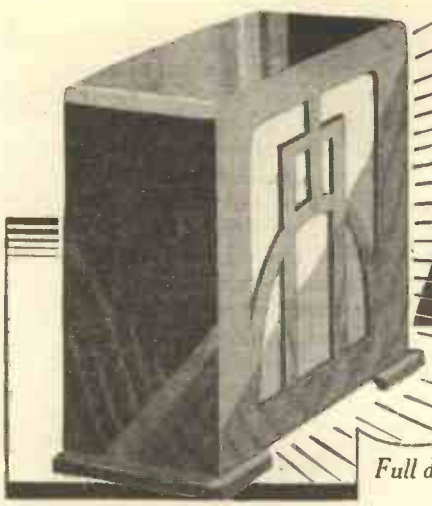


Underneath the baseboard is a small preset condenser. Normally this is screwed to maximum capacity, but if a very large aerial is used, reduce its capacity a little.

FOR SHORT-WAVE WORK



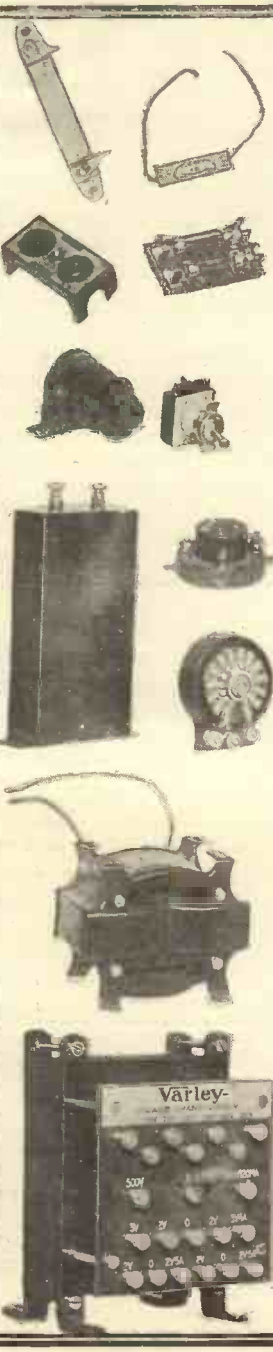
The components mounted on the shelf are for short-wave work, and their controls, therefore, do not have to be manipulated at all when working on "broadcast" waves.



A 6-WATT A.C. AMPLIFIER

By K. D. ROGERS.

Full details on getting 6,000 milliwatts of undistorted power for your loudspeaker.



AMONG the vast ranks of radio set constructors are to be found all sorts of tastes and requirements where designs of receivers are concerned. An obvious enough statement, but one that bears very closely on the matter we have in hand.

Some want sets that will give "comfortable room strength," whatever that may be, and others would like their radio outfit to shake the floor every time Henry Hall's drummer gives the skin a whack.

ALL ABOUT THE COMPONENTS

FIXED CONDENSERS
- 2 4-mfd. (T.C.C. type 800 volts working, Dubilier type L.S.C.).
- 1 6-mfd. (T.C.C. type 800 volts working, Dubilier type L.S.C.).
- 1 4-mfd. (Dubilier type B.B., T.C.C., Lissen, Igranic, Ferranti, Formo, Peto Scott, Goltone).
- 4 2-mfd. (Igranic "Nondu," or see above).
- 2 4-mfd. (Ferranti type C.6, T.C.C., Dubilier 1,000-volt type).
- 2 ·01-mfd. mica (Dubilier type B.775, T.C.C., Graham Farish).

RESISTANCES
- 1 50,000-ohm volume-control (Tunewell type V, Igranic, Watmel, Wearite, Colvern, Sovereign, Bulgin, R.I., Varley, Lewcos, Graham Farish).
- 1 50,000-ohm (Graham Farish Power Ohmite, Colvern).
- 1 15,000-ohm (Graham Farish Power Ohmite, Colvern).
- 1 30,000-ohm (Graham Farish Power Ohmite, Colvern).
- 1 40,000-ohm (Graham Farish Power Ohmite, Colvern).
- 1 500-ohm (Colvern Strip, Graham Farish Power Ohmite, Dubilier).
- 1 700-ohm C.T. (Colvern Strip).
- 1 5,000-ohm (Graham Farish Ohmite, Dubilier, Colvern).
- 2 3,000-ohm (Colvern Strip resistances).
- 3 ·25-meg. grid leaks with wire ends or terminals (Lissen, Dubilier, Ready Radio, Igranic, Graham Farish Ohmite, Goltone).
- 2 ·5-meg. grid leaks with wire ends (Lissen, or see above).

SWITCHES
- 1 double-pole toggle (Bulgin type S.104).
- 1 thermal delay (Bulgin type S.100, Varley E.P.17).

VALVE HOLDERS
- 4 5-pin (Lotus, Telsen, W.B., Igranic, Lissen, Clix, Bulgin, Benjamin, Wearite, Ready Radio).

L.F. CHOKES
- 2 (Heayberd type 752).

MAINS TRANSFORMER
- 1 (Varley type E.P.24).

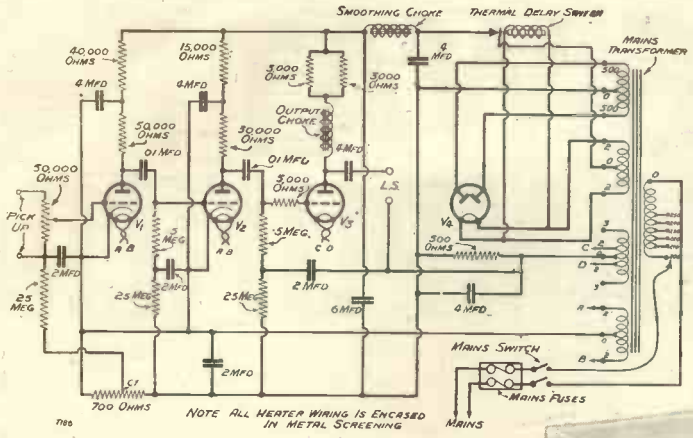
MAINS PLUG
- 1 (Goltone type L.S./31 & M.C./9, Bulgin).

FUSES
- 1 double (Belling & Lee, Twin Safety, Bulgin).

TERMINAL BLOCK
- 1 double (Belling & Lee, Sovereign, Goltone, Lissen, Bulgin).

TERMINALS
- 4 (Belling & Lee type B, Igranic, Bulgin, Eelex, Clix).

MISCELLANEOUS
- 1 terminal strip, 4× 2½ in.
- 1 yd. of flexible metallic twin tinned iron screened tubing (Goltone).
- 1 terminal (Clix, Bulgin, Belling & Lee, Igranic, Eelex, Goltone).
- 1 piece of brass strip, 5 × 1 × $\frac{1}{16}$ in. (for brackets).
- 2 brackets 1 × 1 × ½ in. (for transformer).
- 1 strip of ebonite, 2 × 9 in.
- 7 yds. of systoflex and 10 yds. of 18-gauge tinned copper wire (Goltone, Wearite).
- 1 baseboard, 18×12×$\frac{3}{8}$ in.
- Flex, screws, etc.



TWO STAGES IN DESIGN

To the left you see the amplifier in its theoretical form, the first stage of evolution.

a big output not necessarily because he wants a lot of noise, but because he wants a really good margin of safety from overloading.

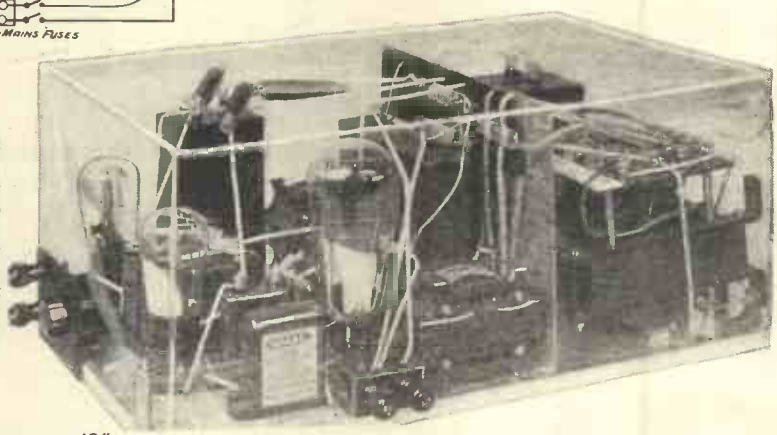
It is for this enthusiast that the 6-watt amplifier has been designed, though it will also be useful for the constructor who wishes to supply small halls or large rooms with dance music, or other programmes that require a big output.

It may seem that 6 watts is a large output to have just to cover the overloading contingency, but if a set is to be used for really good volume and you want to preclude the possibility of a sudden peak in the modulation of the broadcast programme, or the record that your pick-up is playing, overloading one or

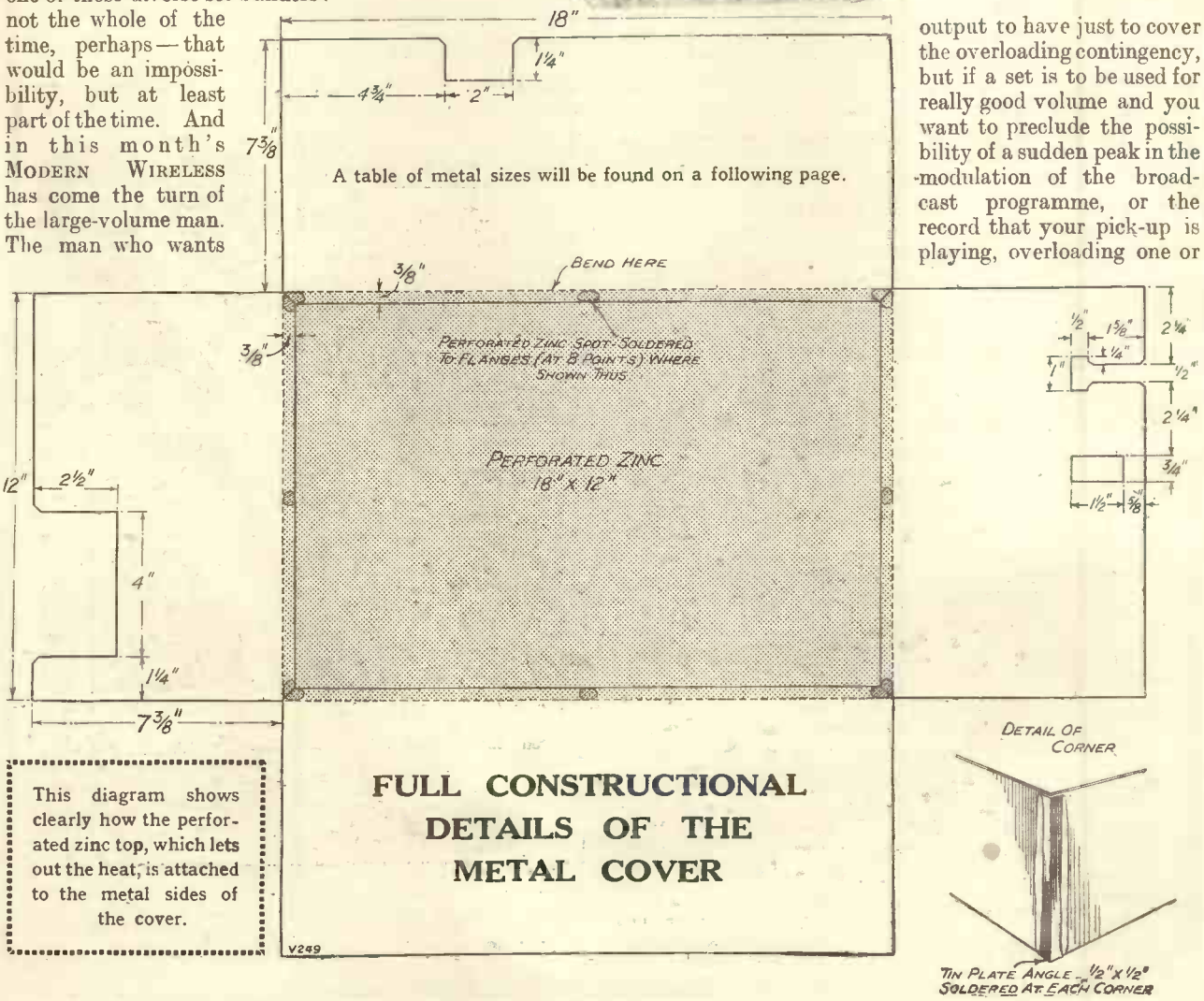
Some there are who are not particularly worried if a little distortion, due to overloading or other causes, creeps into their reproduction (yes, unfortunately, that is true), while others are aghast at the veriest tremor of the needle of the output milliammeter.

What We Aim At

It is our aim to please everyone of these diverse set builders: not the whole of the time, perhaps — that would be an impossibility, but at least part of the time. And in this month's MODERN WIRELESS has come the turn of the large-volume man. The man who wants



On the right is the final stage. The design has taken a practical shape and is shown with a ghost cover for illustrative purposes.



This diagram shows clearly how the perforated zinc top, which lets out the heat, is attached to the metal sides of the cover.

FULL CONSTRUCTIONAL DETAILS OF THE METAL COVER

V249

H.T., L.T. and G.B. from A.C. Supply

other of the valves, you must have a surprisingly wide margin of safety.

It is this factor of safety that the amplifier we are to describe has been designed to provide, whether it is used as an addition to a radio receiver for broadcast reproduction, or whether it is to be employed only for gramophone music.

ALL THE ACCESSORIES

Valves.
1 Mullard 354V.
1 Mullard 164V.
1 Mazda P.P.5/400, Mullard D.O.24, Marconi P.X.25, Osram P.X.25.
1 Marconi U.14, Osram U.14.

Loudspeaker. Marconiphone, Baker's Selhurst, G.E.C., Ferranti, Blue Spot, W.B., R. & A., Epoch, B.T.-H., H.M.V., Ormond, Igranic, Lanchester, Clarke's Atlas, Celestion.

Gramophone Pick-up. Radiophone, B.T.-H., Marconiphone, Celestion, Igranic, Zonophone, Cossor, Bulgin.

Gramophone Motor. Garrard Universal, or H.M.V. Playing Desk incorporating pick-up.

The amplifier is quite "straight" in its design, and it has been made of such dimensions that it will go in the loudspeaker section of most radiogram cabinets. No push-pull or even transformer coupling is employed, all the stages being resistance capacity coupled.

It is completely self-contained, and is enclosed by a metal cover so that it is quite safe in use, the cover being unremovable until the power plug is taken out and the mains thereby disconnected from the amplifier.

Three Low-Frequency Stages

Three stages of low-frequency amplification are used, the stages being of comparatively low gain, while the overall amplification is ample for the most insensitive pick-up. With most pick-ups it will therefore be unlikely that the volume-control can be "fully increased," so there is plenty of margin.

The output valve is one of the high mutual-conductance types, such as the P.P.5/400 or the D.O.24, and the bias and other resistances throughout the instrument have been fixed for specific valves, from which it is not advisable to diverge unless you are prepared to work out the necessary alterations in resistances so that the correct bias and H.T. voltage on the valves shall be obtained.

This is most important, of course, for the voltage adjustment of an amplifier taking 400 volts on the last valve's anode must be accurately carried out. The valves chosen for the first two stages are the Mullard 354V. and the 164V., both indirectly-heated cathode types; while the output valve is the P.P.5/400.

Should the *output* valve be changed to one of the alternatives given, only the bias resistance will require alteration as the anode potential and current required are the same in all cases.

Cathodes at Earth Potential

It will be noted that the bias for the first two valves is obtained by means of common resistances, a tap being taken between them, but so arranged that one half of the resistance carries the anode currents of both valves, while the second half carries only the current of the second.

This arrangement of grid bias allows the cathodes of the valves to be at "earth" potential, and thus reduces the possibility of hum. As a matter of fact, the lack of hum, even with the amplifier all out, is very gratifying.

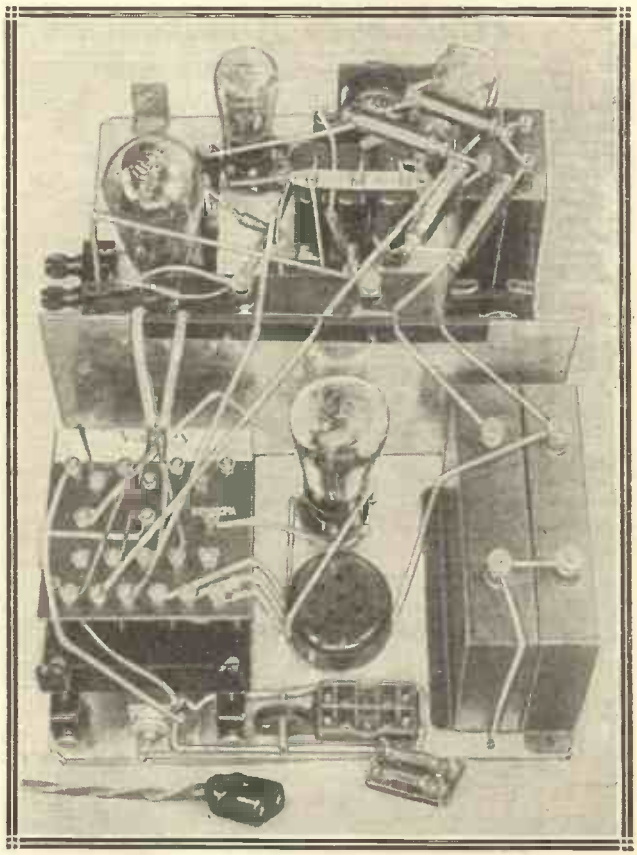
The last valve is as we have said, of the high mutual-conductance type, and, as such, care has to be taken that it cannot give rise to self-oscillation. To prevent any likelihood of this, a series resistance is placed in the grid lead, though this resistance must not be of too high a value. The 5,000 ohms chosen is just about right, and this value should not be exceeded.

Action of Thermal Switch

The resistance in the anode circuit of the last valve (there are actually two resistances in parallel, to reduce the wattage handled by each) is required to cut down the voltage to the right value, which must not exceed 400.

Naturally, when the amplifier is first switched on the voltage supplied by the rectifier is greatly in excess of that figure, for no load is imposed while the heaters of the valves are warming the cathodes. To allow the H.T. circuit to be complete to the valves during this time would court disaster, unless all the condensers that come between H.T. and earth (and this includes the grid-coupling condensers) were of very high-voltage type.

FROM THE MAINS END



So that the H.T. supply is not turned on before the valves have had a chance to warm up—an undesirable state of affairs—a special thermal type delayed switch is incorporated. It can be seen immediately in front of the rectifier valve.

Naturally, this would increase the expense of the instrument, and so a thermal delay switch is included in the H.T. circuit, which delays the making of the H.T. circuit until such time as the cathodes of the valves have had time to warm up The filament of the last valve takes the largest anode current, and therefore acts as the main stabiliser of anode voltage.

The thermal delay switch is a metal gadget which is heated by an amp. of current from the heater circuit of the set. This metal, which is in a strip, gradually becomes hot, and when it reaches a certain temperature it springs up, making contact with a switch point in the component.

METAL MEASUREMENTS

1 piece of 24-gauge tinned sheet iron, 18 in. × 12 in.
1 piece of 24-gauge tinned sheet iron, 7½ in. × 12 in.
2 pieces of 24-gauge tinned sheet iron, 18 in. × 7¾ in.
2 pieces of 24-gauge tinned sheet iron, 12 in. × 7¾ in.
4 pieces of 24-gauge tinned sheet iron, 7⅜ in. × 1 in.
1 piece of perforated zinc, 20-gauge, 18 in. × 12 in.

Through the metal strip and the contact flow the H.T. current, so that until the strip is sufficiently warmed there is no complete circuit for H.T., and thus the voltage on the condensers cannot build up. The time taken is roughly 25 seconds, which is sufficient time to allow the heaters to have warmed the cathodes of the valves, so that as soon as the H.T. circuit is made by the strip a full drain of current is applied, and the voltage merely becomes the normal voltage of the amplifier in action.

Consequently, when the amplifier is switched on there is no sound while the cathodes are warming up, but after a period of 25 seconds or so there is a click from the delay switch, a thud in the speaker, and everything is full steam ahead.

The actual construction of the unit looks difficult, but it is not nearly so tricky as it appears. It has been designed so as to be perfectly safe in use, it is covered by a metal cover which cannot be removed without the mains connection being taken out, so that there is no danger of shock from the somewhat high voltage employed. The amplifier can be used without the case if desired, but such a move would be very foolish, and is most strongly deprecated.

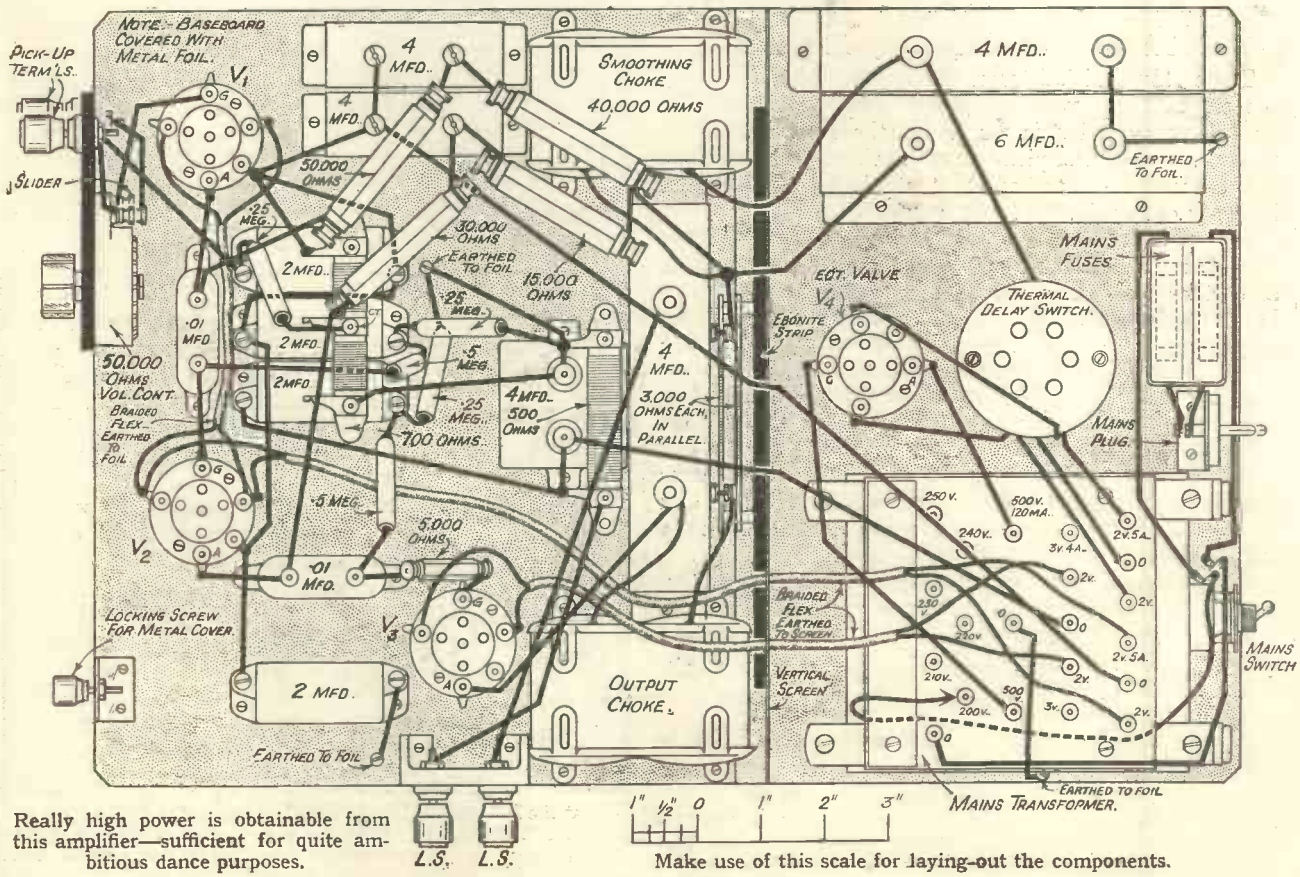
About the Fuses

Fuses are incorporated between the input switch and the rest of the instrument so that the mains are perfectly protected should any breakdown occur in the unit, though if the components specified are employed there will be no danger of this occurring.

In an amplifier of this description there can be very few alternative components listed in our collection of parts, and we strongly advise that alternatives that do not appear should be left well alone unless absolute certainty is felt of their suitability.

The whole outfit is mounted on a sheet iron covered baseboard, and a tinned iron screen 12 in. × 7½ in. (with ½ in. turnover for foot) is placed between the rectifier portion and the rest of the instrument. This is done not so much as a shield against L.F. induction as to prevent the top of the metal cover being pressed down

Concerted Components Give Concert-Hall Quality



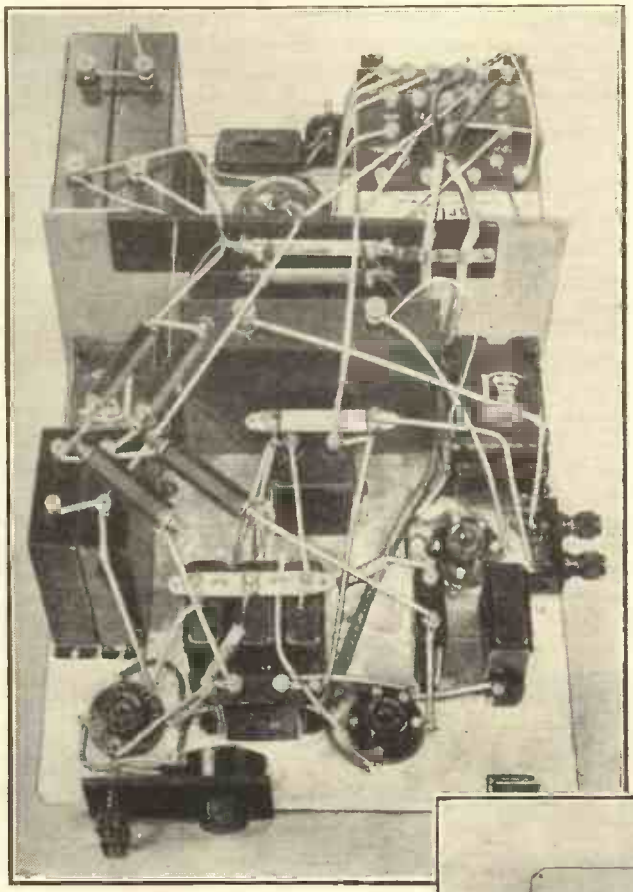
Really high power is obtainable from this amplifier—sufficient for quite ambitious dance purposes.

Make use of this scale for laying-out the components.

Ample Milliamps. at Five Hundred Volts

on to the works should a heavy object be placed on it. The metal screen acts therefore as a strong support, and as a piece of ebonite is used on this screen to take the wires passing over it, it acts, too, as a useful internal support. But that piece of ebonite is essential. Do not run the wires with their systoflex covering over the metal part of the screen, for the wires carry high voltages, and systoflex breaks down comparatively easily at high voltage. Therefore, running it in contact with the metal screen, or

THE OTHER SIDE OF THE "FENCE"



These two photographs have been specially taken to aid you in the construction of the amplifier. You will find them particularly useful when wiring.

with other wires, would very likely result in a breakdown.

The transformer is placed on its side so as to allow easy access to the terminals. It is fixed perfectly rigidly on two metal brackets, which should be so cut and bent that they allow the ends of the feet of the transformer to rest on the metal baseboard covering, while for added rigidity a couple of pieces of ebonite are placed between the body of the transformer and the baseboard.

The two parallel resistances in the anode circuit of the output valve are screwed to the ebonite strip on the vertical screen, where they can be conveniently wired up.

An earthing terminal is supplied on the metal cover, and this automatically makes contact with the metal base and the cover—when screwed down. It is fixed by means of a nut soldered to the metal bracket screwed to the baseboard. The terminal shank then screws into the nut, and when the cover is on clamps this to the bracket quite effectually. This earth terminal is connected direct to earth.

The mains transformer is connected according to the voltage of the mains in the usual way, and then with the valves in position the cover is screwed on and the earth terminal is connected as mentioned above.

Next, insert the mains plug, connect the pick-up to the input terminals, connect the speaker to the output terminals, and everything is ready. Do not forget that you will get up to 6 or 6·5 watts of undistorted output, so see that the speaker used is capable of handling the required wattage, if you intend to let the amplifier "all out."

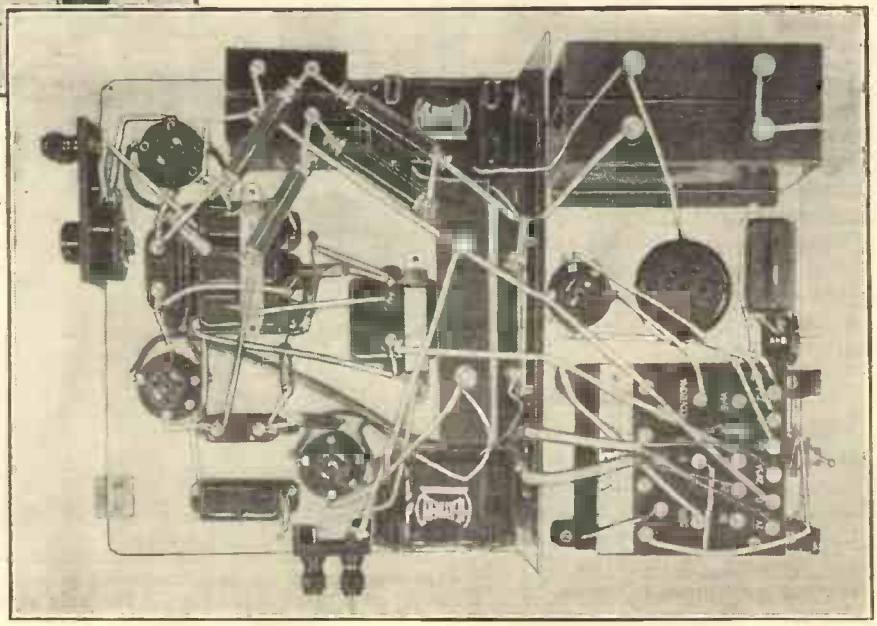
Using After Radio Receiver

If it is desired to use the amplifier with a radio set as distinct from a pick-up, the coupling between the set (the amplifier should follow the detector stage, of course) should be either transformer, or preferably resistance.

There are alternative output valves which could be used with little alteration except in the bias resistance. The anode currents are roughly the same, and therefore the voltage would be pretty constant. Such valves as the Mullard D.O.24, which requires a bias resistance of 540 ohms, and the Marconi and Osram P.X.25, which need 530 ohms, could be used.

It is essential that the speaker be well matched with the output valve if the full value of the amplifier is to be obtained, and though we have employed a choke output scheme, it must not be forgotten that the transformer on the speaker should be of suitable impedance and ratio.

WHAT'S WHAT FOR 6-WATTS



OPERATING THE "DIODION" SUPER-SEVEN

This fine superhet receiver, which was fully described in last month's "Modern Wireless," is very easy to operate, as you will agree after reading this article.

LAST month we gave details for the construction of the "Diodion" superhet receiver, but had insufficient space for the few remarks necessary as guide to the operating of the set.

Condenser Considerations

This is very easy indeed, but first we would like to clear up some misunderstanding that may occur concerning the variable condenser used for the oscillator tuning. This can either be a Polar Aperture condenser, or a Polar No. 4 with separate disc drive and the Aperture type escutcheon. In the case of the former the drilling diagram of the panel will not be strictly accurate, for the control knob of the condenser will come a little above the place shown, which is marked for using the No. 4 condenser, with which the panel balance is perfectly maintained.

It is important that the Aperture type *escutcheon* be used, however, as the normal escutcheon supplied with the No. 4 condenser does not match that used by the Uniknob condenser employed for the main tuning of the set. Therefore Messrs. Wingrove and Rogers have expressed their willingness to supply the Aperture escutcheon to those who want it with the No. 4 condenser and disc drive.

Tuning Trimming

The H.T. voltage taps were given last month, and it remains to discuss small points of operation here. The first thing to do is to gang the Uniknob condenser by means of the one trimmer provided on it. Only this one is required, of course, because the other section of the condenser has a trimmer controllable from the panel, and this is the section that is connected to the aerial tuning inductance.

To trim the condenser it is only necessary to place this control at minimum, and then to tune in a station and adjust for maximum strength with the trimmer. A weak station should be chosen, if possible, and the trimming should be done with care. Thereafter should the trimming go out either up or down the wavelength scale, the separate trimmer operated from the panel (the inside of the two concentric condenser knobs) will enable perfect tuning to be obtained. The internal trimming is best carried out on the medium waveband.

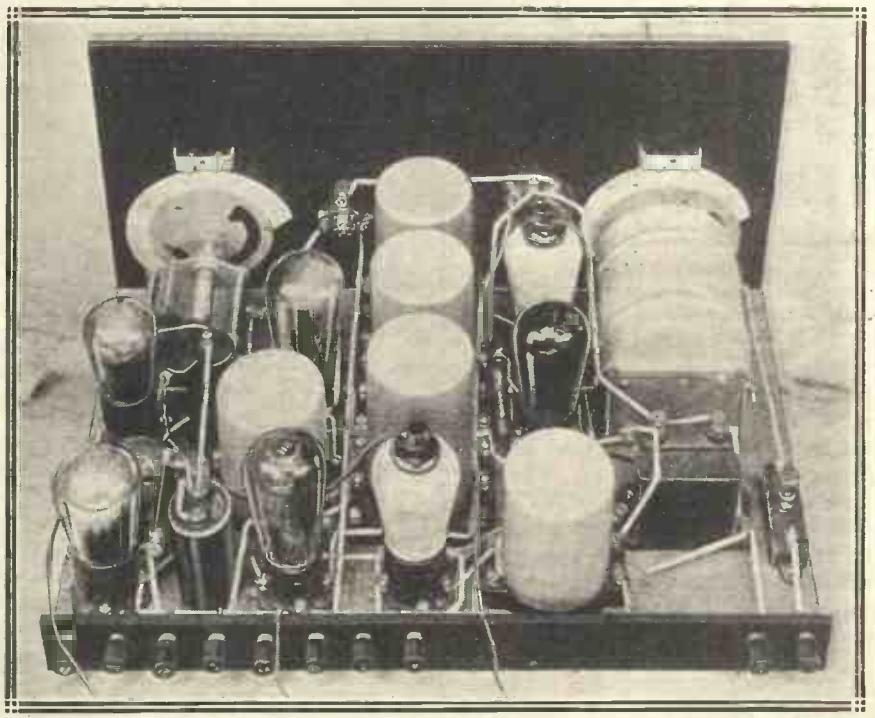
As a check-up of the valves the following may be useful. They are placed as follows in the various valve holders shown in the wiring diagram: V_1, variable-mu valve; V_2, H.L.2 type; V_3, H. type (oscillator) valve; V_4, variable-mu valve; V_5, H.L. type; V_6, H.L. type; V_7, output valve.

Bias Batteries

The bias applied to the variable-mu valves should be 16 volts, and that to the output valve will depend on the type chosen and the H.T. employed. The first L.F. stage is automatically biassed.

As regards tuning, this should be done very slowly, and it will be found that, while the Uniknob condenser control is sharp, that of the oscillator condenser will be very much sharper.

ONLY ONE WHEEL TO "WANGLE"



The trimming of the gang condenser is particularly easy as there is but one adjusting wheel on it that has to be set. The only other adjustment behind the panel is for the series aerial condenser, which, once set, can be forgotten.

QUESTIONS ANSWERED

Shunt-Feeding

W. D. (Chesterfield).—"I have in my set one of the older types of L.F. transformer, and, in view of the strides made in this direction in the last few years, I am wondering whether I could improve my results by parallel-feeding.

"Do you think that this would be an advantage?"

The answer to your question depends upon the design of your transformer. Suppose, for example, the particular core used tends to saturate at low anode current values, then parallel-feeding in this case would definitely improve the results.

Generally speaking, parallel-feed should be used if the primary inductance drops to a marked degree when the transformer is connected directly in the anode circuit in the normal manner.

Perhaps, in your case, the primary turns are few in number, thus giving a low primary inductance. This inductance value may be too low to provide an adequate bass response even with no D.C. anode current passing through the winding. Hence, parallel-feeding is of little advantage.

However, it can be said fairly safely that if the physical dimensions of the transformer are small, improved results are obtained when the steady anode current is deflected from the primary winding by a resistance-condenser feed.

A Moving-Coil Query

T. L. (Faversham).—"I am about to purchase a moving-coil loudspeaker of the permanent magnet type, and am rather hazy about the connections to my set.

"I am told that it is necessary to use an output transformer of suitable ratio with all moving coils, and I notice that the make I am keen on already incorporates an input transformer which is mounted on the chassis frame.

"Do I have to employ another transformer in the set?"

This is an easy one to solve. If the leads from the set to the speaker are to be reasonably short, as they will be if you intend to use the speaker in the same room as the set, just join the L.S. terminals on the receiver to two of the terminals on the loudspeaker input transformer.

You will probably find that this transformer has four terminals to which connection may be made. One of them is common, while connection to one of the remaining three will provide ratios suitable for power, super-power and pentode valves.

For instance, if your output valve is a super-power, you should wire up your leads to the two terminals on the input transformer which give the required ratio. The maker's instructions regarding this point should be followed carefully.

If you do not intend to use the loudspeaker in the same room as the set, your best plan is to equip the set with an output filter consisting of a 20-henry choke and 2-mfd. condenser. This will keep the steady anode current out of the loudspeaker leads.

L.F. Whistles

D. R. (Okehampton).—"I have just fitted an output filter to my det. and 2 L.F. receiver, and, much to my surprise, the inclusion of the filter has made the set unstable. With the filter in circuit, the receiver whistles continuously, but directly the choke and condenser are removed it behaves quite normally.

"Is there anything I can do to remedy the trouble, because I do not wish to scrap the filter scheme?"

The trouble is probably due to your layout. Try the filter choke in another position, and also note the effect of reversing the leads to the secondary of the L.F. transformer.

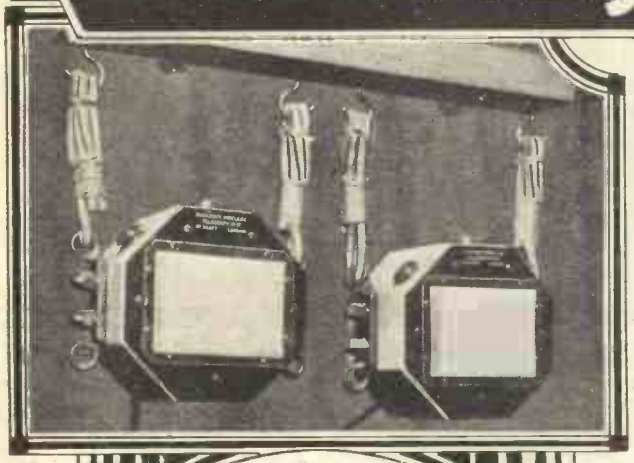
But usually it is the cramping of the components, or altering the layout to permit the insertion of the filter choke and condenser, that causes troubles of this nature. When possible the cores of transformers and chokes should be joined to earth.

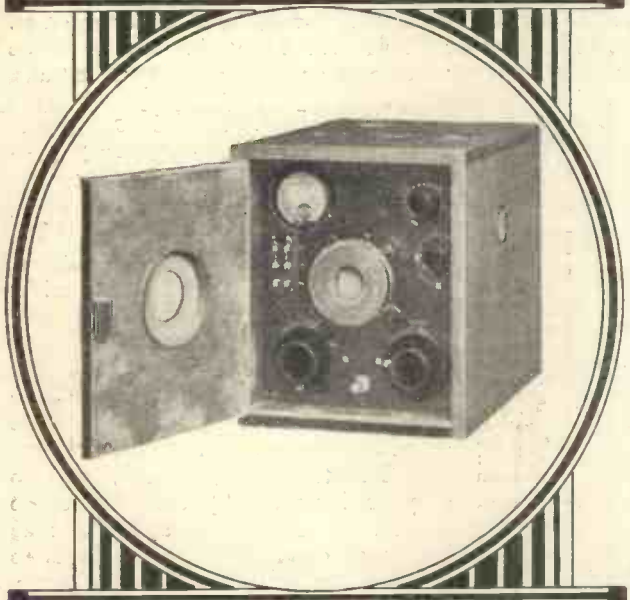
Aerial Insulation

R. S. (Wigan).—"My present aerial has one porcelain insulator at each end of the horizontal span. If I were to add an extra insulator at both ends, would this improve reception?"

Very unlikely, R. S. One insulator is sufficient for normal purposes. It is true that extra insulators would reduce leakage, but so far as receiving aerials are concerned, one good insulator at each end is enough. In transmission, of course, it is different, and the question of insulation has to be gone into carefully.

FROM "MIKE"





How do the listening-rooms work? What kinds of microphones are used? What are "A," "B," "C" and "D" amplifiers? How are the programmes controlled? These leading questions are answered by a B.B.C. expert, who deals with the sequence of broadcasting from the microphone, through the amplifiers, to the aerial!

WHEN I am describing B.B.C. apparatus to enthusiasts I am often asked questions like this: "Well, what *are* these A, B, C and D amplifiers?" "What microphones are used?" "How do the listening-rooms work?"

This shows that many interested listeners don't know the B.B.C. sequence from "mike" to aerial. I want to describe this to you, starting with the little listening-rooms at the side of each studio.

There is a listening-room adjacent to each studio, with a double window through which the studio can be seen. Loudspeaker units are provided in each of these rooms, which are acoustically treated to be suitable for high-quality loudspeaker reproduction.

Low Volume Levels

The speaker units are self-contained, and consist of a two-stage mains-driven amplifier, and a speaker housed in a box baffle.

The use of amplifiers at all speaker points enables the programmes to be fed round the building at low volume levels, and in this way avoids the possibility of cross-talk on to microphone circuits, which might occur if the speakers were fed from some central point at high volume levels.

These amplifiers have resistance-capacity interstage coupling, and an undistorted speech output of 1 watt.

By the use of a speaker in the listening-room adjacent to, but sound-proof from, the studio, it is possible for those responsible to hear the transmission in just the same way as it is being heard by the public, while the performers themselves can be seen through the listening-room window.

In recent years the B.B.C. has used the carbon type microphone, but a change is now gradually being made to the condenser type. Provision is made in each studio so that either type of microphone can be used at will.

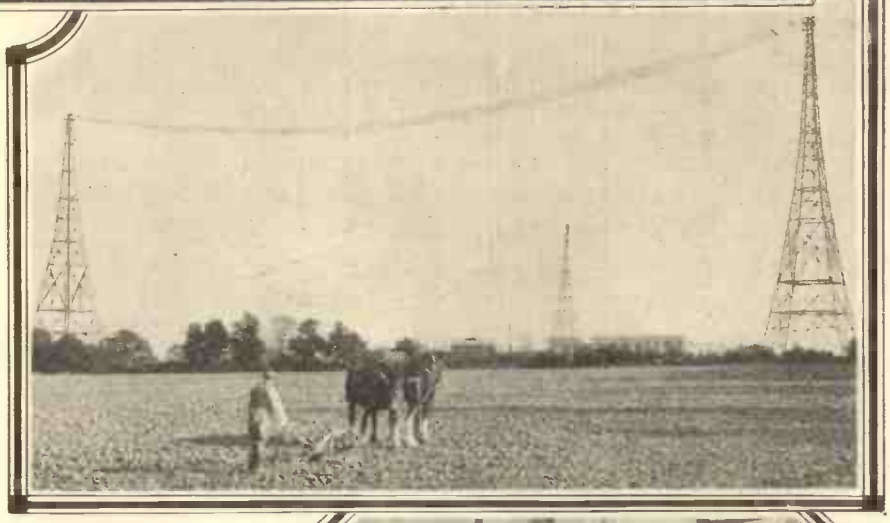
Current for Microphone Amplifiers

The condenser microphone embodies a single-stage microphone amplifier, as part of the microphone unit, but no amplification for carbon type microphones is necessary until the output reaches the control-room.

Microphone plugs, of the multi-pin type, are installed in each studio so that H.T. and L.T. can be provided for the condenser microphone amplifiers, in addition to the contacts for the output leads.

The Reisz carbon microphones in our top picture have long been standard B.B.C. equipment, but are now being replaced by the condenser "mike" below them. We wonder what the announcer occupant of the studio control box at the left thinks of the change.

TO AERIAL



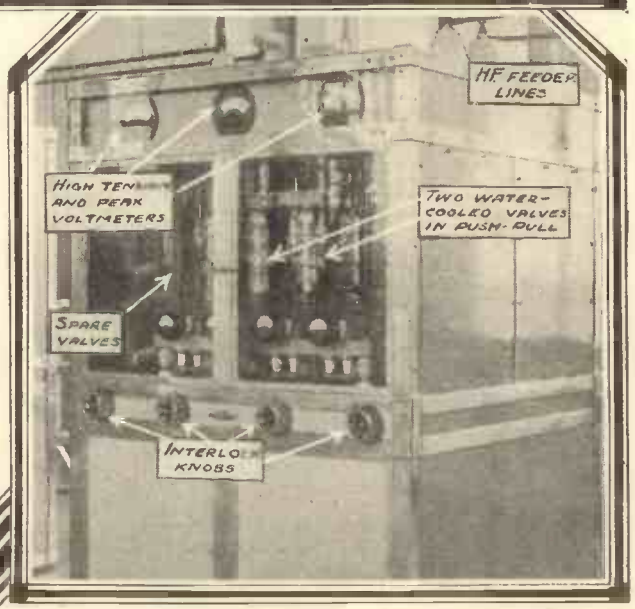
A number of microphone plug-points are installed in all the large studios, and the output of each microphone is fed to a microphone mixing unit in the listening-room adjacent to the studio. Thus the output of a number of microphones can be mixed in the studio listening-room, and the combined output is passed on a single pair of wires to the input of the first or "A" amplifier in the control-room.

This arrangement facilitates the balancing of transmissions, and to some extent it obviates the need to move artistes about during the performance in which the items are of a varying character.

The control-room equipment consists essentially of all amplifiers and auxiliary equipment required in the chain of transmission between any studio (or outside broadcast point) and the S.B. lines feeding the transmitters. It also contains the necessary control positions or desks from which any studio can be brought into circuit and the outgoing transmission can be checked.

Types of Amplifiers

Dealing with the chain of transmission followed by a programme, we find that there are three amplifiers: a microphone or "A" amplifier, a variable gain or "B" amplifier, and a land-line or "C" amplifier. Describing



Engineers with musical qualifications control the Queen's Hall amplifiers, but we imagine only a "whole-time" radio expert could handle the transmitter amplifier unit in our centre picture. Agriculture and radio may be a queer composition, but the scene at the top shows them mixing well, at Brookmans Park.

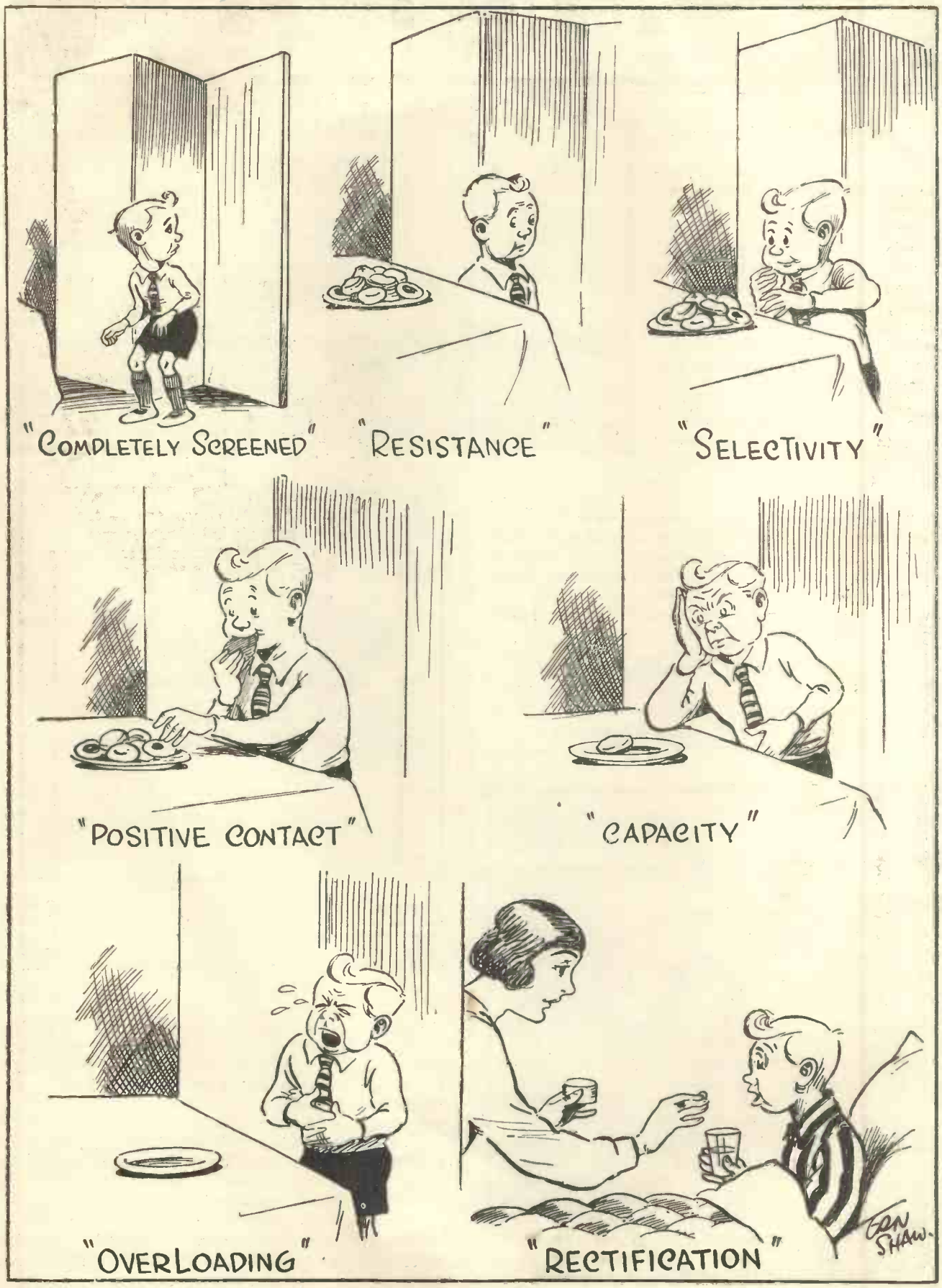
these amplifiers in order, the microphone ("A" amplifier) is of the three-stage type, resistance-capacity coupled, but with its input and output fed through transformers.

The last stage consists of two valves with grids connected in parallel and separate anode circuits, so that the output of the "A" amplifier can be split and fed to an echo-room amplifier if artificial echo is required.

These "A" amplifiers have a maximum gain of 50 decibels, and a working gain of approximately 40 decibels. The amplifier gain is made variable by a 10-stud potentiometer, each stud representing an increase in gain of 4 decibels. There are thirty-one "A" amplifiers (of which three are normally held as spares). They are mounted in

(*Continued on page* 94)

ILLUSTRATED TECHNICAL TERMS



The WORLD'S PROGRAMMES

HOW, WHEN AND WHERE TO HEAR THOSE FOREIGNERS—

TRY IT DURING YOUR LUNCH HOUR! A steelworker on a New York skyscraper takes a midday snooze 800 feet above the ground, soothed by the music from a portable set.

CONTENTS OF THIS SPECIAL SUPPLEMENT

ON THE LONG WAVES

An interesting summary of the latest conditions between 1,000 and 2,000 metres, with notes on the stations, including "mystery" transmissions near the bottom of the dial.

OWING to the vagaries of the Russian stations, the "lower end of the long waves" has recently been getting special attention, and proved to be unusually interesting during the past few weeks. Leningrad has been testing a new transmitter on about 835 metres, and when tuning on 1,000 metres in the hope of catching something interesting, on several occasions two transmissions were heard to the accompaniment of one another.

Can any reader definitely identify either of these newcomers as Moscow?

* * *

A little higher up the long-wave dial, Oslo has been in great form again. Why this station should sometimes get comparatively weak is a mystery, for on his good days—and they have been nearly all good days, of late—he is a magnificent programme, and even in daylight can give a good account of himself at this season of the year.

* * *

To hear Oslo day after day at good volume, and then to reflect that sometimes he is quite difficult to pick up, is enough to discourage the most ardent investigator of reception conditions, for there seems no rhyme or reason in the see-saws of which Oslo is sometimes guilty, and as he is liable to change from very good to very bad within a couple of days, he is probably the most perverse station one can try for!

* * *

Kalundborg, on 1,153 metres, appears to be aware of his impending fate, and to be feeling down in the mouth about it! In a few months' time this wonderful little 7·5-kw. station will give place to the giant transmitter recently built in England and now being installed at Kalundborg.

* * *

The marvel is that, with such low power as is now being used, the little Danish long-waver has been able to hold his head so high. East coast and North-East coast listeners agree with me that he is always in the running with Motala and Oslo for regularity and power (and sometimes in front), and yet those two stations are enormously more powerful.

* * *

The 1,200-metre pair—Reykjavik and Istanbul—have yet to find my aerial with any degree of certainty; and, in fact, above Kalundborg the next worth-while possible is Moscow Trades Union. He is classed as a "possible" because even when he is known to be transmitting he often fails to be distinguishable on 1,304 metres.

Motala, on the contrary, is always in evidence on the 1,348-metre mark, and, of course, both Warsaw and Eiffel Tower can be classed as easy.

* * *

For some reason, Königs Wusterhausen continues to be something of a wash-out compared with his past achievements. My experience of this station, during the past few months, is that he *can* be obtained, if with some little trouble, but he is nowhere near the good programme-provider that we could expect him to be when considering his performances of a year or more ago.

* * *

Radio Paris, on the other hand, seems to get better and better. All things considered, the London district listener would probably be prepared to swop any other six long-wave programmes for Radio Paris, if he had to make the choice. It is a station that never seems to let one down.

* * *

For form's sake we must give Huizen his due, on 1,875 metres, for this station puts out a great deal of good stuff, and at hours when there are not many alternatives offered from the rest of Europe.

As only the more interesting stations have been mentioned in this brief summary, we can safely conclude that the month on long waves has been a good one for most aerials. Especially as there continues to be a genuine fall-off in Morse interruptions, which have hitherto always tended to mar the long waveband results far more than the medium waves.

* * *

The long waveband has been officially increased at its lower end by the Madrid Conference. It is now extended from 224 kc. to 265 kc. The "new" waves are already occupied by eight stations ranging from Moscow to Kalundborg. This still leaves a number of stations above 1,000 metres not on allotted wavelengths.

The GERMAN ANNOUNCER and What He Says

SOME time ago I suggested in these columns a system whereby listening to foreign programmes might be less of a weariness to the flesh by reason of the language difficulty than it is. This difficulty, I stated, was a common experience, even with those who possessed a knowledge of a foreign tongue good enough for ordinary reading purposes. But the difficulty arises through the ear's inability (for want of practice) to catch immediately what is being said.

Announcer's Stock-in-Trade

My system is founded on the simple fact that all announcers use a vast number of expressions which vary but little from day to day. It would present no difficulty to any Englishman if he wished to impersonate in a sentence an English announcer.

Immediately some stock phrase such as this would occur to him: "Before I read the news, here is an S.O.S. Missing from his home, etc., etc." This is just one of a number of phrases from the professional English announcer's stock-in-trade.

The German announcer has his phrases, too, that he uses with but slight variation day after day. At present they are wasted on us, although if we saw them in print we could easily translate them.

Listen for Them

My object in this article is to give you some of these expressions, which I commend you first to commit to memory. Then listen for them through your loudspeaker.

You will probably have to listen hard for them. But no matter! Just make up your mind to pick them out. If you succeed, I am certain you will not have to listen hard for them in future. They will thrust themselves on you, in spite of yourself, just as English expressions do.

The first group of stock expressions I suggest you should master includes the Call and Closing-down signals of all the German stations. These never vary. Hamburg is a good specimen.

RUDOLF RAUHER

RADIO REPORTER

"*Hier ist Hamburg für die Norddeutsche Sendergruppe. Hamburg, Kiel, Hanover, Bremen und Flensburg.*" And its closing announcement: "*Damit, meine Damen und Herren, ist unser heutiges Tagesprogramm beendet. Wir wünschen Ihnen allen eine recht gute Nacht! Auf Wiederhören morgen früh zur gewohnten Stunde!*"

Perfectly simple to translate and equally simple to get once you have heard and recognised it.

There are also the interval calls to be mastered. Königs Wusterhausen offers a typical one.

"*Achtung! Königs Wusterhausen. Der Vortrag* (or other item) *ist beendet. Auf Wiederhören in zwei Minuten.*"

Programme Divisions

The second group is suggested by the word "*Vortrag*" (talk). Broadcast items in Germany resemble those at home, dividing themselves conveniently into the four departments of *Musik, Literatur, Vorträge, Zeitfunk und Sport.*

They are *Vorträge* (talks), *Vorlesungen* (lectures), *Mittags konzerte* (midday concerts), *Abendmusik* (evening music), *Marktberichte* (market reports), *Nachrichten* (news), *Hörspiele* (wireless plays), *Funkzeitung* (radio news), *Abendmeldungen* (evening news), *Pressemeldungen* or *Nachrichtendienst* (news bulletins), etc., etc. These items are usually announced as briefly as: *Wir bringen die Abendmeldungen* or *Sie hören die Abendmeldungen* (Here is the news bulletin), and concluded just as briefly with "*Hier enden die Pressemeldungen.*" (That is the end of the news bulletin.)

A Common Word

The warning which often accompanies such bulletins should also be listened for: "*Deren Verbreitung durch Druck oder Schrift verboten ist.*" (The spreading of which through printing or writing is forbidden, i.e. copyright reserved.)

Konzert is a common word you should not miss, though it is likely you may not recognise it when tacked on to another word and used as a compound. For instance, there are all sorts of concerts, such as: *Morgenkonzert* (morning concert), *Mittagskonzert* (midday concert), *Nachmittagskonzert* (afternoon concert), *Vesperkonzert* (evening concert), *Orchesterkonzert* (orchestral concert), *Orgelkonzert* (organ recital), *Leichtes*

Klassisches Konzert (light classical concert), *Schakplattenkonzert* (gramophone recital), *Blaskonzert* (brass-band concert), *Militärorchesterkonzert* (military band concert), *Unterhaltungskonzert* (social concert, etc., etc., each of which would be announced as follows: "*Das Abend programm beginnt mit einem orchesterkonzert unter der Leitung von Herrn S.*" (The evening programme begins with an orchestral concert under the direction of Mr. S.) For *Abend programm* you might substitute "*das heutige programme*" (to-day's programme), *das Winter programm*, *das Sontags programm* (Sunday's programme), *das morgige programm* (to-morrow's programme),etc., etc.

Concluding Expressions

A number of expressions are used to conclude a concert, among which these are the commonest: "*Damit schliesst unser heutiges Programm.*" (That concludes our programme for to-day.)

"*Damit ist das Abend programm beendet.*" (That concludes our programme for to-day.)

"*Damit beschliessen wir unser heutiges programm.*" (We are now closing down.)

An interval between two consecutive items often brings the announcement: "*Wir machen eine Pause von drei Minuten,*" or "*Wir lassen eine Pause von drei Minuten eintreten*" (There will be an interval of three minutes), or "*Nach fünf Minuten beginnen wir mit einem Beethoven Konzert*" (In five minutes we shall begin with a Beethoven concert).

Sports News

"*Sportdienst,*" "*Sportvorträge,*" "*Sportübertragungen*" (sports news) is always of interest, so to begin with be satisfied with learning a few expressions that occur in such bulletins.

"*Das Spiel wurde in London ausgetragen*" (The match was played in London).

"*Das Spiel wurde wegen Nebel abgebrochen*" (The match was abandoned through fog).

"*München unterlag gegen Berlin mit zwei Toren zu Null*" (M. lost to B. by two goals to nil).

Typical Phrases

"*In Herrendoppel siegte A. gegen B. mit sieben zu fünf*" (In the men's doubles A. beat B. by seven games to five).

"*In Damendoppel siegte C. gegen B. mit neun zu sieben*" (In the women's doubles C. beat B. by nine games to seven).

"*Der Tenniskampf wurde ausgetragen*" (The tennis match was played).

Popular Pastimes

Among the popular pastimes that are frequently mentioned in a *Sportfunk* (sports bulletin) are: *das Boxen* (boxing), *das Sportfest* (sports meeting), *das Ringen* (wrestling), *das Speerwerfen* (throwing the javelin), *das Diskuswerfen* (throwing the discus), *das Pferderennen* (horse racing), *der Radsport* (cycle racing), and *die Regatta* (the regatta); while during the season there are certain to be notices of *Der Schneesport* (winter sports), *das Eisschiessen* (curling), *der Eisplatz* (open-air ice rink), *die Kunsteisbahn* (artificial ice rink), *der Skiverband* (ski-club), and *das Schlittschuhlaufen* (skating).

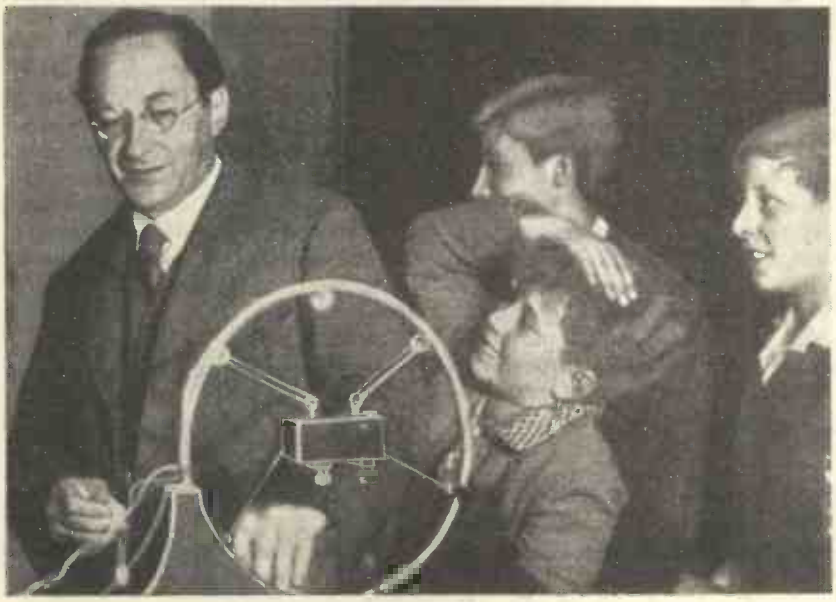
Coming Events

Programme announcements (*die Programmbekanntgabe*) usually take the form of the following: "*Am 6 Oktober findet eine Studio aufführung der Oper "Alkestis" von Egon Weelisch statt*" (On October 6th there will be a studio broadcast of the opera "Alkestis," by E. W.), or "*Aus dem Theater an der Wien wird am 8 Oktober die Blume von Hawai übertragen*" (On October 8th die Blume von Hawai will be broadcast from the Theatre an der Wien).

Nachrichten

News (*Nachrichten*) paragraphs have also their quota of stock phrases, frequently beginning with the following:

"*Eine interessante Mitteilung über . . . gibt heraus dass . . .*" (An interesting communication about . . . says that . . .). "*Ein Wienert Abendblatt bringt die Nachrich dass . . .*" (A Vienna evening paper reports the news that . . .).



"—AND DON'T THEY LOVE IT!"

You won't find much drudgery about lessons when they are conducted via the radio. Our picture shows part of a school broadcast from Langenberg. It would seem that the schoolmaster is more popular than some we know of—perhaps he has spared the rod and found that it has not spoilt the child!

"*Nach bulgarischen Nachrichten erfahren wir . . .*" (According to a Bulgarian message we learn that . . .). "*Nach russischen Meldungen erfahren wir . . .*") (A Russian message informs us that . . .).

Giving Encouragement

The selection that I have made must not be regarded as being in any way complete, for it is nothing more than a fragment of what German announcers say. It should, however, help you to make a start or give you an idea of what you should be on the look out for. And, what is more important still, the mastery of this fragment alone should give you all the encouragement you need to persevere with what seems at the moment an impossible task.

The Polish authorities say that Wilno is intended as a relay station to Warsaw for increasing crystal range. British listeners would welcome a 16-kw. relay! If your receiver will tune to 563 metres (higher than Budapest), you will welcome the chance our Roving Reporter gives you to pay a visit to Wilno.

I HAVE spent a most interesting time at the Wilno station, thanks to the courtesy of the Polskie Radio concern.

The director of the Wilno station is M. Witold Hulewicz, a lover of England and the English, who tries to get as much programme time as possible for English announcements and items of interest to listeners outside little Poland.

The station is not actually in the interesting old town of Wilno, but is a short *furmanka* ride out into the suburb of Lipowka, three miles south.

First-Rate Quality

The Chief Engineer at Wilno is M. Tadeus Dabrowski. He works hand in glove with the Warsaw engineers and was connected with the Wilno radio activities before the present station was built. It was Dabrowski who designed the ultra-modern concrete station building which caught my eye as we came up the drive.

The transmitter is not of Polish construction and the contracts were put to outside firms. The quality is first rate, as I had several opportunities of judging, both on local receivers and in the station control room.

The building looks very much like a coastguard station, and it is surmounted by a conning tower erection in concrete which heightens this impression. The "conning tower" is actually something to do with the aerial lead-in. Immediately above the building there is the usual T-shaped aerial on two lattice masts about 180 ft. high.

A powerful receiver is worked at Wilno and, owing to the frequency control of the Polish transmitter, the greatest care is taken to see that no stations on adjacent wavelengths wander off their allotted wavelength channels!

"AND A-HUNTING WE WILL GO!"

The hunting-horn call-sign of Wilno appears to be so popular with the staff that they can't even keep it out of their radio plays, one of which was being broadcast when this picture was taken.

This aerial system is not massive, but, then, Wilno is not a very high-power station. It is intended mainly as a relay of Warsaw to increase the crystal-set range.

During my visit it has struck me forcibly that a large number of people around Wilno, Katowice, Lwów—and other places which are familiar on British amateur reception logs—are poor farmers who can only afford small crystal sets. The 16-kilowatt relay provided by Wilno is invaluable to them. There is also a population of about 200,000 in Wilno itself.

Flood-Lit Panels

The transmitting gear is carried on aluminium panels which are flood-lit in a very futuristic but useful fashion. All the gear is enclosed, and only the peak volt-meters and flow meters can be seen on the outside.

The power comes from the local Wilno station and is rectified by six-phase banks of valves at the transmitter.

M. Dabrowski is in charge of the testing and receiving gear at the station.

The programmes are under the control of Roman Pikiel, but, of course, most of the programme material comes from Warsaw.

Wilno does not take the early morning Warsaw programmes, but starts up with a news bulletin of its own at about eleven o'clock in the morning, and then takes the main programme from Warsaw till the early evening at about six o'clock.

File of Records

Then there are local news bulletins and a short programme announcement of items which are to be given exclusively through Wilno for the following few days.

Unless anything special is coming from the Wilno studio, the station switches on to the Warsaw land-line circuit. The relay is always taken by line from Warsaw, but there is an emergency receiver which can be pressed into use for radio relaying.

When there are items on the Polskie Radio programme which are not of interest to local Wilno listeners, gramophone records are put on. There is a big file of records, many of them British, in the studio ante-room.

Very probably you have heard the hunting-horn call which is given as an interval signal and before the general call at the commencement of the programme.

One of the announcers gives this, and there is a gramophone record of it which can be used when the lady announcer, Joan Piekarska, is on duty in the studio! The assistant announcer, M. Zapasnik, is the hunting-horn expert!

Miss Piekarska is a good linguist. She is expert in the Lithuanian and White Ruthenian dialects, and talks given from Wilno in these languages are often delivered by her.

Five Languages

The announcer in the Warsaw studio can speak English, French and German, as well as Polish. So when Wilno takes the Warsaw programme, preceded by its local announcement from Miss Piekarska, there is quite a flow of oratory in five different languages before the programme opens.

Wilno has two fine sports stadia, and the engineers are arranging for outside broadcasts from one of them. During the next month or so you may hear some of these through Wilno.

One of these stadia is a fine outdoor place, cut in a hillside overlooking the town, and it should be easy to get an O.B. from here. The only trouble is that there are no telephone lines in the neighbourhood, and it means running special cables.

Church Relays

By the way, when you hear church services from Wilno, not emanating from Warsaw, you may be interested to know that they come from the well-known Ostra Brama Church, with a famous eikon which is the centre of attraction of thousands of pilgrims from all parts of Poland.

The Polskie Radio Company have, after a long conference with the Church authorities, obtained permission to have two microphones in the Ostra Brama.

Conversational News

When Wilno switches off from Warsaw and gives its own news bulletin, an official from the local news agency takes charge.

Business and sporting events of the district are dealt with in a conversational manner, until the automatic cuckoo call of Wilno, superimposed on the transmission, shows that it is time to switch back to the parent Warsaw programme.

NEW TRANSMITTER FOR TOULOUSE

Radiophonie du Midi, Toulouse, the owners of the well-known station Radio-Toulouse, announce that the new 60 kw. in aerial station has just been completed. The station was built by the S.F.R. of Paris, and was ordered in 1930.

The transmitter has been erected at the Château d'Agnan, some 20 miles from Toulouse, and the old castle has been completely transformed. But the exterior has been kept much as it was.

I understand that the moment the Post Office grants the required permission, the station will start off.

TWIN BABIES!

Used as we are to seeing the massive aerial systems of high-power transmitters, we shall probably consider the two 180-ft. lattice masts of Wilno as quite childish affairs! But they're very efficient.

OTHER PEOPLE'S PROGRAMMES

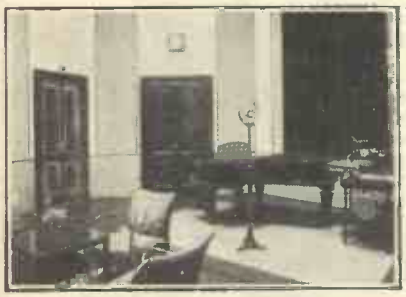
No. 2. — Italy

It is very true that one half the world doesn't know how the other half lives. And the casual listener doesn't enjoy hearing foreign programmes nearly as much as the man who knows what is going on. Last month we told you something of the German programmes — this time we are off on a trip to Italy to see how they do things in the land of gondolas and volcanoes!

THERE can be hardly any doubt but that the mention of Italian programmes will immediately call to your mind the voice of the charming lady who daily announces, to the unconcealed delight of British listeners, the programmes from Radio Roma.

Charming Voice

Maria Luisa Boncompagni is the name of this lady who has, on the strength of her voice alone, received more proposals of marriage and more enthusiastic letters than the most successful film star. There is probably no announcer who is better known throughout the world.



THE LITTLE STUDIO

Were it not for the microphone in the centre of this studio, the smaller of the two at Trieste, it might well be mistaken for a drawing-room in some comfortable country home.

But although Italian broadcasting is so closely tied up with Maria Luisa, there is a great deal more than that to the programmes.

As a matter of fact, even in the realm of announcing a Radio Roma's famous voice has a rival farther north. Signora Iolanda Sivizzi, whose picture you see on the next page, is one of the chief reasons why enthusiastic listeners tune to 247 metres and listen to Trieste!

One of the most interesting things about Italy's programmes, therefore, is that lady announcers have been found so successful. The "golden voices" of Europe are without doubt headed by Signoras Boncompagni and Sivizzi, and the programmes become more intimate and more charming for that very reason.

Fine Opera Relay

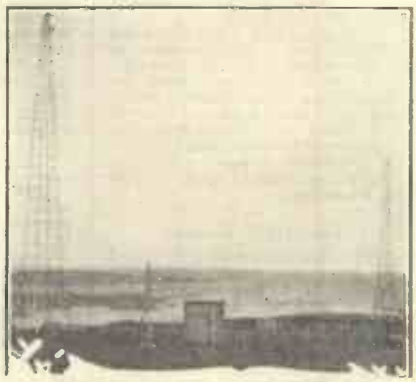
The actual programmes of Italy differ very little from those of the rest of Europe. If you listen to Rome or Naples or Trieste or Florence you will hear light music and opera, jazz and drama, talks and sporting events.

But there is no doubt that in the matter of operatic relays Italy leads the world. And little wonder when you consider that at Milan, one of the main broadcasting centres of the country, is situated what is probably (although Americans will be up in arms at once!) the leading opera house in the world—La Scala.

I have heard these actual performances in Milan and as a result I never fail to listen to the Milano-Torino-Genova-Firenze group when relays from La Scala are advertised.

Not Romantic

One is naturally apt to connect Italy with romance—the canals of Venice, the bay of Naples and the island of Capri, the historic buildings of Rome and so on. But, as a matter of fact, very little of this romance is reflected in the radio programmes.



EXPOSED TO THE WINDS

This fine commanding position makes Trieste's aerial a friendly landmark for miles around.

Trieste—The Most Progressive of Italian Stations

Italians enjoy their football results as much as we do. They like their dance music in the evening. They have their talks on hygiene, and drama, and books. Shipping news is given a prominent place in

HERE IS "RADIO ROMA"!
The Rome station has come to mean Signora Boncompagni to innumerable listeners, and so we give you this opportunity of meeting the charming lady whom you know now only as a voice.

the day's events, and gramophone records help to fill up the empty half-hours.

All very like England, isn't it? But there are several ways in which Italian broadcasting excels.

Regional Scheme

At the moment a regional scheme of broadcasting is in force, and although it is rumoured that all the broadcasters are soon to be linked together with only one or two national programmes for the lot, the various districts still vie with one another in discovering bright ideas for broadcasting.

For instance, once a year the stations in the north take a relay from Siena. This town is famous throughout Italy for its annual horse race, which takes place in the public square—a most dangerous racecourse since it is built entirely of stone and has the added attraction of being built on a slope!

Still, nobody seems to mind a few broken bones, and the whole town turns out to watch the race which is run on ponies between representatives of the rival communities.

As each rider is allowed to foul his opponents as much as he wishes, even to the extent of knocking them off their ponies, the broadcast becomes rather a thrilling affair.

Programmes in Italy take up less of the day than they do in other European countries. Morning transmissions from the provincial stations, at any rate, are rather intermittent and, with the exception of Rome, "early to bed" seems to be the general rule.

Quality, Not Quantity

It would seem that quality, not quantity, is the order of the day, for there is probably no country where you will find more time de-

STARTING YOUNG
This chip of the Fascist block has no stage fright when facing the microphone. She looks determined that listeners shall pay attention to what she has to say!

voted to music of the more serious order. Even variety programmes consist for the most part of "straight" singers and chamber music. The robust comedian, who is such a feature of our own variety hours, is rarely heard in Italy.

Whether such a programme policy, high-minded as it is, suits the average Italian listener is a moot point, for the number of wireless licences issued to Italians is ridiculously small for the total population.

Trieste is probably the most go-ahead of all the E.I.A.R. stations, and some interesting broadcasts have taken place during the past few months.

There was the very successful relay of the launching of the Oceania, one of the new giant liners built in the famous shipyard of Monfalcone. And the delightful afternoon when listeners were taken over to the Fascist colony which has been established at Cologna for providing sun treatment for Italian children. There is a little picture of some of them on this page.

Children Take Part

During this broadcast the children themselves gathered round the microphone and took part in the programme, an idea which is practised very widely with the programmes of Trieste.

Every Monday and Thursday special broadcasts are arranged for what correspond to our Boy Scouts and the programmes are a real "children's hour." The boys take part all the time, sing songs and join in the discussions which are raised by lectures on patriotic, scientific, and nature subjects.

It is little wonder that these broadcasts are popular and receive the good wishes of so many Italian listeners.

School For Talkers

To return to Signoras Boncompagni and Sivizzi. These two ladies, in company with the other announcers who are less heard of but none the less efficient, have set a very high standard in radio speech. As a consequence a school has recently been started in Florence for the purpose of teaching budding radio talkers the technics of announcing.

Although there is really very little

SIGNORA IOLANDA SIVIZZI
One of the very good reasons why so many listeners all over Europe tune their receivers to Trieste's wavelength. Signora Iolande is the possessor of a charming voice which upholds the prestige of the Adriatic seaport against all comers.

difference in the main features of European programmes, each country is proud of its own individuality, and Italy is in no way behind the other countries of Europe in providing programmes which express the very best in art and music of which the country is capable. And a very good best it is, too.

PLACING STATIONS with the "M.W." DIAL DIAMONDS

A practical explanation of the method of using this month's Free Gift.

WE have already received a very large number of appreciations of the "M.W." "Dial Diamonds," introduced to listeners last month. And in the present number another pair of these wonderful aids to station-placing is embodied in the "Station Placers" that is given to every reader.

Last month the dial readings from 0 to 100 were covered, and this month the corresponding Dial Diamonds for 0 to 180 degrees are provided for the benefit of those whose tuning condensers are marked in that way.

Essentially Simple

The principle involved is, of course, exactly the same, and even the novice at this game can fill in his stations and use the Diamonds straight away to identify unknown stations.

We need not do more than recapitulate the method, as it is so essentially simple; you simply have to place the exact dial readings of any known stations on their respective station lines. Then, when you have a goodly number strung out down the Diamond, pencil a line in lightly to connect them all together.

Real Accuracy

That line will connect every station line with a certain dial reading, showing you the spot on the dial to look for that particular station. Could anything be simpler or more effective?

Similarly, if you have a programme coming in, but do not know what station it is, the dial reading in question will be connected with a certain station line—and there you are! That is the station tuned-in.

Now, to get real accuracy and so forth it is obvious that the more *known* stations you can put in the better. And the *accuracy* with which you place them is of great importance, as it affects neighbouring readings; and if it is far wrong it will throw them right out, too.

Getting a Hump

A practical little point worth mentioning is to use a sheet of paper to follow the various lines along. It is much easier to place it along a line than to follow the line with the unaided eye. For there is bound to be a great number of lines when we have one for every wavelength used. And arrange the edge of your paper to move along the edge of the Diamond, so that the names there are not obscured by it.

Here is another interesting point about using the Dial Diamonds. If a station shifts off his wavelength he gives you a hump on the curve. Incidentally, he probably gives other listeners the hump, too, for wavelength wobbling is sure to cause interference with their programmes!

So if your curved line seems to want to stray, at any point, you can mistrust the station in question as one who is probably working off his correct wavelength.

For Powerful Stations

At the time of writing, Fécamp is doing this, his wavelength being the one *below* Cork's, instead of which his dial reading is now slightly above. The hump on the curve shows this irregularity up very clearly.

The only other cause of humps on the curve is the marking in of the wrong dial readings. But *you* wouldn't do a thing like that, would you?

For very powerful stations, that spread over several degrees of the dial, it is often a good plan to take the aerial right off, or the earth, or use a short aerial, just to get an accurate reading.

This is especially helpful when the H.F. condenser is not the one that is being taken as the basis of the Dial Diamond readings.

TEUTONIC THOROUGHNESS

The attention to detail of German technicians is well exemplified by this photograph of the control room at Munich (533 metres, 60 kilowatts).

STATION SITUATION

In the following list are recorded all the principal long- and medium-wave programme providers now regularly available in this country, in ascending order of wavelengths.

Wavelengths and Frequencies	Remarks	Occupied By

FROM 200 to 300 METRES

211·3 m. 1,420 kc. — **Newcastle** (Great Britain).

214·3 m. 1,400 kc. — **Aberdeen** (Great Britain). The above two stations usually relay the National Programme.

216 m. 1,391 kc. — **Shared Wavelength.** The two low-powered stations on this wavelength are **Halmstad (Sweden)** and **Radio Chatelineau (Belgium).**

217 m. 1,382 kc. — **Shared Wavelength.** **Karlstad (Sweden)** and **Königsberg (Germany)** are the two low-powered stations sharing this wavelength.

218 m. 1,373 kc. — **Salzburg** (Austria).

221·4 m. 1,355 kc. — **Pori (Björneborg)** (Finland).

223 m. 1,345 kc. — **Fécamp (Radio Normandie)** (France). For some time now Fécamp has been working about two metres higher than this, the allotted wavelength.

224·4 m. 1,337 kc. — **Cork** (Irish Free State).

226 m. 1,328 kc. — **Hudiksvall** (Sweden).

227·4 m. 1,319 kc. — **Flensburg** (Germany).

229 m. 1,310 kc. — **Uddevalla** (Sweden). Uddevalla is the lowest-powered station in Europe.

231 m. 1,301 kc. — **Common Wavelength.** This wavelength is used by three low-powered Swedish stations — **Hälsingborg, Malmö** and **Umea.**

232·2 m. 1,292 kc. — **Shared Wavelength.** Wavelength shared by **Kiel (Germany),** and **Norrköping (Sweden).**

235 m. 1,283 kc. — **Lodz** (Poland). For experimental transmissions.

235·5 m. 1,274 kc. — **Christiansand** (Norway).

237·2 m. 1,265 kc. — **Common Wavelength.** **Bordeaux Sud Ouest** and **Radio Nimes (France)** and **Orebro (Sweden)** occupy this wavelength.

239 m. 1,256 kc. — **Nürnberg** (Germany).

240 m. 1,250 kc. — **Radio Beziers** (France).

240·6 m. 1,247 kc. — **Stavanger** (Norway). Although of very low power, this station is often heard in Britain, especially in the North.

242·3 m. 1,238 kc. — **Belfast** (Northern Ireland).

242·7 m. 1,236 kc. — **Liège Experimental** (Belgium).

244·1 m. 1,229 kc. — **Basle** (Switzerland).

245·9 m. 1,220 kc. — **Commou Wavelength.** **Swansea (Gt. Britain)** occupies this wavelength with **Berne (Switzerland), Cartagena (Spain), Cassel (Germany), Eskilstuna (Sweden), Kiruna (Sweden), Linz (Austria), Säffle (Sweden),** and **Turku (Abo) (Finland).**

247·7 m. 1,211 kc. — **Shared Wavelength** **Trieste (Italy)** and **Kalmar (Sweden)** share this wavelength.

249·6 m. 1,202 kc. — **Varberg** (Sweden).

252 m. 1,193 kc. — **Common Wavelength.** 252 m. is occupied by **Almeria** and **Barcelona (Association Nat.) (Spain),** and **Trolhättan (Sweden).**

253 m. 1,184 kc. — **Gleiwitz** (Germany). Relays the Breslau Programmes.

255 m. 1,175 kc. — **Toulouse P.T.T.** (France).

257 m. 1,166 kc. — **Hörby** (Sweden).

259 m. 1,157 kc. — **Frankfurt-am-Main** (Germany). New station this season.

261·6 m. 1,147 kc. — **London National** (Great Britain).

263·8 m. 1,137 kc. — **Moravská-Ostrava** (Czechoslovakia).

265·4 m. 1,130 kc. — **Lille** (France).

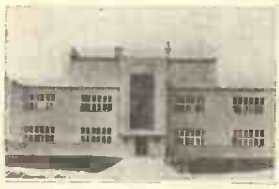
267·6 m. 1,121 kc. — **Shared Wavelength.** **Oviedo (Spain)** and **Radio Valencia (Spain)** share this wavelength.

270 m. 1,112 kc. — **Shared Wavelength.** **Bremen (Germany)** and **Bari (Italy)** share this wavelength.

272 m. 1,103 kc. — **Rennes** (France).

273·7 m. 1,096 kc. — **Turin** (Italy).

276·5 m. 1,085 kc. — **Heilsberg** (Germany). East Prussia's Regional station relays the Königsberg programmes.



279 m. 1,076 kc. — **Bratislava** (Czechoslovakia).

280 m. 1,071 kc. — **Radio Liège** (Belgium).

281 m. 1,067 kc. — **Copenhagen** (Denmark). Same programme as Kalundborg on 1,153 m.

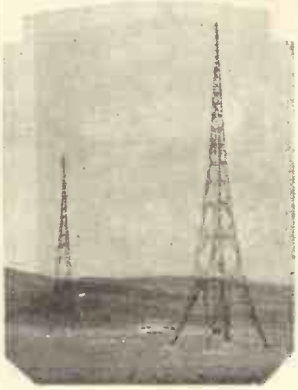
282·2 m. 1,063 kc. — **Lisbon** (Portugal).

283 m. 1,058 kc. — **Common Wavelength.** **Berlin Relay, Magdeburg,** and **Stettin (Germany)** share this wavelength with **Innsbruck (Austria).**

286 m. 1,049 kc. — **Montpellier** (France).

287·6 m. 1,043 kc. — **Radio Lyons** (France).

288·5 m. 1,040 kc. — **British Common Wavelength.** **Scottish National** shares this wavelength with **Bournemouth** and **Plymouth.** (The latter is also experimenting with neighbouring wavelengths.)



291 m. 1,031 kc. — **Viipuri (Viborg)** (Finland).

293 m. 1,022 kc. — **Shared Wavelength.** **Kosice (Czechoslovakia)** and **Limoges (France)** share this wavelength.

296·1 m. 1,013 kc. — **Hilversum** (Holland). Increases power from 7 to 20 kw. at 4.40 p.m.

298·8 m. 1,004 kc. — **Tallinn** (Estonia).

FROM 300 TO 400 METRES

301·5 m. 995 kc. — **North National** (Great Britain).

304 m. 986 kc. — **Bordeaux Lafayette** (France).

307 m. 977 kc. — **Shared Wavelength.** **Falun (Sweden)** and **Zagreb (Yugoslavia)** occupy this wavelength.

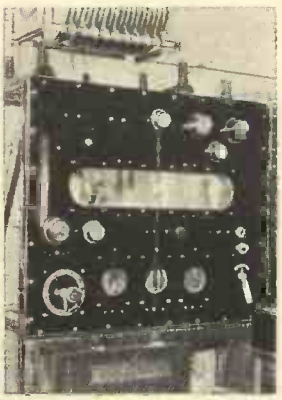
309·9 m. 968 kc. — **Cardiff** (Great Britain). **Pietarsaari (Jacobstad) (Finland)** is also on this wavelength.

312·8 m. 959 kc. — **Common Wavelength.** **Cracow (Poland), Genoa (Italy)** and **Radio Vitus (Paris)** share this wavelength.

315 m. 950 kc. — **Marseilles** (France).

How the Stations are Waiting For You

Wavelengths and Frequencies	Remarks	Occupied by
319 m. 941 kc.		Common Wavelength.
	Dresden (Germany), Naples (Italy) and Sofia (Rodno-Radio) (Bulgaria) are all on this wavelength.	
322 m. 932 kc.		Göteborg (Sweden).
325 m. 923 kc.		Breslau (Germany).
328·2 m. 914 kc.		Poste Parisien (France).
331·5 m. 905 kc.		Milan (Italy).
	The above three are all new high-power stations, and being "neighbours" are very difficult to separate, except on selective sets.	



335 m. 896 kc.		Shared Wavelength.
	Cadiz (Spain) and Poznan (Poland) share 335 m.	
338·2 m. 887 kc.		Brussels No. 2 (Belgium).
	Flemish is the language always used in announcements.	
342 m. 878 kc.		Brno (Czechoslovakia).
	As pronounced, the name sounds like "Birno."	
345 m. 869 kc.		Strasbourg (Brumath) (France).
	Both French and German are spoken—man and woman announcers.	
349 m. 860 kc.		Radio Barcelona (Spain).
351 m. 855·5 kc.		Leningrad (Russia).
352·1 m. 852 kc.		Graz (Austria).
356 m. 843 kc.		London Regional (Great Britain).
356·3 m. 842 kc.		Tiraspol (Russia).
360·5 m. 832 kc.		Stuttgart (Mühlacker) (Germany).
363·3 m. 825·3 kc.		Algiers (N. Africa).
	Usually announces in French, but English and Arabic sometimes used.	
364 m. 824 kc.		Bergen (Norway).
367·6 m. 816 kc.		Fredrikkstad (Norway).
368·1 m. 815 kc.		Common Wavelength.
	Wavelength shared by Bolzano (Italy), Helsinki (Finland), Seville Union Radio (Spain).	
370·4 m. 810 kc.		Radio L L Paris (France).
	The "L L" is pronounced clearly, and as in English.	
372 m. 806 kc.		Hamburg (Germany).
376·4 m. 797 kc.		Scottish Regional (Great Britain).
	Sometimes referred to as the "Falkirk" station.	
378·6 m. 792·5 kc.		Moscow (Russia)
381 m. 788 kc.		Lwów (Poland).
385 m. 779 kc.		Radio Toulouse (France).
390 m. 770 kc.		Archangel (Russia).
389·6 m. 769·9 kc.		Leipzig (Germany).
	This is now Europe's most powerful station.	
394 m. 761 kc.		Bucharest (Roumania).
398·9 m. 752 kc.		Midland Regional (Great Britain).

FROM 400 to 550 METRES.

403 m. 743 kc.		Radio Suisse Romande (Sottens) (Switzerland).
	Announces in French.	
408 m. 734 kc.		Katowice (Poland).
	Polish generally used, but also answers correspondents in French.	
413 m. 725 kc.		Dublin (Irish Free State).
	New station at Athlone now announcing as "Dublin."	
416 m. 721·1 kc.		Rabat (Morocco).
419·5 m. 715 kc.		Berlin (Witzleben) (Germany).
424·3 m. 707 kc.		Common Wavelength.
	Wavelength shared by Madrid Union Radio, Madrid Radio Espana (Spain) and Moscow-Stalin (Russia).	

430·4 m. 697 kc.		Belgrade (Yugoslavia).
	The name sounds like "Baograd."	
431 m. 696 kc.		Parede (Portugal).
436 m. 689 kc.		Stockholm (Sweden).
	This wavelength also occupied by Malmberget (Sweden).	
441 m. 680 kc.		Rome (Italy).
	Works in conjunction with Naples as "Roma-Napoli."	
447·1 m. 671 kc.		Common Wavelength.
	Aalesund (Norway), Notodden (Norway), Paris (Ecole Superieure) (France), and Rjukan (Norway) share this wavelength.	
450·1 m. 665·5 kc.		Odessa (Russia).
453·2 m. 662 kc.		Common Wavelength.
	Eight stations are on this wavelength—Bodö (Norway), Danzig (Free City), Klagenfurt (Austria), Porsgrund (Norway), Salamanca (Spain), San Sebastian (Spain), Tromsö (Norway), Uppsala (Sweden).	
459 m. 653 kc.		Schweizerischer Landessender (Beromünster) (Switzerland).
	Announces in German.	
465·8 m. 644 kc.		Shared Wavelength.
	Lyons La Doua (France) and Tartu (Estonia).	

473 m. 635 kc.		Langenberg (Germany)
476 m. 630·2 kc.		Sebastopol (Russia).
480 m. 625 kc.		North Regional (Great Britain).
488·6 m. 614 kc.		Prague (Czechoslovakia).
	The name sounds like "Radio Praha."	
493·4 m. 608 kc.		Trondheim (Norway).
497 m. 603·6 kc.		Moscow (Russia).
500·8 m. 599 kc.		Shared Wavelength.
	Florence (Italy) and Nijni-Novgorod (Russia) share this wavelength.	
509 m. 590 kc.		Brussels No. 1 (Belgium).
	Announces in French.	
517 m. 581 kc.		Vienna (Austria).
	The name is pronounced "Rahdio Veen."	
525 m. 572 kc.		Riga (Latvia).
	The name is pronounced "Re-ga."	
533 m. 563 kc.		Munich (Germany).
	The name is pronounced "Munchen."	
542 m. 554 kc.		Shared Wavelength.
	Palermo (Italy) and Sundsvall (Sweden) both work on this wavelength.	
550 m. 545 kc.		Budapest No. 1 (Hungary).
	Pronounced "Booda-Pest, Hongrie."	

FROM 1,000 TO 2,000 METRES.

1,000 m. 300 kc.		Moscow (Russia).
1,034 m. 290 kc.		Kiev (Russia).
1,071 m. 280 kc.		Tiflis (Russia).
1,083 m. 277 kc.		Oslo (Norway).
1,116 m. 268·5 kc.		Moscow (Popoff) (Russia).
1,153 m. 260 kc.		Kalundborg (Denmark).
	Linked with Copenhagen, and announced "Kalundborg Kobenhavn."	
1,171·5 m. 256 kc.		Tashkent (Russia).
1,200 m. 250 kc.		Shared Wavelength.
	Istanbul (Turkey) and Reykjavik (Iceland) share this wavelength.	
1,229·5 m. 244 kc.		Boden (Sweden).
1,237 m. 242·5 kc.		Vienna Experimental (Austria).
1,260 m. 238·1 kc.		Novosibersk (Russia).
1,304 m. 230·1 kc.		Moscow (Trades Union), (Russia).
	Often talks in different languages—German, French, English, etc., for propaganda purposes.	
1,348 m. 222·5 kc.		Motala (Sweden).
1,350 m. 222·2 kc.		Kasbah (Tunis).
1,411 m. 212·5 kc.		Warsaw No. 1 (Poland).
	The name Warsaw sounds like "Varshova."	
1,445·7 m. 207·5 kc.		Eiffel Tower, Paris (France).
	Announced as "Tour Eiffel."	
1,481 m. 202·6 kc.		Moscow (Old Komintern) (Russia).
1,538 m. 195 kc.		Ankara (Turkey).
1,554·4 m. 193 kc.		Daventry National (Great Britain).
1,635 m. 183·5 kc.		Königs-Wusterhausen (Zeesen) (Germany).
	This is the German Government's official station for important announcements.	

1,725 m. 174 kc.		Radio Paris (France).
1,796 m. 167 kc.		Lahti (Finland).
1,875 m. 160 kc.		Huizen (Holland).
	Exchanges transmissions with Hilversum every three months.	
1,935 m. 155 kc.		Kaunas (Lithuania).

SIMPLE-SET SEARCHING

Telling how the man without elaborate H.F. stages on his receiver can get the best long-distance results by the expenditure of a little trouble.

By "simple sets" I mean those on which searching is not *quite* so simple as it is on those with one or two screened-grid H.F. stages. On the latter, one more or less just turns the knobs and waits for the stations to come in, but with det. and one L.F. or det. and two L.F. it is that little extra skill with the knobs that makes so much difference.

It is with these simple sets, too, that a little hotting-up produces the most noticeable effects. In fact, they are just where the enthusiast scores over the "any-old-how-will-do" man.

Don't misunderstand me and think that it is difficult to get stations without H.F. amplification; just the opposite is the case, for it is in respect of the more distant foreigners and less powerful "wallahs" that the details of this article count.

Give it the "once-over" and see if there is not some count on which you can ginger-up your results a bit.

Consider your aerial first. With the super sets, any bit of wire is as good as something more like a real aerial, but for simpler sets it is much better to have a large aerial, and a small aerial coil or tap, than the other way round.

It Pulls Its Share

Why? Because your aerial circuit then approaches nearer to the true aperiodic, and results will be much more evenly good over the whole range of the dial.

Well, that's a start. Here's another on the same lines. The earth connection has to pull its share on a det. and L.F.; you can't make up for it before the detector, so leave the gas-pipe to its proper job, and dig a hole in the garden or furrage out the *ascending* water main.

Now everything in the garden is lovely; we can give the set a first general survey. Whew! Look at those old valves! They've stood you in good stead long enough.

New steep-slope valves will put many a weak station on your log as "received at full speaker strength" instead.

Even if your valves *are* modern, see that they are getting enough H.T. voltage to enable them to perform as they should!

The Weakest Link

And here's an ear-searching question: "Is your loudspeaker a sensitive one?" Maybe you are losing quite a lot if it is not. Unless you are confident about its capabilities, why not take it round to the radio shop and compare it with some of the later ones?

FOR YOUR DELIGHT

The best orchestras in Europe are always at your command by the turn of a knob. And so powerful are modern transmitters that you need have no elaborate receiver.

Forgive me if I seem to be harping rather on this "old stuff on new sets" business, but it's the same old theme of "the weakest link, etc." and it's no use putting a good horse on to a cart without wheels! Still, here's a tip for every simple-set searcher.

Very often a station will not appear on your speaker because it is not powerful enough to be heard without those final titivatings of the reaction knob, and until you can hear it you cannot, of course, start the titivating.

Sounds a bit impossible to overcome perhaps, but why not have a pair of telephones for doing the first searching and adjusting?

The set's output can go to the two centre points of a double-pole change-over switch, the outer pairs going one to the speaker and the other to the 'phones. You can then change over "in no time."

Also, a 50,000 or so variable resistance across the 'phones will save your eardrums if you have any qualms about them.

It's surprising what a lot more you will get with the 'phones to aid you. And if you just want to log stations, then you'll have to add another leaf to your log when you add the 'phones to your set!

Experiment with Voltages

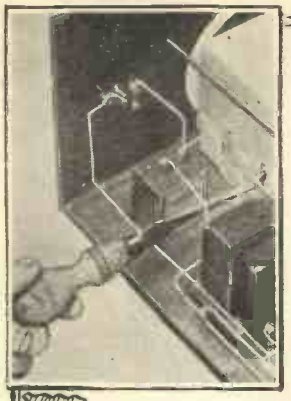
Of course, I must follow the recognised procedure and warn you that a smooth control of reaction is vital for distant reception. No, "plops," please!

If you have not already got the build-up as smooth as possible, then make it your first duty to experiment with H.T. voltages on the detector's H.T. tapping. Even go so far as to fit a separate terminal for the detector if it is supplied in double harness with another valve.

Long-wavers are always good stand-by stations, and you don't need quite such sharp tuning on the long-wave band. So why make Radio Paris and the other stations with slower-moving frequencies squeeze through that small series aerial condenser?

A simple on-off switch across the aerial series condenser will do the trick for you nicely.

There's no end of fun to be got out of making a small set perform prodigies of foreign station reception, and the only secret is care of details. Happy searchings!



BETWEEN 200 AND 550 METRES

How Many Stations—Too Powerful for Comfort—Notable Absentees—A Border Line Case—Punch Behind Trieste—Forget the Eggs and Bacon!

THE direction in which an aerial lies, its position relative to neighbouring trees and so forth, must undoubtedly have some influence upon the stations it receives best; and that is why the writer recently welcomed the opportunity of trying out a "plate aerial" receiver. It was a D.C. mains set (2 S.G.'s, det. and pentode), and no external aerial or earth connection at all was used. What the set got, it had to pick up without even a frame aerial or other aid, its only lead being a six-footer to the nearest lamp-socket.

* * *

How many stations should a good set get in such difficult circumstances?

It was installed on the third floor of a Central London house, and its performance there was watched very closely, as only stations coming over really well could hope to provide entertainment in such circumstances.

* * *

In brief, these were the outstanding points about the medium waves:

London National was at least twice as strong as the Regional, and was too powerful for comfort even in daylight.

North National and Midland Regional were both very good after dusk; North Regional was fair, Scottish Regional about the same, and the other medium-wave B.B.C. stations not worth bothering about.

* * *

Of foreigners, twenty-six good programme-value stations were obtained at different times, Fécamp at the bottom and Budapest at the top, both being good. The best of the intermediates were Nürnberg (239 metres), Trieste (247 metres), Turin (273 metres), Heilsberg (276 metres), Hilversum (296 metres), Bordeaux-Lafayette (304 metres), Breslau (325 metres), Poste Parisien (328 metres), Milan (331 metres), Strasbourg (345 metres), Leipzig (390 metres), Sottens (or Radio Suisse Romande) (403 metres), Beromünster (or Schweizerischer Landessender) (459 metres), and Brussels No. 1 (509 metres).

* * *

Notable absentees from this selection of the "best" stations are Rome, Toulouse and Stockholm; all could be received, but were not comparable with the above-named for strength or reliability.

* * *

Katowice was a border-line case, very good some nights but not always. Florence, also, only just missed special mention.

In brief, therefore, the set always had plenty of likely stations to pick from, in spite of the fact that its self-contained aerial was never intended for anything but "local" listening; and the alternatives were really good ones, quality and strength, indeed, being far beyond expectations.

* * *

Probably the freedom from disappointing fading was due to the fact that the tests happened to synchronise with a time when general reports on reception showed it was a very good non-fading period. The way that Leipzig, for instance, would hold on for an hour or so at really magnificent volume without a single troublesome fade was remarkable.

* * *

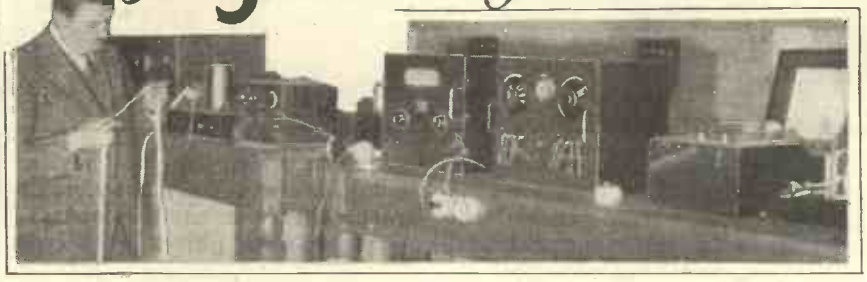
As an example of the unexpected results which may be obtained when working with a small cabinet-contained aerial of this type, the case of Trieste is worthy of note. He—or, rather, she, for it was our old friend, the young lady!—was quite clearly audible at 8.30 one morning, in bright sunshine!

"Quite clearly audible" does not mean big strength, however; for, as a matter of fact, the room was quiet, and to catch every word one had to stand near the loudspeaker fret. But it shows that there is some real punch behind Trieste when it can make one forget the eggs and bacon for a moment!

* * *

A close check-up with other listeners, ordinarily situated, confirms the foregoing selections as the most reliable stations of the past few weeks; and, by the same showing, Riga, on 525 metres, may have surprised some listeners, for he was clearly received under the reception conditions outlined above at 7.15 p.m. one evening. Any listener who wants to add Latvia to his bag of countries should certainly try for Riga.

The SLEUTH of the ETHER



Much has been heard recently of the checking station at Brussels, where M. Braillard and his officials keep a stern and watchful eye on the wavelengths of Europe's broadcasters. Our special correspondent to-day takes you on a visit to this station and explains how the tests are made and what happens to those "wicked" stations who stray from their allotted figure. So let's start straight away.

IN the company of one of M. Braillard's officials I paid a visit last week to M. Edm. Divoire and the famous Brussels wavelength-checking station of which he is assistant director.

"What I want to see," I stressed, "is the actual wavemeter which spots the defaulters in the European ether and which is used to check the B.B.C. wavelengths."

Meters that Check Meters

My guide did not disappoint me. Together we went to the U.I.R. checking station in a quiet suburb of Brussels, and I saw not only the wavemeters which check Europe's biggest broadcaster, but the master meters which check the wavemeters themselves.

Most of the apparatus is in an ordinary living-room; in fact, a big rack containing a tuning-fork control and a multi-vibrator gear synchro-clock is at the side of a fireplace. In another rack are six superhet wavemeters (in three pairs) and two receivers covering wavelengths of 200–600 and 1,000–2,000 metres. These superhets are mounted up in a very professional way on two wooden tables.

Measuring Field Strength

There are sets of 'phones in front so that the operators can check up the wavemeter readings aurally as well as on the milliammeters in the plate circuits. All the wiring is carried through shielded conduits and underneath the floor to the battery centre. There are no loose wires at all to be seen anywhere near the set. The Brussels station certainly looks like a laboratory! On a separate table is a large frame aerial in a stand, and a small set which is one of the two used for field strength measuring.

"About two hundred frequency measurements are made every evening, and this schedule has been carried out for the past five years," explained M. Divoire's assistant. "As the number of stations on the ether has increased so our staff has had to get busier and take more frequency readings. Every month the average readings for each station are plotted on a graph, and these are published for the benefit of broadcasting authorities."

The dual-wave sets have many interesting features—especially to a keen wireless listener who, as I do, builds his own sets and likes to know what the laboratory people consider best for world-wide reception.

The standard receivers have two H.F. stages with three tuned circuits and two L.F. stages. The 'phones are used for rough checking, but there is also a calibration device working in conjunction with the heterodyne wavemeters. This little job has to be done with great rapidity and accuracy, for directly a station is tuned in the wavemeter is tuned down to it and the reading taken—all within a few seconds.

"Practically every evening is spent in checking up the leading foreign stations in this way," continued my guide. "Last month's graph of frequencies is taken, and the alterations noted. Sometimes stations jump considerably in their wavelengths, especially if some other station outside the union has come on with higher power since the previous readings were taken, and then, perhaps, one of the stations to be measured has had to choose an entirely different spot in the ether to come to roost."

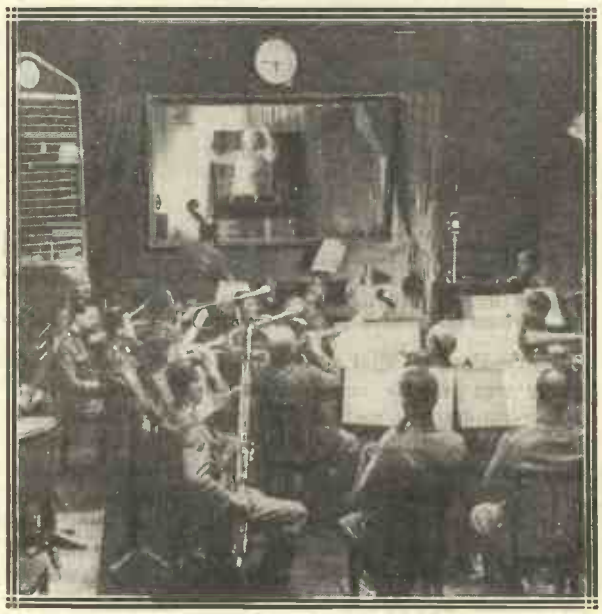
Accurately Calibrated

While the average amateur can afford to turn the dials aimlessly, the operators at the two check receivers have to spot each station and plot the wavelength variation all within a few seconds. The Brussels wavemeters, which are now used by the leading companies connected with the U.I.R., are the result of the experiments made by the men at this laboratory.

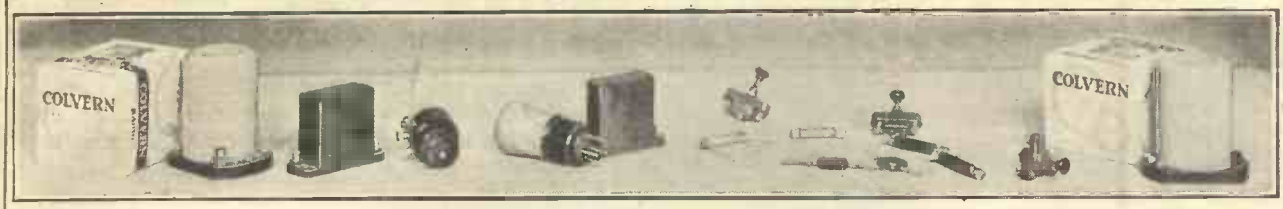
The technical committee's station is out in the suburbs of Brussels, so that it is well away from electrical interference, and the wavemeters can be accurately calibrated.

They are solidly-built jobs. They have big slow-motion dials with a vernier control, and a magnifying glass for the reading. It is possible to

SEEN—BUT NOT HEARD



A long-wanted improvement for broadcast music has been tried out at the Budapest station. The conductor is enclosed in a glass-fronted, soundproof room, and hears the orchestral music just as the listener hears it, via a loudspeaker. He controls the orchestra in the usual way and also by means of coloured lights. Budapest is the only broadcasting station in the world to have such a system in use.



get an easy reading to one-twentieth of a degree. As a matter of fact, I understand that they get an accuracy of about one part in ten thousand when checking wavelengths between 1,000 and 2,000 metres.

They showed me how easy it is to work the meters. First the heterodyne valve of the wavemeter was switched on and allowed to run up to its normal working temperature, so that the meter would be quite accurate. The station was rapidly tuned in on the high-mag. receiver.

"Heilsberg," said the set operator in a toneless voice. It is his duty to check over the same stations time and time again!

I looked inside an open cabinet of one of the Brussels testing meters and saw solid-looking variable condensers with aluminium balanced cylindrical armatures, air-spaced inductance coils on Pyrex supports, and extremely rigid-looking wiring.

Harmonics at Will

These meters are regularly tested against the standard wavemeter at Brussels, which is a tuning fork of the type used by the B.B.C. to control the relay station wavelengths. The tuning fork, of a special alloy called Elinvar, vibrates at 1,000 cycles per second. It is caused to vibrate by the A.C. current in the grid and anode coils of the power valve which drives it and which is in turn controlled by the waggling of the fork.

The multi-vibrator provides harmonics which can be selected at will for checking up the ordinary wavemeter, including those used by the B.B.C.

At practically every station where there is not a piezo crystal or a drive valve, a tuning fork is used to control the wavelengths, and you would think that the Brussels engineers would be satisfied with the working accuracy of their tuning fork for checking up the wavemeters. Not so, however.

Almost every day the master tuning fork and the multi-vibrator are checked against another standard. A synchro-clock (driven by a synchronous motor), running at a speed of a thousand cycles a second, is geared down to give a dot on a paper strip every thousand periods. One of the two pens bearing on the paper strip makes a dot when driven by the synchro-clock. The other pen prints dots at the same period from time signals transmitted by the Royal Observatory of Brussels.

Checking Field Strength

If the tuning fork does not drive the synchro-clock at exactly the right speed, the error will be shown up by the dots on the paper strip not coinciding. As a matter of fact, the test has hardly ever shown any error, but it is regularly done to make sure that even the master tuning fork is never out of truth.

"Wavelength checking is not the only job we have to do," said the guide. "This station is one of ten (including your B.B.C. Tatsfield station) which are Continental ether *gendarmes!* We are the watch dogs of the ether, and the field-strength measuring sets here at Brussels and at the other stations enable depth of modulation, quality, 'spread' and other vital matters to be checked so that the broadcasters can know if everything is O.K. at a distance. It is so easy to get false readings from local sets near the transmitter.

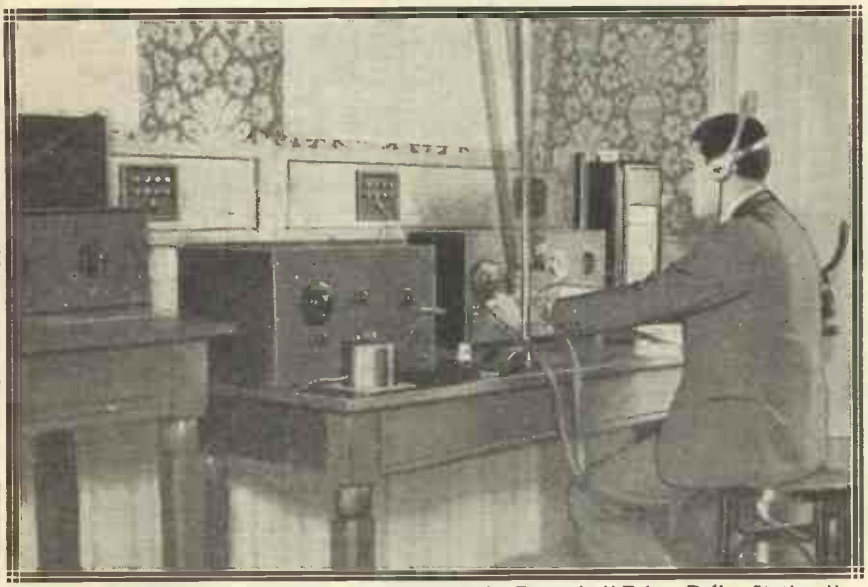
Local Oscillator

"For this work we have a super-het. with a frame aerial. The signal after detection is recorded on a milli-ammeter recorder. This gives an exact reading of the depth of modulation, but a standard must be known, and here again a local oscillator is used periodically to check up the readings on our field-strength sets."

Before leaving Brussels I saw the office staff of the *Gendarme* whose harsh duty it is to deal with the black-lists of stations which do not stick to their wavelengths, and the chief engineers of which have to be given polite reprimands!

A job needing tact!

WHERE THEY WATCH THE WAVELENGTHS

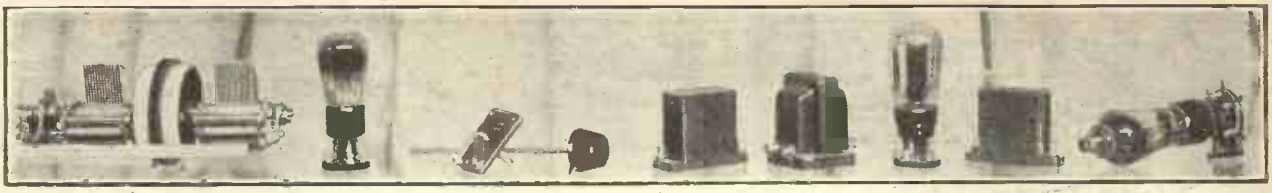


Some of the wavelength-checking apparatus at the Brussels "Ether Police Station," where all stations are tuned in nightly and their exact frequencies noted.

The calibrated dial of the wavemeter was rapidly turned and the locally-generated oscillations were made to beat with the carrier of the station received.

Aluminium Armature

At first the beat note was a low note of quite considerable intensity, but rapid manipulation of the wavemeter dial brought the beat note to a dead silence. A calibration curve was hurriedly consulted and the reading on the wavemeter dial gave the frequency of the transmission in kilocycles.



FROM HERE, THERE AND EVERYWHERE

Last-minute flashes from the world's broadcasting stations to keep you up to date with all changes and interesting happenings.

BARI, ITALY. The new Bari transmitter was—like those for Trieste and Florence—manufactured at the Chelmsford, Essex, works of the Marconi Co.

* * *

MADRID, SPAIN. The EAQ station that works on 30·4 metres with a power of 20 kilowatts is to be the official link of the Radio Club Ibero-Americana, which aims at achieving a better understanding between the Spanish Peninsula and America.

* * *

KAUNAS, LITHUANIA. The recent increase in power from 2·5 to 7 kilowatts was the result of installing a new mercury vapour rectifier.

* * *

LILLE, FRANCE. The site for the new station to be built under the Ferrie Plan has now been officially ceded.

* * *

WINNIPEG, CANADA. The VE9JR Winnipeg station is now working on 25·6 metres on weekdays from 10.30 p.m. to 1 a.m. (22·30–01·00).

* * *

RADIO PARIS, FRANCE. A special form of modulation, known as the Chireix system, or "de-phasing modulation," is employed by this popular French station.

* * *

ALGIERS, N. AFRICA. English lessons are now broadcast on Tuesdays at 21·45 (9.45 p.m.).

* * *

SHANGHAI, CHINA. Owing to the chaotic conditions of radio in China, Shanghai has about 27 different stations, many of them owned by wireless firms.

* * *

PRETORIA, S. AFRICA. It has been suggested that a special Afrikaans-speaking station be erected at Pretoria or Bloemfontein.

* * *

MOOSE JAW, SASKATCHEWAN. Programmes from the Moose Jaw studio are now re-broadcast from VE9JR, on 25·6 metres, from 10 to 10.30 p.m on Sundays (22·00–22·30).

BUCHAREST, ROUMANIA. There is a possibility of Bucharest shifting its wavelength from 394 metres, owing to the very bad interference experienced from Leipzig's news transmitter.

* * *

MOSCOW, U.S.S.R. The fiat has gone forth that radio must cost less to the State, which is generally taken to mean that some form of licence will be introduced soon.

* * *

RADIO BARCELONA, SPAIN. The animated dialogues sometimes heard from Radio Barcelona on 349 metres are not what they seem, for Barcelona has the world's only ventriloquist announcer, who often conducts animated conversations with himself!

* * *

VIENNA, AUSTRIA. The new transmitter being erected at Bisamberg will not be ready by the New Year, as hoped, but is expected to be on the air in the early Spring.

* * *

POSTE PARISIEN, FRANCE. As might have been expected, listeners to the Poste Parisien are complaining of interference from Breslau. And Breslau listeners complain of Poste Parisien!

* * *

"RADIO THESALONIK," GREECE. This, the first Grecian broadcasting station, is to work on 270 metres, probably for two hours a day, commencing at 11.45 and 19.15 (11.45 a.m. and 7.15 p.m., respectively).

* * *

KAMIKAWA, JAPAN. This receiving station, near Tokio, was the one successfully concerned in the recent two-way telephony between Japan and the League of Nations' station at Geneva.

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BUDAPEST, HUNGARY. Owing to an artistes' strike, the regular operas from Budapest may be abandoned.

* * *

TOKIO, JAPAN. The humorously-call-lettered Tokio station JOAK has been in trouble because its listeners say that the programmes are too dry!

* * *

TRIESTE, ITALY. This station has recently been getting over extremely well in the early mornings.

* * *

RADIO TOULOUSE, FRANCE. The new station which has been getting over well on 385 metres is situated at Château de St. Agnan.

* * *

BERLIN, GERMANY. Continuing Germany's regional scheme, Berlin is to have a high-power station. It will probably be working this month (January).

* * *

VIENNA, AUSTRIA. To the new Vienna station belongs the distinction of owning the highest-powered valve in Europe, if not in the world. It is a 300-kilowatter, of German design.

* * *

THE VATICAN, ITALY. The Vatican station has now taken to ultra short wavelengths, a half-metre link having been installed to connect the Pope's summer residence at Castelgandolfo.

WEST REGIONAL, GREAT BRITAIN. Test transmissions are expected to take place in April.

* * *

BUDAPEST, HUNGARY. The new station to work on super power is being proceeded with rapidly, but no official date of opening has yet been fixed.

* * *

AMSTERDAM, HOLLAND. Nearly half the listeners of Holland have no set of their own, but listen via radio exchanges.

MALTA. Although there are no broadcasting stations on the island, a licence fee of one guinea per annum is charged!

* * *

PLYMOUTH A new transmitter is to be installed and will experiment on a lower wavelength than the present one, until the best available wavelength has been found.

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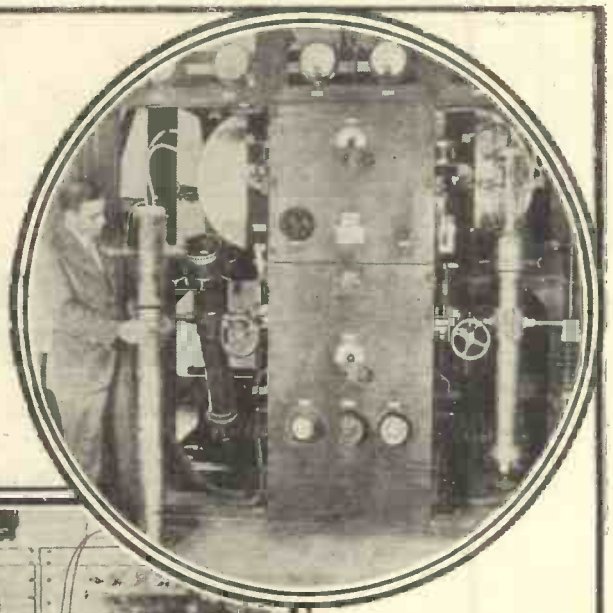
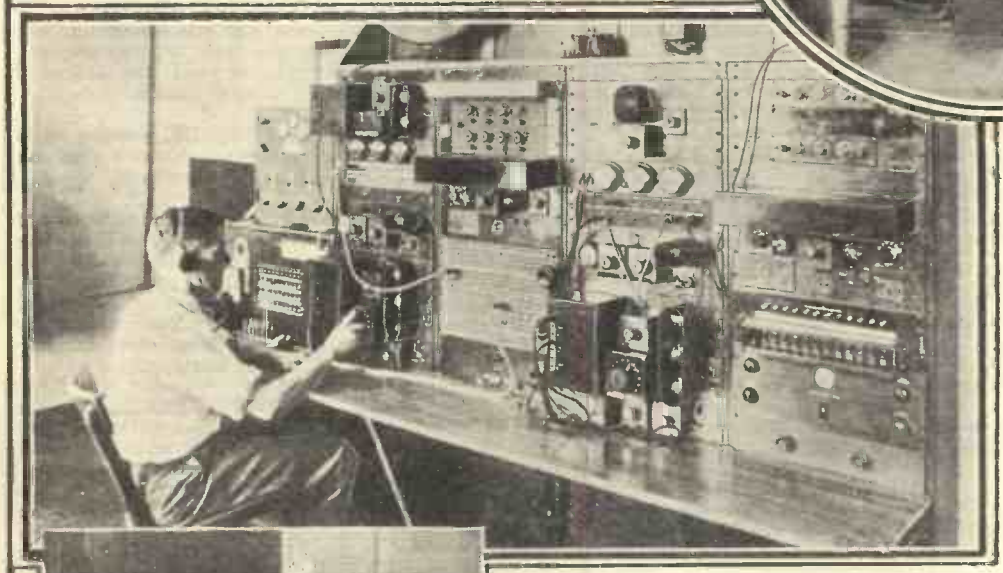
NEW YORK, U.S.A. A feature of the Christmas programmes was a relay from a church at Bethlehem.

RADIATING 50-KILO-WATTS IN THE STATES

WTIC—Hartford, Connecticut—is an American broadcasting station. It has, during its seven and a half years of service, been heard all over the world, from Kamchatka to Cape Town, and from Aberdeen to Sydney.

Little wonder that the officials of WTIC are proud of their 50-kilowatt transmitter!



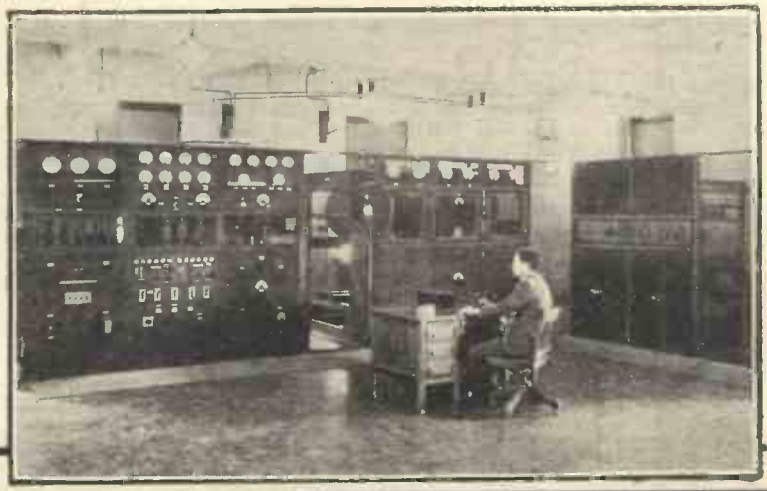


SWINGING VALVES

The water cooling jackets of the 100-kilowatt valves can be tilted on their axes to facilitate removal of the valves. The operator seen above is holding one of the valves after removal and the tilted jacket is seen empty. On the left you see the control-room, which is situated adjacent to the studios. Arrangements are made for a land-line to New York, and programmes from WEAF are relayed daily.

THE LONG AND THE SHORT OF IT

The lady on the left is comparing one of the big transmitter valves with the little quartz crystal which is used to control transmissions. Below is the main transmitter room with the central control desk. The complete transmitter apparatus can be started up and closed down by means of a single switch on the control engineer's desk.



AN AMERICAN SUPER STATION

February, 1925, saw the first broadcast from The Travelers' station, Hartford, Connecticut, U.S.A., and since then the microphone has been used solely for broadcasting. This is such a rare occurrence for a 50-kilowatter in America, that we feel it merits an article to itself!

THERE are not many super-powered stations in the world which are used solely for broadcasting purposes.

Station W T I C, however, which is situated at Hartford, Connecticut, U.S.A., is one of these. It is a station with a 50-kilowatt punch; and it broadcasts on a wavelength of 282·8 metres, equivalent to 1,060 kilocycles.

The station is owned and controlled by one of the big commercial and insurance concerns of the eastern States, with which is incorporated The Travelers' Broadcasting Service Corporation.

In the Front Row

The Travelers' station made its formal bow to the American public on the night of February 10th, 1925. It was an immediate success. So much so that within a few years it developed and grew far beyond its original size.

To-day, indeed, The Travelers' station, W T I C, at Hartford, Connecticut, is in the very front row of the American giant broadcasters. It has been heard all over the world, from Calcutta to Jamestown, in South Africa, from Aberdeen to Sydney, from Japan to Alaska.

If you look at your map of America you will see that the town of Hartford is situated near to the eastern coast of America, not far above New York. Here are located the studios and the administrative buildings of The Travelers.'

The actual broadcasting plant and aerial are situated ten miles west of the town on a 200-acre mountain site, which was chosen after careful tests had been made upon something like ninety different sites. It is to this most careful choice of site that W T I C's extraordinary range is, in many ways, due.

Excellent Beacon

The aerial towers of W T I C comprise the usual 200-ft. steel structures now common to most of the big broadcasters in America. They are lighted up at night, thereby being rendered visible for miles around and forming an excellent beacon for airmen.

The transmitter proper is housed in a massive but beautiful building of New England architecture, being adequately spaced in a large room some 2,000 sq. ft. in area. Below this, on the ground floor, is distributed the associated power equipment, technical offices and store-rooms, whilst the floor above the transmitter is reserved for any future developments of the station.

The transmitter of W T I C is crystal-controlled. So efficient is the control of frequency thus obtained that, although the Federal Radio Commission of America permits a variation in frequency of 500 cycles in a million, the normal frequency-variation of W T I C's transmitter is never more than 20 cycles in a million. This degree of control refinement is attained by maintaining the thin wafer crystals of quartz which serve to control the frequency at a temperature which is absolutely constant.

The temperature of the W T I C control-crystals is not only held constant to within a fraction of a degree by means of a thermostatically-controlled heater, but in other ways the effects of even this slight variation have been reduced to a minimum.

Continuously Cooled

The transmitter itself is for the greater part of the usual American type, its chief feature being the giant 100-kilowatt valves which are employed. Two of these valves are used in the 50-kilowatt power amplifier of the transmitter.

Some idea of the immense amount of energy handled by these valves may be gained by a consideration of the fact that if they were not continuously cooled by a uniform flow of ice-cold water they would within a few seconds generate enough heat to melt their copper jackets.

All the voltages required for the transmitter are derived through rectifiers, generators and transformers working off a primary source of 2,300 volts A.C. The valve filaments take 600 amps., which current is supplied by a large motor-generator working off the initial supply of current; 10 : 1 transformers step-up the initial A.C. current to 20,000 volts D.C., which forms the main plate supply of the valves.

Automatic Relays.

The transmitter is, of course, semi-automatic in operation. It can be started-up by the pulling over of a single switch, and indicating instruments which check every circuit of the broadcasting plant are provided with automatic relays which give warning whenever anything goes amiss with "the works."

The supervisor controlling the transmitter sits at a central desk in the transmitting-room, and signal lights which alter from red to green like small traffic lights indicate to him whether any given portion of W T I C's giant broadcasting apparatus is functioning correctly or not.

No Wastage

The aerial tuning circuit of the transmitter is situated away from the main plant. The 50 kilowatts of broadcast power which is generated by the transmitter is led over a thick transmission line to an "aerial tuning house," some 500 feet distant from the transmitter building, and situated directly below the aerial, which, incidentally, comprises one of the "T-cage" type. Here the radio energy is fed directly up into the aerial to be dissipated into space with the least possible amount of wastage.

The location and design of the aerial system, the wire earthing arrangement of the transmitter, the very effective insulation of the steel aerial towers, and the location of the aerial itself at a distance from the transmitter, all go to make up a radiation system for station W T I C of the highest efficiency. Hence surprisingly little of the transmitter's output of energy is dissipated as useless heat close to the aerial; practically the whole power of the transmitter being flung off from the aerial in a serviceable manner.

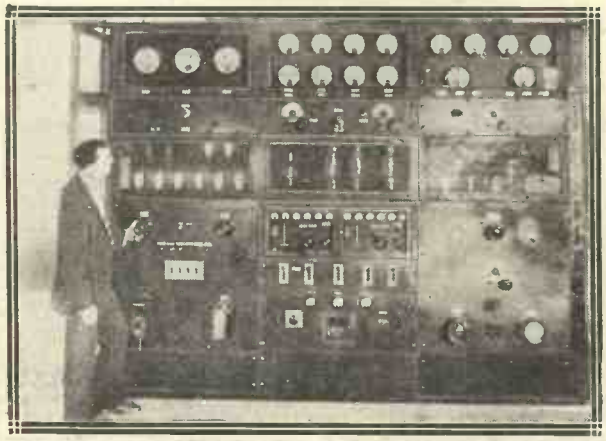
Hartford, Connecticut, is not very far from New York, and it is not surprising to learn that station W T I C is linked in synchronisation with the famous W E A F, of New York City.

A Shared Channel

This is a radio arrangement which is the first of its kind in wireless history. W T I C operates half the available broadcast time on its own wavelength, after which it changes over to W E A F's wavelength, thus sharing the latter channel with the New York station.

An altogether interesting arrangement and one which in the future will become more and more in evidence no doubt.

CRYSTAL CONTROLLED



Crystal-control is used for the wavelength of W T I C, and is operated on the centre panel. To the left, the engineer is operating the rectifier control. Fifty kw. and 282·8 m. are the credentials of this station.

SHORT-WAVE "SHORTS"

A new station at Madrid, using the call-sign E A J 7, is transmitting irregularly on 29·7 metres.

* * *

A recent addition to the list of short-wave stations is Y V-11 B M O, Venezuela, working on 48·95 metres.

* * *

The Norddeich station, D A N, is working regularly with several German ships on 36, 24 and 18 metres. This station has also been heard just below 5 metres, but probably harmonics were responsible for this.

* * *

Several British amateurs are now working on telephony on the 5-metre band, and may be received at great strengths up to distances of a few miles with the simplest of receivers. If you should hear an amateur transmitter testing on "56 megacycles" you will know that you are down in the region of 5·3 metres.

* * *

The new Empire Station at Daventry commenced its regular transmissions on December 19th. Five wavelengths will eventually be used, one of which will almost certainly be in the neighbourhood of that now used by Chelmsford, G 5 S W. The others are expected to be in the regions of 48 32. 18 and 16 metres.

* * *

Those who have never heard South America should look out for Rio de Janeiro (P R B A) on 31·58 metres. He is strongly received on most evenings after 10 p.m.

"LONDON CALLING THE EMPIRE"

A first-hand description—specially written for readers of "The World's Programmes"—of the Empire transmitters at Daventry which started their broadcasts to every corner of the Empire on the 19th of last month.

On the top of an unusually cold and windy hill near Daventry, under the giant masts that help to make 5 X X a real "National" transmitter, are a number of unassuming little wooden masts and a neat little brick building which are destined to become far more famous than 5 X X, 5 G B, or, indeed, any venture that the B.B.C. has yet made.

The New "Baby"

I was lucky enough, on my visit to the Empire station, to find two engineers who were old friends of mine, who also took such pride in "the B.B.C.'s new baby" that they never tired of showing people round. When they found someone, like myself, who was as keen on short waves as they were, and who didn't perpetually worry them about who was going to pay for the Empire programme, they simply couldn't be stopped!

The result was that in six hours or so I don't imagine I missed much of the organisation that will control "Stations G S A to G S G."

In the modest-looking, squat building that you have already seen in illustrations, is housed the most comprehensive system of short-wave transmitters in the world. Also, if the hopes of the engineers are realised, it will be the most efficient.

The general scheme is already familiar, I expect, to most readers. The Empire is divided up into five "zones," and for each of these a system of beam aerials has been erected at Daventry. Each zone, with the exception of Australasia, will be served simultaneously with the same programme on two different wavelengths.

Not Much "Alternative"

This policy has been criticised by the non-technical Press, who think that an alternative programme should be provided. Actually it wouldn't be much of an alternative, for it will generally happen that only one of the two wavelengths will be really well received.

A system of eighteen outside aerials enables all the necessary changing to be done, although, naturally, it is all carried out from inside the transmitter building. When I saw the two transmitters they were arranged so that each could be worked on four different wavelengths, the changes not taking more than a few minutes.

To do this, four quartz crystals and four complete crystal-oscillator stages form the first unit of each of them. These are followed by frequency-doublers and amplifiers driving the final stage, with an input of 50 kw. The Empire would rejoice could it but see those 5 amps. at 10,000 volts going into the last stages of the two transmitters!

Beautifully Arranged

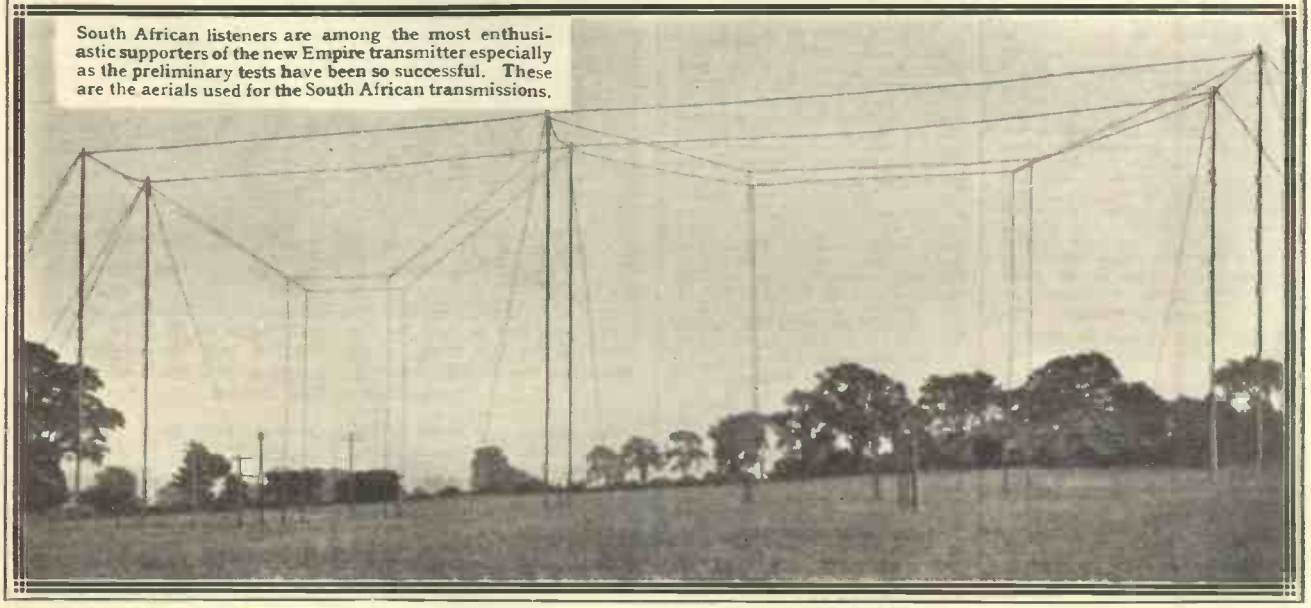
From the last units two leads go off to "aerial feeder panels," which are really glass panes at which the feeder lines from all the various aerials end. A kind of super-plug-and-socket connection, about the size of a sparking-plug, is used for this important job.

The transmitter-hall is beautifully arranged, one transmitter running down each side, the power-supplies being at the far end and the two control desks in the centre. The control-room for the programmes arriving from London is a separate unit just inside the main door.

At one side another "hall" houses five huge radiators and fans, cooling the water which flows round the valve anodes and tuning coils—for even the coils have to be water-cooled on a job like this. On the other side of the building are housed the banks of generators supplying all the requirements of grid bias and filament current—a matter 400 amps. at 26 volts for the main amplifiers alone!

When the programmes commence,

(*Continued on page* 49)



South African listeners are among the most enthusiastic supporters of the new Empire transmitter especially as the preliminary tests have been so successful. These are the aerials used for the South African transmissions.

What the Distant Stations are Doing

Extracts from the log of "M.W.'s" own station searcher who listens to the world's programmes so that you may know the conditions in the ether every month.

Long distance reception upon the medium waveband appears to be undergoing a gradual but revolutionary change. A few years ago we never dreamed of re-receiving South American broadcasting upon this band. Compare that state of affairs with the present day.

Now we are almost certain to receive one or other Buenos Ayres station if we sit up late enough. Peculiarly enough, this sudden change of conditions has not, as might be imagined, been brought about by an increase of the power of the South American stations.

Is It Unreasonable?

The power and, in most cases, the wavelengths are the same now as they were when we were unable to receive them. Even more interesting is the fact that the highest power as yet employed by any of these stations is 10 kw., and L R 3 (one of the most powerfully received Buenos Ayres stations) employs only 3 kw., although it will shortly be increased.

In consideration of these facts is it so unreasonable to expect more changes in reception conditions, changes that may result in our receiving Australian and New Zealand broadcasting regularly?

At the present time New Zealand and Australian enthusiasts can receive European broadcasting comparatively readily. One may remark that with all Europe's high-powered stations they most certainly should. The interesting point, however, is that besides receiving numerous European high-powered stations, a number of the low-powered stations are heard fairly regularly. These stations include Leipzig (when employing 2·5 kw.); Gleiwitz (5 kw.); Hamburg (1·5 kw.); and Radio Toulouse (8 kw.).

American enthusiasts also hear Australian and New Zealand, to say nothing of Japanese, stations regularly.

Daylight Reception

1932 was renowned for its daylight reception. Even so, the last month has beaten all its predecessors in this field.

Genoa; Trieste, Stavanger; Nürnberg; Bordeaux Lafayette; Bordeaux Sud-Ouest; Flensburg; Fécamp; Heilsberg; Bari; Hilversum; Poste Parisien, Paris; Strasbourg; Radio Toulouse; Dublin; Ecole Superieure; Katowice; Rome; Langenberg; Brussels, and Budapest have provided good loudspeaker signals upon many occasions. At slightly lesser strength I have received Viipuri and Helsinki (both in Finland), and Fredriksstad and Porsgrund (Norway).

As night comes on the log swells to amazing proportions, and such stations as Lwów; Tallin; Riga; Trondheim (Norway); Sundsvall; Ljubljana; Belgrade; Bucharest; Lisbon (C T 1 A A) (when transmitting); Orebro, and Christiansand have been heard regularly, strength being about equal to the North Regional transmitter.

Held Its Own

Readers may remember a remark of mine in these notes regarding an all-electric orchestra, known as the "Thermin Electro-Ensemble," which broadcasts regularly over the Columbia Broadcasting System stations.

A similar orchestra was broadcast from Berlin recently.

Generally speaking, the instruments were very similar to the instruments after which they were named. The electric-piano was an exception.

The complete orchestra held its own against any ordinary orchestra of similar size.

L. W. O.

"LONDON CALLING THE EMPIRE"

—*continued from page* 48

the following arrangements will be used, although modifications are sure to take place later on as the requirements of each zone become clearer: Australasia, 25·5 metres, 9.30–11.30 a.m.; India, 25·3 and 16·9 metres, 2.30–4.30 p.m.; Africa, 31·3 and 49·6 metres, 6–8 p.m.; West Africa, 31·5 and 49·6 metres, 8.30–10.30 p.m.; and Canada, 31·5 and 49·6 metres, 1–3 a.m. All times are G.M.T.

I note from the aerial arrangements that provision has also been made for serving Africa with a wave of 13·97 metres, India with 31·5 metres, West Africa with 25·5 metres, and Canada with 19·8 metres.

The reason for using 25·3 as well as 25·5 metres and 31·3 as well as 31·5 metres is that one transmitter shall handle each pair. Thus when No. 1 transmitter has been transmitting to Africa on 31·3 until 8 p.m., the other will be all ready to go on 31·5 for West Africa at 8.30, while, if necessary, the first is being changed over from 49·6 to 25·5 metres.

With the possible exceptions of W 8 X K and W 2 X A F, the Empire transmitters will be the highest-powered short-wave broadcasting stations in the world. Being, for the present, the most modern, it may be truly said that a big step in short-wave radio technique has taken place. We can say no more for the time being, except that "the proof of the pudding is in the eating".

W. L. S.

THE REGENTONE "STRAIGHT-THREE" A.C. RECEIVER

Some first-hand information about an interesting three-valve A.C. set. It has a detector, followed by two L.F. stages, and will appeal greatly to lovers of this "straight" circuit arrangement.

By A STAFF TECHNICIAN.

THERE was a time when radio-minded folk would indulge in heated arguments concerning the merits of S.G. amplification, and the question usually resolved itself into the straightforward issue of whether the composition of a three-valve circuit was better as a detector and two L.F., or as an S.G.-det.-L.F. arrangement.

Far From Being Dead

Nowadays the merits and advantages in certain respects of S.G. amplification are almost universally admitted. But that should not be taken as an implication that the old and ever-popular det. and two L.F. circuit is dead. Far from it.

It just means that from the point of view of the modern requirements of a high degree of selectivity combined with reasonable sensitivity, the S.G.-det.-L.F. scheme is, commercially, the better proposition.

You will notice that we say "commercially." That is because in many other respects the det. and two L.F. combination still has a lot to commend it. For instance, apart from what in these days is the primarily important consideration of lower cost, the fact that it has only one tuned circuit is reflected in the ease with which it can be operated.

Commendable Action

It is for these and other reasons that we commend the action of Messrs. Regentone in producing an all-electric version of the "old love."

The Regentone "Straight-Three"—a model of which was recently subjected to "M.W.'s" tests—is a good, reliable set. By comparison, obviously, it cannot be expected to give a measure of selectivity commensurate with that given by an S.G. arrangement, but in all other respects we are justified in referring to it as an ideal "family" receiver.

Sprinkling of Alternatives

After all, the suitability of any set for modern conditions necessarily depends upon the uses to which you want to put it, and if contentment in the radio sense is obtained with a set that gives superb reproduction of the local stations with a fair sprinkling of reliable alternatives, then this Regentone instrument is just the thing for you.

It is built into an attractive solid walnut cabinet—it incorporates an excellent moving-coil loudspeaker—it is dead simple to operate, and it is available at the extremely modest price of £12 complete. It might, in fact, be regarded as the most convincing argument that we have yet found in favour of the retention of the no-S.G. combination.

Turning, for a moment, to the actual controls, the central upper one is the knob by which the set is tuned, and immediately below it is the four-way switch control giving medium waves, long waves, gramophone and "off" positions.

On the left is a control which is primarily for the purpose of adjusting selectivity, but it also constitutes a most useful pre-detector volume control on powerful local transmissions.

USES METAL RECTIFIER

The mains rectifier for high-tension can be spotted to the left of the chassis, while to the right is the inductance.

TECHNICAL SPECIFICATION

NUMBER OF VALVES.—Three—detector, L.F. and pentode.

GENERAL DESCRIPTION.—All-electric three-valve receiver for A.C. mains, 200-250 volts, 40-100 cycles. A moving-coil loudspeaker is incorporated. Can be used with mains aerial. Sockets are provided for pick-up and external L.S.

CONTROLS.—One for tuning, one for volume, one for selectivity, and switch giving medium long-waves, "off," and "gramophone" positions.

DIMENSIONS.—Height 20 ins., width (at base) 17 ins., depth 10 ins.

PRICE.—£12 complete.

MAKERS.—Regentone Ltd., Regentone Works, Worton Road, Isleworth, Middlesex.

The one remaining knob—that on the right—controls reaction, and in consequence it only comes into use when it is desired to receive distant stations.

No Trace of Interference

Provision is made at the back of the instrument for the usual aerial and earth connections, and sockets are also provided for a gramophone pick-up and for an external loudspeaker. In addition, an ingenious plug and socket scheme enables the receiver to be used in conjunction with a mains aerial, under which conditions it works very well.

In our practical tests, which were conducted with an outside aerial of average dimensions, the strength of the local stations had to be considerably reduced in order to provide comfortable listening. There was not the slightest trace of interference between them, indeed, by careful adjustment of the selectivity control we found it possible to separate the London Regional and Midland Regional stations, which speaks volumes for the efficiency of the set.

As a result of our tests it is with confidence that we recommend this set as a good, reliable domestic installation.

AT YOUR SERVICE

by OUR TRADE COMMISSIONER

A HAPPY New Year to you all, and may 1933 be a bumper year for radio. It ought to be if the energy many firms are putting into their businesses takes effect.

"Astride of the Times"

The introduction to the Wearite catalogue contains the words quoted above, and an examination of the contents fully endorses them. The range of components emanating from this go-ahead concern are varied and numerous, and the reading of the book alone is interesting, whether or not you are on the look-out for a piece of radio apparatus.

Always in the forefront of superhet component design, we find that Messrs. Wright & Weaire have now extended their range of oscillators, intermediates, and so on, to include a four-gang coil assembly which consists of an aerial unit, a band-pass H.F. unit and oscillator to be tuned with an ordinary four-gang condenser.

The heterodyne filter for cutting out interference is a new line that is particularly interesting, and I hear that the ingenious Q.V.C. volume-control and combined switch is going very well. Strip resistances and R.D. resistances cover a wide range of values and wattages. Screened chokes have also attracted the attention of the powers-that-be at Tottenham, and several models are available.

But it is in the mains transformers and the L.F. chokes that I am particularly interested, for here we find that very substantial price reductions have been made possible by re-designing a number of components and introducing other new ones. The result is that the Wearite range of mains apparatus is one of the finest I have struck at anything near the price. Just you get one of these catalogues and see for yourself.

Marconiphone Promotion

We heartily congratulate Mr. J. H. Williams, who since April last has been a director of Marconiphone Co. Ltd., on his appointment as Managing Director. Mr. Williams' career with the company has been almost meteoric—starting as sales representative (we are told) in Manchester, he rapidly climbed the ladder till now, some nine or ten years later, he has reached the top.

Mr. G. R. Osborne, too, is another who is on the upward trend in the same firm, and we are delighted to hear of his appointment recently as Sales Manager. I knew this young enthusiast years before broadcasting was ever thought of, during the dark days of '14–'18, when he joined the then Marconi International Marine Communication Co. Ltd., and so have been following his progress with particular interest. He should do well as Sales Manager, for above every thing he is a real enthusiast in the world of radio.

Some trade news and views that are of interest to readers, whether or not they are connected with the radio industry.
Members of the trade are invited to send items of interest, or photographs, to be included under this heading.

Blue Spot Successes

I was having a chat recently with Mr. Brown of the British Blue Spot Company, Ltd., and I was interested to hear that the Blue Spot battery receivers introduced at the recent show are in great demand. I'm not surprised—they are jolly good.

The Annual Banquet and Ball

Mr. J. H. Whitley was the guest of honour at the annual banquet and ball of the Radio Manufacturers' Association at the Savoy Hotel last month, which was a great success. It is always a lively, cheerful gathering, and this time it seemed better attended than ever. 'Twas a merry show!

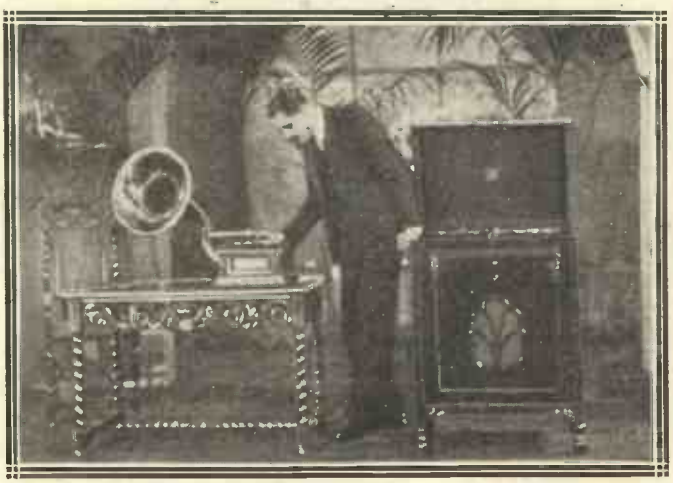
New Ferranti Chart

A constructors' chart for a four-valve battery set has recently been issued by Messrs. Ferranti Ltd. The well-known Ferranti band-pass circuit has been used, and push-pull output is employed. The cost, excluding batteries, valves and cabinet, is £11 12s.

Climax D.C. Set

A D.C. model of the "Climax Band-pass" Three receiver has been brought out, and is similar to the A.C. one in performance. It is stated that the performance on a

BEFORE AND AFTER



A scene from a "Pathetone Weekly" film showing an H.M.V. gramophone contemporary with Caruso alongside the latest superhet auto-radiogram. The former plays the original Caruso records, and the latter the new re-recording of the famous tenor's voice.

Many Interesting New Components

gramophone of the new set is one of its outstanding features. The price is 16 guineas.

H.M.V. at Sheffield

The Special Products Branch of The Gramophone Company has installed a loudspeaker address system in Sheffield Town Hall so that speeches can be heard from any of the five halls without difficulty. Incidentally, the apparatus can be used, not only to make a speaker audible in the hall in which he is speaking, but also will broadcast his voice throughout the building should occasion warrant wholesale " reception " of the speech.

I understand that broadcast programmes and gramophone record recitals will also be available through the same medium in the near future.

Claude Lyons and B.A.T.

I have just received a couple of lists of B.A.T. products from Claude Lyons Ltd. They include practically everything you could wish in the way of switches, resistances, chokes, power transformers, and gramophone motors and pick-ups. A very wide range of transformers for A.C. sets is provided and, as with all Claude Lyons' parts, you can be sure that they are good. " Ohms Without Tears " is the way Mr. Lyons introduces the B.A.T. resistors, which follow the gradually getting popular colour system of resistance indication. Here again a very wide range of values is available, and the prices are low.

A special feature is that the resistances can be obtained in three ranges of percentage accuracy, namely, 10, 5 and 2 per cent, the price ranging in the case of the 1-watt or smaller types from 10½d. for the 10 per cent, to 1s. for the 5, and 1s. 3d. for the 2 per cent accurate resistance.

It would take a lot of space to go at all thoroughly into the many pages of the catalogues, and I would strongly advise all my readers to send to 40, Buckingham Gate, S.W.1, for copies, so that they may peruse them at their leisure, and have them at hand whenever they are in search of radio parts.

GROUPED EFFICIENCY!

There is no accessory requirement of the discerning enthusiast which cannot be found in the extensive Ediswan range. The random array of sample lines shown here presents a picture of quality apparatus to delight the eye and whet the appetite of every " must-have-the-best " set owner.

FERRANTI, FORWARD!

Mr. V. Z de Ferranti receiving from Ann Penn the silver cup awarded by the " Evening Chronicle " for the best value-for-money set at the Manchester Exhibition. The set chosen by the public ballot was the Ferranti Superhet.

An Interesting Book

I have before me a most interesting little book issued by the Igranic Electric Co. Ltd., and describing the various electric amplifying and reproducing equipment that are produced at their Bedford factory. The book is in addition to the standard Igranic catalogue of ordinary radio goods, but it is worth sending for if you are interested in power amplification as supplied to public address systems and dance halls.

A Powerful Team

I suppose that one of the strongest teams of components and accessories is that marketed by The Edison Swan Electric Co. It contains practically everything that you could wish for in the way of batteries, loudspeakers, pick-ups, and valves, in addition to a lot of smaller lines that are well up to the high standard that Ediswan set.

Some of the chief lines are shown in the photograph on this page, wherein you will recognise the B.T.-H. moving-coil speaker unit which can be obtained in several types, ranging in price from round the £3 mark for a cabinet model of the Minor R.K. to something like £7 15s. for the A.C. model of the senior R.K.

Pick-ups in two varieties are available, while the huge range of Mazda valves needs no explanation to our readers. These valves have always been in the forefront of radio valve design and none has enjoyed a better reputation for efficiency and long life.

Ediswan dry H.T. batteries, too, have recently set a standard of reliability and efficiency combined with low price that has been the talk of the radio trade, while the wet variety have long been recognised as excellent value for money.

The Extralife accumulator for L.T. supply is one that deserves special mention. At 4s. 3d. for the smallest it is wonderful value. And so I could go on enumerating the many attractive lines of this old-established firm, for whenever you turn among the lines emanating from the various factories controlled by Ediswan you find something worth while, something you can do with in your radio outfit.

ON THE SHORT WAVES

by W.L.S.

My gentle hint that a short-wave club in this country might be a good thing has brought forth a host of suggestions, some of them helpful and some otherwise. Perhaps I had better make it clear at once that I was not thinking of treading on the toes of the International Short-Wave Club, which has a London Chapter in full swing, and others, I believe, in the course of development.

Now that this Club is actually so placed as to be able to hold meetings, the cause of my original suggestion has been largely removed. At the same time, however, there is still plenty of room for local short-wave clubs, and if I can do anything to assist in their formation I shall be more than pleased to do so.

I should like to say quite definitely, by the way, that (flattered as I am by the suggestions that I should start a club myself) I have not the necessary spare time to take on any "extras" for a very long while!

Dark Hints

Some of those who read this may have noticed dark hints in "Popular Wireless" about a superhet for short-wave broadcast reception, that is on my bench at the moment. There is no harm in saying at this stage that it is intended for readers of "M.W.," and that it will be described in full as soon as possible.

So many readers in the "Outposts of Empire" have written pleading letters for a real big loudspeaker set—preferably a superhet—that after due consultation with the Powers That Be I started attacking the problem.

No matter what branch of short-wave reception claims your special interest, you will find these pages by our popular contributor make uncommonly good reading.

"W. L. S." combines a ripe experience and knowledge of his subject with a special aptitude for clear writing on the technicalities, and cheery comment on the S.W. topics of the moment. This month, among other items, he has some interesting things to say about a forthcoming short-wave super-heterodyne receiver.

Short-wave superhets to-day are a very different proposition from their brothers and cousins of a few years ago. Luckily for us all, the changes have been in the direction of a general cleaning-up of the design. Components, too, have improved vastly, with the result that it should now be possible to get as much out of five valves as one used to expect from seven or eight.

RADIO "FIRE ALARM"

Part of the equipment of this forest "fire-lookout" is a complete portable transmitter and receiver, which is used for reporting and communication during fires.

Beautiful Stability

Superhets are of little or no interest to the "ham," or even to the man whose idea of Paradise is to sit and listen to the said "hams." Weak C.W. signals are best dealt with by a much smaller and quieter set. The superhet shows up best on telephony transmissions that are already moderately strong on a smaller set, and its great advantages are, of course, the enormous signal-strength obtainable and the beautiful stability and ease of handling.

Signal-frequency amplification with S.G. valves is all very well down to 40 or perhaps 35 metres; but after that it becomes rather questionable whether it is worth while. To obtain a small amount of amplification for a great amount of trouble is a state of affairs that proves rather unpopular with the average radio man, who, as a rule, wants something for nothing!

Getting Every Ounce

With a superhet one can, of course, get every ounce out of the S.G. valve working at the intermediate frequency of 100 or 110 kilocycles, and the feeling that a valve is being fed with expensive watts and not doing anything for them is entirely removed.

It is nice to note the return of moderately good conditions after

the rather wretched state of affairs that existed throughout the late summer and autumn. December is a good month, as a rule, and January and February rarely let us down. What a blessing it is for all of us that the bad radio months are usually the months in which outdoor pursuits take up most of our time.

Vagaries of the Ether

We short-wave fans are far more dependent upon the vagaries of the ether than are the folk who simply tune in whatever broadcast station they want, *when* they want it. But, when one comes to think of it, doesn't that make it far more interesting? If one could always sit down to the set and tune in Sydney, would it not begin to pall after a few weeks? I don't think I should find any thrill in short-wave work were it not for the "glorious uncertainty" associated with it.

Hard Thinking

It is rather amusing sometimes to ask a fervid broadcast-listener why he has never thought of taking up the short waves. "Too much trouble," says one. "Never heard of 'em," says another.

Others will talk glibly about being more interested in "quality reproduction," listening the while to an overloaded amplifier working into a cheap loudspeaker.

The whole fact of the matter is that short waves are being treated too much as an entirely separate branch of radio. The day *will* come, undoubtedly, when all commercial receivers will cover the "ultra shorts" as well as the other bands, but someone will have to do some hard thinking and evolve a real wavechange scheme before that happens. I freely admit that it has got *me* beat.

Crazy People

The designing of a scheme that will make it possible to *tune* over the short, medium and long wavebands is, of course, relatively simple. Plenty of sets have been described in "M.W." and "P.W." that are admirable in this respect. What no one has yet done is to devise a set that will give equally easy operation on all bands. Something that will tune in Sydney as if he were, say, Langenberg is what we all want.

This can be done with care on a set for short waves only; but the all-wave set with this desirable qualification is something that I have yet to see. May the day come soon. Even when it does, there will still be crazy people like you and me who go on building our own sets just for the fun of the thing!

Palatial Laboratory

Incidentally the mental pictures that one or two correspondents of mine have formed of my own gear are distinctly amusing. One describes his idea of my "shack" as a palatial laboratory with yards of benches, and at least thirty different short-wave receivers all rigged up ready to be switched on at a moment's notice. He apparently thinks that I am the "mad millionaire" of fiction, with a vast fortune all tied up in short-wave gear.

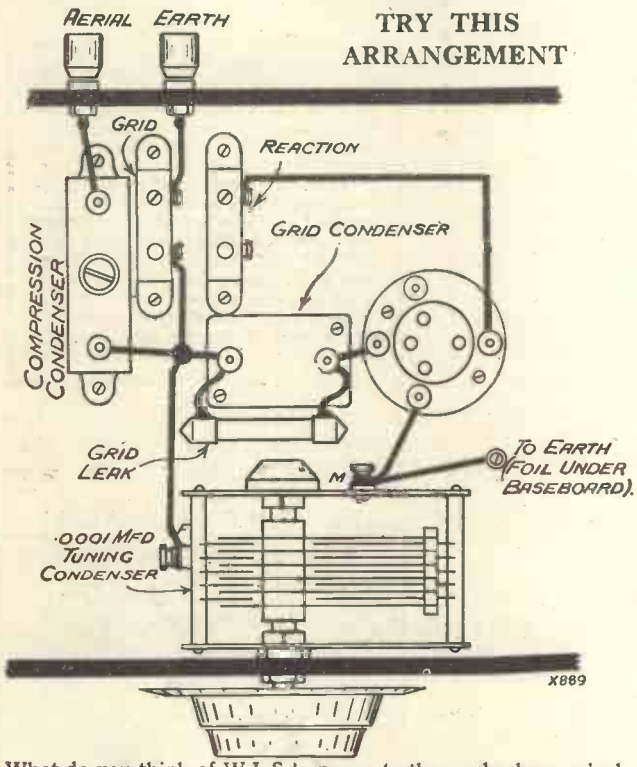
I don't know where this strange idea came from, unless he thinks that all the sets that I design and describe are left permanently rigged up where they started!

Suffice it to say that the average casual caller might easily catch me "on the hop" with nothing but the modest single-valver rigged up!

I never allow myself to be caught without anything, and this "single" is the Set that Must Not Be Pulled to Pieces. As a "stop-gap" it is quite unrivalled.

"I am rather doubtful if it will be found satisfactory in the matter of wavelengths. It looks to me as if certain zones may find that the transmissions meant for other parts may turn out to be better than their own." Read W.L.S.' comments on the new Empire station on a following page.

I am often asked, by the way, for my idea of "the ideal layout" for a detector stage. Personally, I don't think there is such a thing as an *ideal* layout for anything, but the accompanying sketch shows an arrangement of parts for the detector that seems just about as efficient as one can make it.



What do you think of W.L.S.' answer to those who have asked him for an "ideal layout" for a detector stage? Our short-wave expert says: "I don't think there is such a thing as an ideal layout . . . but this arrangement seems just about as efficient as one can make it."

All the leads are short and direct, and yet the coils are well away from the "iron and steel department"—a more important point than seems to be generally appreciated. I was entertaining myself the other day by reading some of my own articles in "M.W." back in 1927 and 1926, and I seemed to be far more worried in those days about keeping the field of the coils clear than I am now.

I admit that we may have been rather over-enthusiastic then, when the "low-loss" craze was at its height. Nowadays we realise that the term "low-loss" means absolutely zero! But then—*what* a craze it was. Anything that looked more like a skeleton than a variable condenser had the horrid adjective pinned on to it, and cost 50 per cent more accordingly.

It is a matter of lasting regret to me that I have not been able to keep intact one of my receivers of seven years ago. Doubtless we should enjoy a hearty laugh at its performance

nowadays, for conditions have fallen off almost continuously since the memorable winter of 1927–8. I shall see to it that my single-valver, previously referred to, becomes "immortal," if only for the sake of affording me some cheap amusement in 1940!

As we are entering upon another year (and all best wishes, by the way, to my readers!), it is rather interesting to speculate on what developments we may expect to see. Personally, I don't expect much more than a general improvement in the standard of transmission and reception.

No Revolutions!

Nothing revolutionary appears to be on the way, but everything is always improving in a quiet way, and, taking this in conjunction with the fact that conditions are now due to improve also, we may be better off when I write my last notes for 1933.

I think we can truly say that 1932 has seen an improvement in reliability. Reception of American stations, for instance, is no longer looked upon as the achievement of the expert. When a man says he has heard America on short waves, the usual reply is: "And so he jolly well ought to!" Which is as it should be. We don't treat broadcasting as a miracle any longer, and even our beloved "DX" is fast becoming a commonplace.

A Step Forward

One thing that I am looking forward to is a higher degree of accuracy in mass-produced components. This applies particularly to short-wave people, whose chief trouble in trying out a new set is still to find exactly where they are. When things are so good that I shall be able to describe a set in "M.W." and to guarantee that, if similar components are used, Sydney will be found on 33·5 degrees, *then* we shall have moved another step forward.

Short-wave stations are all bunched together in groups, so closely that it is a real problem to identify a station without waiting, perhaps, for a long speech in a foreign tongue before any announcement is made.

The accurate calibration of any particular short-wave set is an easy matter, but standardisation is, as yet, quite a long way off. Incidentally, very few people seem to possess a heterodyne wavemeter, although I find my own one of the most useful pieces of gear about the place. I have made references to this before, and they have nearly always brought forth requests for the design of such an instrument. The reply is simple—just make yourself an ordinary oscillating detector, and there you have it.

Handy Wavemeter

Use good components, wire the thing up rigidly and, above all, put a respectable slow-motion dial on the tuning condenser, and you will then have a heterodyne wavemeter that should serve you very well. Don't change the valve about or even alter the H.T. voltage, or you will naturally play havoc with the calibration.

I find that a 16-volt grid-bias battery and a very small 2-volt unspillable accumulator may be included without making the wavemeter too bulky, and if it is made in a small aluminium box with a handle on the side, it becomes very convenient to walk about with.

I have purposely refrained from talking about "what is on the air" this month, partly because nothing very startling has happened since the beginning of November in the way of new stations. By the time you read this, however, the Empire station will be on the air—another milestone in short-wave radio.

I am rather doubtful whether it will be found satisfactory in the matter of wavelengths. By this I don't mean that it will be a failure for any particular zone, but it looks to me as if certain zones may find that the transmissions meant for other parts may turn out to be better than their own! Australasia, for instance, might well find that the 31-metre programme is better than the 25. This is only a long shot on my part, but I am going by our own experiences in the reception of foreign parts.

By next month we shall all *know* what things are like, and I will therefore "close down" until then.

ANOTHER USE FOR PARABOLIC REFLECTORS

Although looking rather like some micro-ray apparatus, the instrument in the top photo is actually a microphone assembly for use in large halls, the reflector being used to concentrate sound in the microphone. Below are seen the two sizes of reflectors which have been used very successfully.

ROUND the TURNTABLE

Gramophone Record Correction—Lifting "Top" or "Bottom"—The Multitone Transformer—An Excellent Loudspeaker.

By "TONE-ARM."

THE technical side of gramophone record production has improved tremendously during the last few years, but many owners of radiogramophones do not realise that even now the record is far from perfect, and needs "correcting" in some form or another.

Record "Fall-Off"

Records have characteristics that fall off at the high note as well as the low note end of the musical scale, and for this reason many pick-ups are now designed with definite "lifts" at the top and bottom of the scale. This has a good effect on all average records, but it does not necessarily cater for all, and often you will come across a disc that has a particularly high-pitched recording on it.

Such is the case in some of the Gracie Fields' records, and in these there is "too much high stuff" when reproduced by one of the brilliant types of pick-ups. Records are not standard in their curves, unfortunately, and it is advisable to have some form of adjustible corrector if you are considering correction in your radiogram.

Variable Humping

The corrector will have to provide a variable humping for the lower end of the scale, for no record or pick-up has yet come to my notice having the proper amount of bass. The other end of the scale will not usually require lifting, it is more likely to need decreasing, as in the case of the Gracie Fields' records.

I am experimenting now with a variable tone control that may prove useful in this respect. It does away with the need for a complicated system of stages of amplification, at the same time it allows both the high and the low notes to be lifted, or reduced, as well as either in turn. Most schemes can only tackle one of the two at a time, and the method is quite simple. I hope it will prove properly effective, for I want to use it on my own radiogramophone.

Potentiometer Control

One of the best devices so far introduced to the public is the Multitone transformer, whose characteristics are altered at will, within certain limits, by means of a potentiometer control. This can be placed in the set or it can be used as an input transformer for the pick-up outside the receiver. In this latter respect it enables the same results to be obtained, a lift of bass or treble can be achieved, and the makers recommend that this input be used with another Multitone inside the set, either one or other of the transformers having the potentiometer control, but not necessarily both.

FOR CORRECTING THE "PICK-UP"

Here is the Multitone transformer and potentiometer mentioned in the text. It is suitable either for pick-up control or use in an amplifier.

Reducing High Notes

A simple way of reducing the high note response of a pick-up is to connect a resistance across it, the value of the resistance depending on the pick-up. A further improvement on this is a resistance of the variable variety in series with a condenser of about ·01 mfd. across the pick-up windings.

But the Multitone gives a much more desirable result, by allowing the response curve of the transformer to be swung, from giving a lift at the bass end, through straight-line normality to the rising high note response. It is ingenious and thoroughly sound in theory and practice, while the results are most satisfactory.

Good Speakers

From pick-ups and tone controls let me go on to loudspeakers. It is obvious that all the tone controlling in the world will be wasted unless the loudspeaker that is to handle the result is a good one. And the trouble is that poor loudspeakers are still by no means unknown. I have spent some time testing speakers recently, and though my tests have included all sorts and prices, I have been surprised at the number of good models there are about.

Leaders

As I have said, there are poor ones, but the general standard is commendably high, though there are naturally some that stand out as leaders in their classes. The Ferranti M1 is one of these, as is the Epoch 99K, and its sister speaker the 99X.

The Ferranti M1 is a permanent magnet type of no small cost, but the money spent is well placed, for the response of the speaker is excellent. It is not by any means insensitive; in fact, it is one of the most sensitive models I have tested.

THE H.M.V. SUPERHET TEN AUTORADIOGRAM

A luxury instrument embodying every modern improvement.

By an "M.W." Staff Technician.

The cabinet in which this de-luxe receiver is housed is beautifully constructed of specially picked walnut.

WHEN it fell to my lot to test the H.M.V. Superhet Ten Autoradiogram, I realised that I was indeed fortunate. For is not this de-luxe receiver the acknowledged Rolls-Royce of radio?

Some months ago I was privileged to visit the Gramophone Company's great works at Hayes, and to see the H.M.V. receivers in the process of manufacture. The visit was illuminating; the great care with which every part is machine-finished and tested is amazing. Not only is every component tested individually, but each completed receiver is given the most exhaustive try-out before it is finally passed as being fit for the public to handle.

Absolutely First-Class

The whole of the H.M.V. range is absolutely first-class, and the Autoradiogram, which is the most luxurious receiver in that range, is in every sense of the word representative of the very best in modern radio and gramophone practice.

On the radio side you have an instrument capable of bringing in every programme in Europe, together with a degree of selectivity giving true razor-sharp station separation.

So far as reproduction is concerned, it goes without saying that a firm with H.M.V.'s wide experience would not be found wanting in this respect; the quality on both radio and gramophone is fully in keeping with the rest of the instrument.

On the gramophone side we have the well-known and ingenious H.M.V. automatic record-changer which plays up to eight records.

The circuit provides much that is of interest.

There are ten valves, including the rectifier, and the circuit is basically that of a superhet. On the medium-wave range, the waveband covered is from 210–500 metres, and on the long waves 900–2,000 metres.

Free from Harmonics

The aerial coil is coupled by a band-pass filter to a preliminary H.F. amplifier, which incorporates a variable-mu V.M.S.4 valve. The output from this stage is applied to the first detector, into which the oscillations from a separate oscillator valve of the M.H.L.4 type are fed.

The oscillator circuit is designed to be free from harmonics, and the first detector is also band-pass coupled to the first intermediate frequency-amplifying stage, which in turn is coupled by a third band-pass unit to the second intermediate frequency stage, variable-mu valves being employed in each case.

Then, we have still another band-pass unit, through which the signal voltages are applied to the second detector, working as an anode bend rectifier, with a specially decoupled anode circuit.

Push-Pull Output

This completes the radio chassis, and the output from the second detector is taken to another chassis upon which is mounted the L.F. amplifier. There is a filter between the second detector and the L.F. side, which prevents any high-frequency currents flowing through into the output end of the receiver.

The L.F. chassis comprises a resistance capacity stage, coupled to a push-pull output.

Up to 4½ watts of undistorted energy are available from the two P.X.4 push-pull output valves, and there is a tone control in this portion of the receiver, which is extremely useful in the event of heterodyne interference being experienced.

All the tuning controls are "ganged," and operated by a single knob, special care having been taken with the trimming of the oscillator condenser so as to ensure that at every point on the wave-ranges the frequency of the oscillator is 125 kilocycles different from the frequency to which the first H.F. stage is tuned.

TECHNICAL SPECIFICATION IN CONDENSED FORM

GENERAL DESCRIPTION.—A ten-valve (including rectifier) superhet radiogramophone with automatic record-changer that plays eight records continuously, or repeats one record indefinitely.

CIRCUIT DETAILS.—V.1—variable-mu H.F. amplifier; V.2—first detector; V.3—oscillator; V.4 and V.5—variable-mu intermediate-frequency amplifiers; V.6—second detector; V.7—first L.F. stage; V.8 and V.9—push-pull output valves; V.10—rectifier.

CONTROL ARRANGEMENTS.—RADIO: One for tuning, one for volume, one for tone control, one for local-distant switching, and one four-way switch.

GRAMOPHONE: Main volume control at front operates on both radio and gramophone. In addition, there is a switch to start the gramophone motor, a three position switch which enables the instrument to be used (a) as an ordinary gramophone; (b) as an automatic record-changer, and (c) for the repetition of one record indefinitely. A small press-button at the front enables any record to be rejected.

SPECIAL FEATURES.—(1) High selectivity and astonishing sensitivity on radio side. (2) Effective tone control. (3) Simplicity of operation. (4) Illumination of only the appropriate wave-length scale. (5) Automatic record-changer. (6) Superb cabinet work.

PRICE.—Standard cabinet model, 80 guineas. Special cabinet, 95 guineas.

MAKERS.—The Gramophone Company, Ltd., 363/367, Oxford Street, London, W.1.

Every Station Brought In at Will

The radio chassis is ingeniously mounted on rubber so as to give freedom from microphonic troubles, and is readily accessible for valve replacements, etc.

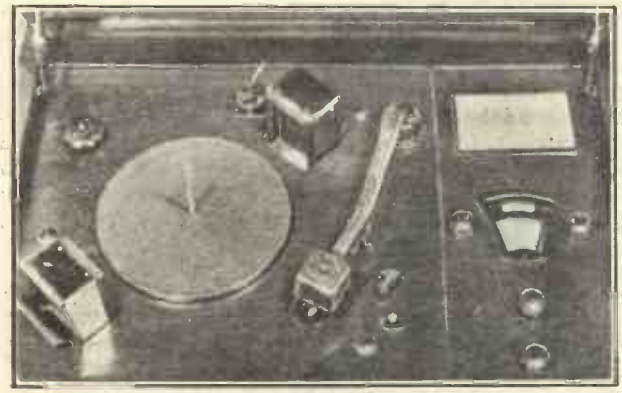
The main condenser gang is also mounted on rubber to ensure that no vibration is transmitted to the condenser flats. In fact, the workmanship everywhere is of an extremely high order and indicative of sound engineering practice.

Practical Features

Another feature which is evident of considerable forethought is the assembly of the three pilot lamps for illuminating the medium and long-wave scales, and also the gramophone indicator. To make replacements easily possible, these three pilot lamps are assembled on a small panel, which is instantly removed without disconnecting any wires.

With regard to the controls, apart from the tone control, wavechange and local distance switches, which in a sense are only subsidiary controls, the radio part of the instrument is operated by just two knobs, the main tuning control and the volume regulator. With these two knobs every station in Europe worth listening to can be brought in at will. The scales for both medium and long waves are calibrated in wavelengths, and when you want to hear a particular station you turn the knob to the appropriate setting, and if that station is on you hear it.

A COMPLETE HOME ENTERTAINER



The automatic record-changer, seen above, plays eight records continuously or repeats one record indefinitely. The receiver is also equipped with a tone control and "local distant" switch.

The local distance switch is a very practical feature, and cuts down the full sensitivity to that small fraction sufficient for listening to the local programmes in comfort.

Frankly, the sensitivity and selectivity of this Superhet Ten Auto-Radiogram were absolutely amazing, and the reproduction both on radio and gramophone left nothing to be desired.

FULLY ACCESSIBLE

The receiver consists of two separate chassis, each of which is mounted on rubber so as to absorb shocks. There is a filter between H.F. and L.F. amplifiers which prevents high-frequency current from getting into the L.F. stages.

It is really surprising that such remarkable results can be achieved with the retention of one-knob control.

The loudspeaker is, of course, an energised moving-coil, and sockets are provided for the connection of an additional loudspeaker or remote volume-control.

Although the instrument is completely all-electric, there is no trace of any background hum, or, in fact, any indication that the receiver is connected to the mains at all.

The fascinating record-changing mechanism is a joy to use; you just load up the turntable with the eight records you wish to hear, after which there is no need to go near the instrument until they have all been played. Nothing could be more delightful!

In so far as externals are concerned, the cabinet work bears evidence everywhere of the finest possible craftsmanship. It is made from specially picked walnut, built upon a solid pillar framework, and is provided with hand-carved legs. As an article of furniture it could not be improved upon.

In fact, this H.M.V. receiver is the finest de-luxe model that it is possible to obtain, and for sensitivity, selectivity and quality it is in a class by itself.

The Gramophone Company are to be congratulated on the production of such a magnificent design.

A CABINET FOR THE EXPERIMENTER

By J. UTTLEY.

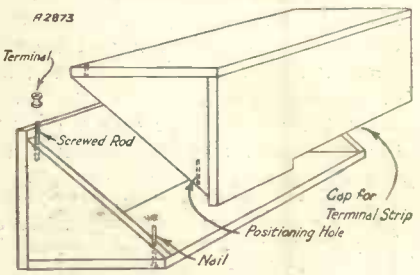
NOWADAYS, the experimenter's board layout is not permissible in most houses. On the other hand, the conventional "cabineted" set does not offer much scope to those who like to try out various changes and alterations in their sets.

Faced with this handicap, I made a special form of cabinet which, while not offending customary taste, yet gives one every facility for making rapid alterations.

The size of the cabinet is somewhat larger than usual and is made solid, i.e. without a lid. It is then cut diagonally in two, making two parts practically identical, one part forming the housing of the set and the other serving merely as a lid.

It will be obvious from the sketch

EASILY BUILT



A slot should be cut at the back of the "lid" to display the terminal strip.

that a set can be built in it with the same ease as on the conventional baseboard and front panel, while the removal of the back gives immediate access for making any later alterations.

How to Obtain BETTER RADIO

Whether you build your sets or buy them ready-made, you'll always find some query cropping up regarding maintenance, installation or modification. This special monthly feature solves all such problems for you in an attractive and entertaining manner.

AGAIN we must extend our sincere thanks to innumerable readers who have proffered congratulations, and again we must insist that grateful though we are for unqualified appreciations, we extend an even heartier welcome to constructive criticisms and suggestions.

Our aim is to please all our readers all of the time, and we shall be greatly assisted in our attempts to achieve that ideal if large numbers of our readers will tell us what they want!

THE COMPILERS.

USING SEVERAL LOUDSPEAKERS

THERE are two ways in which a number of loudspeakers can be connected. These are illustrated in the sketch on this page.

When in *series* the energy from the set goes through each loudspeaker in turn, and when in parallel the energy is offered as many alternative paths as there are loudspeakers.

The series method is easier for simple distribution schemes, such as the connecting up of two or three speakers in different rooms of a house.

Recommended Method

And this is the method we recommend for general home use where ordinary types of loudspeakers are concerned.

But it cannot always be the best method—radio is never so simple as that!

For perfect results every loudspeaker ought to have its own output valve, but listeners are not likely to adopt such measures. And in any case it is not going to be worth while in small installations.

If two or three of those small moving-coil loudspeakers, each with its own input transformer, are to be joined up together, there is a plan of a most attractive nature which can be adopted, so long as an ordinary power valve is used.

Each transformer (on the speakers) will have tappings enabling it to be matched with different valve outputs.

Join up the transformers in parallel, using the "pentode" tapping in each instance. The object of doing this is to prevent the impedance of the anode circuit dropping unduly.

The tapping for the pentode will provide the maximum primary impedance, and one hopes that the paralleling of two (or even three) will not drop the value a great deal below that required for the best working of the power valve.

Normal transformer primaries in parallel might reduce the impedance seriously and the normal alternative of having them in series could easily send it up unsatisfactorily.

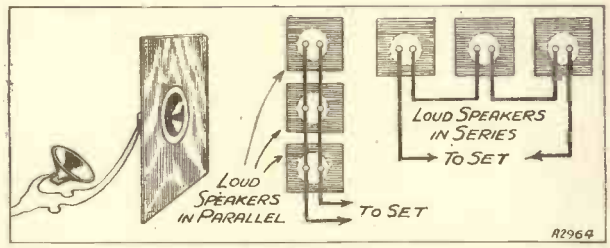
Of course, if the impedances of loudspeakers or, if they have them, their transformer primaries are known, it is possible to work out fairly good circuit conditions for them with quite ordinary valves.

If a set embodies an output transformer for a moving-coil speaker of low resistance, there are two ways of connecting another speaker to it.

It can be joined in either series or parallel with the primary of the transformer if it has a high resistance (its input transformer primary winding, should it be fitted with such, is for our purpose, "high resistance," as is any loudspeaker not normally needing a transformer), or if it is a moving-coil its moving-coil connections can be taken direct to the secondary of the set's output transformer in a series relation with the other speaker.

But it should be noted that we do not claim any of these arrangements to be perfect. On the other hand, there is often little audible effect in departing from the strictest rules and regulations of output matching!

SERIES AND PARALLEL CONNECTIONS



On the left is a loudspeaker wired up with a loudspeaker unit having no cabinet or baffle, for the purpose of brightening the high notes. The other two sketches illustrate how to join loudspeakers in series and parallel.

MAINS UNIT SIZES

THIS is a subject upon which we have already commented in this section, but it is obvious that there is still one point which causes some confusion of thought in the minds of readers.

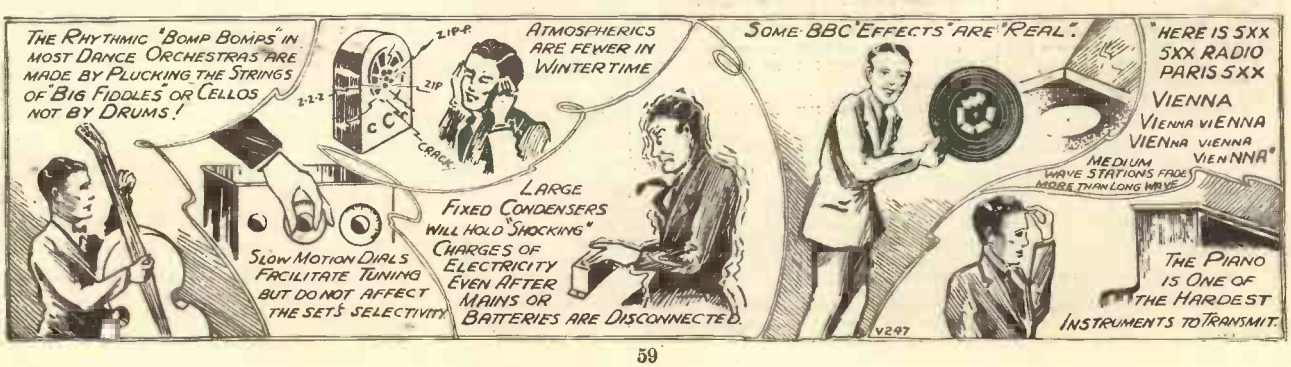
Many appear to have it firmly fixed in their minds that if a mains unit will not provide sufficient H.T. current for a set, it will inevitably cause instability, howling and hum.

Not the Prime Cause

Shortage of current is not likely to be the prime cause of such troubles.

But the mere fact that it exists suggests that an attempt is being made to use a "small" unit with a large set. The small unit is not likely to be smoothed or decoupled enough for a receiver giving comparatively great amplification.

WHAT EVERY WIRELESS ENTHUSIAST SHOULD KNOW



All About Decoupling and How to Add It

Smoothing and decoupling tend to run directly proportional with size and price!

Therefore, a mains unit must be chosen for a particular set and not bought haphazardly. And ample margin should be allowed against any future greater current demands that might be levied on it by a change to a bigger power valve or even a bigger set!

THE NEED FOR DECOUPLING

DECOUPLING is a fairly recent thing, and in view of this many may well ask whether it is of really vital value or just a pandering to a new knowledge of the theory of wireless.

Actually, decoupling is often quite essential, the reason being that modern apparatus is so much more efficient.

Indeed, the amplification achieved by a quite ordinary H.F. stage is colossal compared with the results which used to be obtained.

That is why it is supremely desirous to prevent any uncontrolled feedback from the one valve to another.

Back Coupling

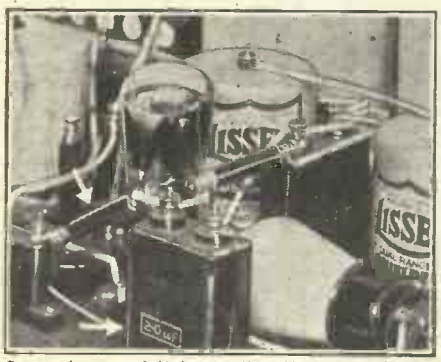
One of the most likely points for a coupling to exist between the valves, quite apart from the normal inter-valve transformers (but these work "forward"—the right direction), is in the H.T. supply.

The anodes of all the valves are taken to H.T. and the H.T. is supplied by an H.T. battery or mains unit. Batteries possess internal resistances and these increase with age in the case of the types used for H.T.

That resistance can, and often does, act as a coupling resistance.

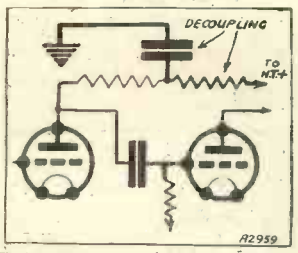
The coupling in a mains unit will obviously reside in a component or components common to the two or more "voltage taps," though in many modern mains units steps are taken to provide adequate decoupling.

THE VITAL ITEMS



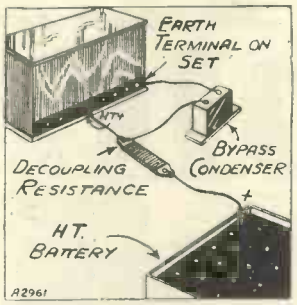
Some degree of "decoupling" is to be found in practically all modern sets.

SO SIMPLE!



This simple circuit is fully explained in the accompanying article.

EASY TO FIX



Decoupling fitted externally to a set.

We show a theoretical diagram of the two decoupling components, a resistance and a fixed condenser, in circuit.

Their object is to prevent L.F. impulses passing from the plate of the valve to the H.T., or vice versa.

The resistance, as its name suggests, is a difficult obstacle for the impulses to pass through, while the condenser allows them to slip away to earth. This is a rather loose description, but it is substantially correct.

Decoupling can be added externally to a set in an H.T. lead (generally the detector needs it more than the other valves), and we give the connections in the second drawing.

For detector and L.F. valves the condenser should have a capacity of at least two mfds. and the resistance be of 25,000 ohms or so. But the resistance need only be 600 ohms in the case of H.F. valves.

In serious cases of instability common H.T. feeds must be avoided. We'll discuss this point in a future issue, for we have already overrun our allotted space for this particular subject.

ADDING SMOOTHING

IT must be admitted that the smoothing incorporated in some mains units is not particularly good. We cannot help thinking that it is the belief of at least a few manufacturers that the listener will tolerate a certain amount of hum.

No doubt some will, but it is as certain that as many more will not, and it is to these that we now address ourselves.

Isolating H.T.

Often the fitting of an output filter will reduce hum considerably, and in any case it is a rather essential arrangement when H.T. is derived from the mains, because it isolates the loudspeaker and its leads from the H.T.

We have dealt with the output filter in a recent instalment. But it may be decidedly advantageous to introduce additional smoothing "earlier" in the set.

Generally, it is the detector valve H.T. feed which demands the addition. The connections are exactly the same as for adding external decoupling, except that an L.F. choke replaces the resistance; therefore, the second illustration in the last article applies.

This extra smoothing also acts as a decoupler, so it serves two useful purposes. We draw our readers' attention to a particular make of L.F. choke in the photograph.

This make, the R.I. "Audirad," has the attractive feature that it chokes at a high frequency as well as it does at a low frequency.

Stopping H.F.

It is well known that a great deal of interference at times creeps through from the mains in the form of H.F. irregularities, and so the "Audirad" must score over ordinary chokes to some considerable extent in some conditions.

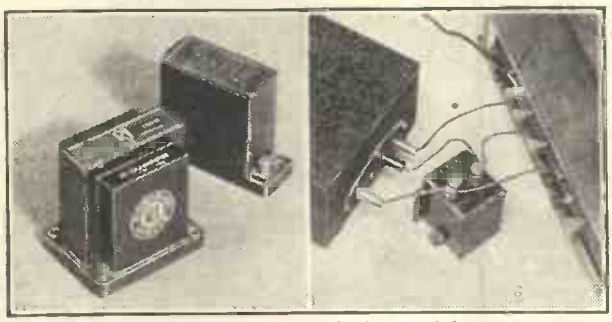
It is advisable to enclose the choke and condenser in a small wooden box and, naturally, the connections have to be carried out with insulated wire and made carefully.

If there is room to accommodate the components inside the set, this should be done.

Ordinary shielding is not usually very effective for stopping mains hum, and certainly it is waste of time experimenting with small partition shields, such as are often quite effective for preventing H.F. fields from inducing currents in components or wiring.

We have encountered hum which has been generated by a mains component feeding into an H.F. choke. This has been cured by using a resistance instead of the H.F. choke in the detector circuit.

STOPPING THAT HUMMING



Showing how extra smoothing can be inserted between a set and a mains unit.

THAT OPEN DOOR

IN the winter time doors are mostly kept closed, but when rooms get stuffy they may be open for periods.

A door can at times have a considerable effect on the operation of a loudspeaker. The reason is plain to see.

Removing Reflection

The walls of a room largely affect its acoustic properties, and the door of the average-sized living-room constitutes quite a large proportion of the surface of one wall.

And there are reflective as well as absorbent effects to bear in mind. If a loudspeaker is directed at a door, the plain wooden surface of this may cause considerable reflection. Obviously, this ceases when the door is opened.

Bear these points in mind if you suddenly notice a change in the quality of your loudspeaker—it may be that door.

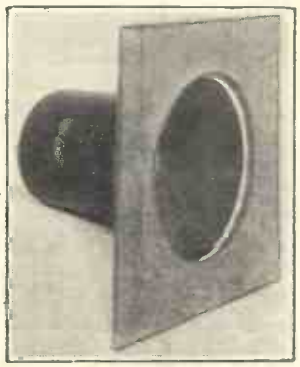
WHEN BAD SPEAKERS MAY IMPROVE RESULTS

A LOUDSPEAKER may contribute to a set's selectivity by being inefficient! Strange though that may sound, it is perfectly true.

Supposing the loudspeaker is very poor on the high audio frequencies. If the programme to which you often listen suffers from a heterodyne, the loudspeaker will render it faintly or, perhaps, not at all!

On the other hand, many loudspeakers are deficient in the bass.

BASS DESERTION



A small baffle of this kind is almost useless in preserving the bass.

But the application of reaction emphasises bass notes unduly.

Righting Wrongs

The "bass-less" loudspeaker provides compensation and the "overall" results are much better than they would otherwise have been.

Of course, it is not always that one fault will tend to cancel out another like that, but quite frequently "two wrongs do make a right," and at any rate produce something nearer to "rightness" than would otherwise be possible without elaborate and expensive measures being taken.

USE A FUSE

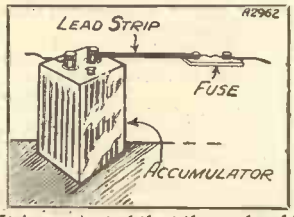
FUSES are as necessary to electrical engineering as light is to a lighthouse. Radio reception is a branch of electrical engineering, but it is not usually

Another Instalment of Better Radio Next Month

concerned with very high voltages or large currents.

Nevertheless, the current used in any set, mains or battery, will cause damage if it is not confined to its legitimate paths. For example, if the H.T. is applied to the filament of a battery valve it will burn it out.

SAVING THE CELLS



It is suggested that there should always be an accumulator fuse.

That fact is well known. But we wonder if it is realised that a tiny two-volt L.T. accumulator is capable of doing much greater damage?

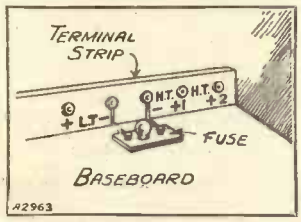
Extremely heavy current can be drawn from the smallest of accumulators—enough current to melt a copper wire if it is "shorted" across the terminals.

L.T. Dangers

That is bad for the accumulator, but if it had a celluloid case or the red-hot metal fell on to some other inflammable material——!

Therefore, if the listener is liable to experiment with his set, or if the

THE RIGHT PLACE

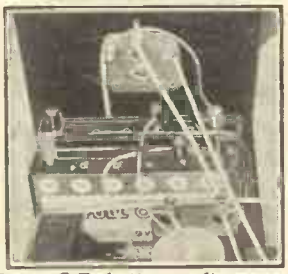


The correct place in the circuit to insert an H.T. fuse.

L.T. accumulator is, of necessity, rather exposed in its position, we would advise him to fit an L.T. fuse.

A half-ampere wire fuse will be needed for the average battery set. Not a flash-lamp type of fuse; that would be no good as its resistance would cause a voltage drop.

AND THE G.B.?



Some G.B. battery voltages are nearly as high as small H.T.'s!

On the other hand, the flash-lamp type of fuse is perfectly satisfactory in an H.T. circuit and is widely used.

Double-Duty Fuses

But it should be noted that one fuse in the negative H.T. supply lead does not provide complete protection. There may be a considerable voltage difference between H.T. positive leads.

However, it will give pretty complete safeguarding to the valve filaments, and it is these which are the most delicate items in most sets.

In large receivers the grid bias may attain the dimensions of a small H.T. battery, and the experimenter may well ask himself whether it might be advisable to insert a fuse to guard against short circuits from it.

Actually, the fuse used to guard against the H.T. can be made to offer protection against grid-bias short circuits as well.

The fuse must be connected up as shown in the illustration—that is, between the H.T. minus and the L.T. minus.

The grid-bias positive connection is then taken to the H.T. minus terminal instead of to the L.T. minus or one of the points in direct connection with it.

With this circuit arrangement and providing the fuse is trustworthy (important point, that), the valve filaments will be protected against both H.T. and G.B.

TESTING ACCUMULATORS

YOU must never test an accumulator on "open circuit," or you may get misleading readings. It should always be tested on "load"—that is to say, when it is actually connected up to the set and the set is switched on.

The battery ought to be tested at weekly intervals at least, although if there is any doubt about its capacity, tests should be made even more frequently.

It is a good plan to keep a "log" for an accumulator in which the dates of charging and testing are

ANOTHER KIND OF "S.G."!

The advisability of testing for specific gravity of the acid is often not realised.

noted, together with the appropriate voltages and specific gravities.

The voltage must never be allowed to drop below 1·8 volts per cell. (Immediately after a charge the voltage may rise to 2·5 volts, but there is a rapid drop until about 2 volts is reached, after which the voltage remains fairly constant for a comparatively long time.)

The Acid Test

But a voltage test is not a complete test; the specific gravity of the acid ought also to be tested, especially if the capabilities of the charging station are at all questionable. (Many of these seldom, if ever, test acid, and so often let the batteries in their care gradually deteriorate.)

When an accumulator cell is discharged the "S.G." of its acid will drop to between 1 and 1·15, and after charging it will rise to 1·225 or higher.

The correct figures for a particular battery will be supplied by the makers and are, indeed, nearly always printed on a label on the battery itself.

They vary with different makes to a little extent, and needless to say these and any other instructions which may be given should be closely adhered to. The lives of many accumulators are greatly shortened because their users fail to carry out the simple servicing necessary.

But servicing does not end with voltage and specific gravity tests. Careful watch should be kept over the condition of the plates.

At the first sign of sulphation expert attention is desirable. And if a quantity of sediment collects, it should be cleaned out.

Also, the terminals must be kept clean and completely free from corrosion.

CUTTING OUT HETERODYNE WHISTLES

WE have already pointed out that heterodyne whistles are sometimes lost in inefficient loudspeakers. At the same time one hopes one's speaker is not in that class, for it is not every programme that is marred by such interference.

It is possible to obtain heterodyne filters which can be cut in or out of action, as desired.

A quite simple method of eliminating heterodynes is to connect a fixed condenser across the secondary of an L.F. transformer in the set if one is used. The condenser may need to have a capacity of as much as ·005 or even ·01 mfd. in cases!

Tone Control

Of course, this is a drastic measure, and many high notes fall by the wayside as well as the heterodyne whistle. But it is not easy to cut this out without doing that.

It can be done with elaborate tuned filters in such a way that even higher notes are not seriously cut down, but such schemes are not within the province of the average listener.

We rather incline to the use of conventional tone controls, for these provide an easy means of adjusting the conditions of accentuated or reduced high or low notes, and thus permit the heterodynes and "monkey chatter" to be nipped off at will, though, of course, legitimate high notes have to go as well.

However, they can be brought back at once when desired.

Heterodyne whistles can sometimes be cut off by a skilful adjustment of reaction. The more reaction you apply in a set, the more, generally speaking, are the high notes reduced.

Very often the selectivity control can be operated to sharpen tuning and reduce volume, the latter then being restored by reaction. This generally gives a considerable reduction of heterodyne interference, the overall effect being to vary the high note response within fairly wide limits.

TONE VALUES

In the previous article we referred to the use of tone controls for eliminating hererodyne whistles.

We are all in favour of applying tone adjustments of this nature. But we do not consider tone control should be allowed to develop into a kind of music mangle with which individual listeners would be expected to mess about with their audio-frequency spectrums until they got sounds which pleased their individual ears.

The aim should merely be to make a set give the closest approximation to "straight-line" results possible in all conditions.

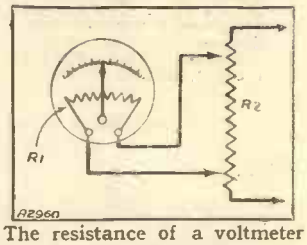
We believe it to be against the interests of good listening to tempt listeners to sharpen or mellow particular items.

MISLEADING METERS

A CHEAP, low resistance voltmeter may give very misleading readings at times. You see, when it is connected in circuit its own resistance may upset the characteristics of the circuit it is being used in connection with.

Particularly is this so when an attempt is made to measure the output voltages of a mains unit. A very high resistance voltmeter is needed for that.

A "CLOSED" CIRCUIT



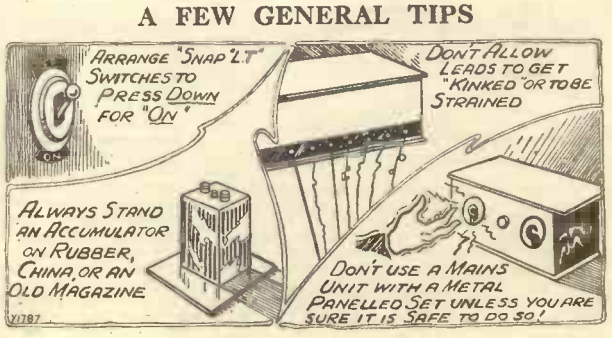
The resistance of a voltmeter may affect its readings.

With a low resistance voltmeter the readings will be much lower than they should.

As an alternative to a high-resistance voltmeter, which is an expensive instrument, mains unit outputs can be measured with milliammeters.

If it is remembered that the amount of current a valve will pass depends upon the voltage on its anode and the grid bias used, it will be seen that it is a simple matter to employ the valve-maker's characteristic curves to provide the information desired with the assistance of a milliammeter.

A FEW GENERAL TIPS



RECENT RECORD RELEASES

BROADCAST

ANOTHER year has come, but still the same flood of gramophone records continues. Isn't it marvellous how the various companies keep it up? Some twenty to thirty fresh discs have been brought out by Broadcast, and goodness knows how many by the other gramophone concerns.

As a mere one person I can but relate how the various records react on me in the hope that it will be a useful guide to you when you decide to visit your local dealer. My opinion may not be yours, for there is no accounting for tastes. However, here goes. This is what I think of the various Broadcasts that have been placed before me for review and description.

Taking them at random, I start with The Three Ginx singing The Old Man of the Mountain and While We Danced at the Mardi Gras (on 3265). The first is quite a lively item artistically sung by this harmonious trio, but it would be better for more careful diction. Still, the effect is pleasing and the rhythm is good, especially where the piano takes up the melody. The second number is a waltz, and is quite tuneful without being outstanding in any way. The vocal solo part could be better, and should not be so disjointed.

From this let us go on to the dance orchestra recording on 8105 of When Mother Played the Organ and What Would Happen to Me? by Joe Green's Band. The former is a semi-sickly waltz of the old Victorian-memory style, the most relieving part being the introduction of a Hawaiian guitar towards the end. The other tune is very much better, and at times is almost snappy, though the trumpets could be brighter with advantage.

Keep Your Last Good-night For Me and Big Ben Saying Good-night are the two items chosen for 3270 by The Blue Mountaineers. This is a good band, and I am always ready to listen to records it has made. In this case the latter tune is a bit monotonous, but that is not the fault of the band but the composer, and it will appeal to many though the words are not particularly clever. The former is a sugary foxtrot that is well played. It could be improved by better orchestration.

Strange Harmony and When the Stars Were Shining, both from La Tosca, and sung by Josef Schmidt on B101, are worth hearing. He is said to be very popular on the Continent, and has often broadcast from Berlin. He takes the latter record too slowly for my liking, and I much prefer it in Italian rather than German, with more dramatic rendering, but there is no gainsaying the fact that it is a good record in many respects. I am looking forward to the next Schmidt recording.

The Blue Danube will always be a favourite, and played by Eugene's Magyar Tzigane Band we get something of the true gipsy element in its rendering, though it may not exactly fit in with the general public's conceptions of the waltz. Accompanying this on 3271 is The Skaters' Waltz, which will also nicet with approbation, I imagine.

So much for the "twelves" this month. Here are some of the smaller Broadcasts which are worth mentioning. Charlie Higgins is still going strong, this time in When I Was Twenty-one and With Me Bagful of Nuts and Some Sweets in Me Mouth on 918. Both are cheerful records that will help many of us these tiresome days.

The Rhythm Rascals are as good as ever in a couple of dance discs, 923 and 924, containing We're a Couple of Soldiers and Marching Along Together on one, and We Just Couldn't Say Goodbye and Say It Isn't So on the other. The latter two numbers need no introduction; they are among the most popular of present-day dance tunes, while the former of the other two mentioned bids fair to become one of the best-sellers. They are well played, and at the low price of 1s. it is difficult to conceive a better bargain.

I must just dodge back to a couple more of the large Broadcasts, this time to complete the "Internationals," of which the record of Josef Schmidt is one. The two I want to put before you are B102 and B104, containing, respectively, Alfred Bere's Orchestra playing Famous Waltzes of the World and Ralph Kirberry and His Orchestra playing Love Me To-night and Isn't It Romantic from the latest Chevalier film. I refrain from criticism here as I want you to hear them and choose for yourself with an unbiassed mind. You may or may not like them according to your taste in what goes to make a good record.

COLUMBIA

The nominal Christmas season is over, but I fancy a great many of my readers have not yet thrown off the pantomime spirit, and so reference to a record that came out too late to be included last month, Crazy Pantomime, will not be wasted.

This is the second of the famous Columbia on Parade records, the first being issued a year ago, and is No. DX410. It is really excellent, and is another all-star entertainment, but conceived on quite different lines from the first. The story is that of Cinderella, but hotted-up in a fashion that allows Flanagan and Allen, Peggy Wood, Harry Tate, Norman Long, Binnie and Sonnie Hale, Stanley Holloway, Naunton Wayne, Billy Leonard and Debroy Somers and His Band plenty of scope, of which they take full advantage. The fact that the story, as we know it, is sadly twisted makes no difference, for it is a crazy panto, and the efforts of Flanagan and Allen to announce, stage-manage, change scenery and the like keeps the pot boiling furiously throughout. You will like this record, and after you have heard it once or twice you will like it more, for there is plenty to take in, and the finer points and subtleties are not always realised at one or two hearings.

A brief selection from some of the records released during the month. Only a few are discussed, but they are representative of the many brought out by the various gramophone record companies.

Another sure laughter-raiser is the Roosters record The Village Concert on DX390. It is broad humour, but the poor village vicar will always be the butt of stage and film, and here, again, plenty of capital is made over his idiosyncrasies. This record will go well.

Arthur Prince, the ventriloquist, and his boy Jim are probably the best known of all the hundreds who go in for this ever-fascinating type of entertainment. They are certainly unsurpassed as a clean, happy and, above all, clever record duo. Insubordination is the title of their disc, and I must say it appeals to me very much indeed.

The opposite must be said about Old Jim's Christmas Hymn, which, to my mind, savours more of sheer sob-stuff rather than pure pathos. You feel that ordinary tears are not to be deemed sufficient, and that they must be supplemented with plenty of the real Hollywood glycerine before the recording staff will be satisfied that their job has been well done. The number of this sea of slop is DB954.

Fifty-Fousand Quid and The Stillness of the Night (DB978) are two Norman Long typicals. They are both good, though they are not a bit alike in subject. The former is true in its sentiments, while the latter is a light song of the cynical variety. I enjoyed both.

Albert Sandler can be relied upon to make a good record, and the latest is no exception to the rule. I like both sides of DB971 and think you will, too. The titles are well known, You Loving Me and Marcheta.

Christopher Stone referred on the radio to Accordeon Nights as interminable, meaning, I suppose, that the series of records bearing that title appears to be everlasting, for DB983 contains Parts 9 and 10 of this small library (by Geraldo and His Accordeon Band). Let them go on, say I, for they are both tuneful and excellently recorded. I am not going to tell you what is on this disc; you must hear it for yourself, and hearing will most likely mean purchasing, for it is very good.

Mr. Flotsam and Mr. Jetsam are not so good as usual in Down With Dora and The Spooning of the Knife and Fork. The ideas are good in each instance, but the vocal balance seems to be not so good as usual; and having set such a high standard we are prone to expect it to be kept up. (DB973.)

To be serious once more, or, rather, to turn to a record with a serious aspect, we must pick up DX419. This contains the famous Te Deum Laudamus, sung by 10,000 voices at the Methodist Union Conference at the Royal Albert Hall. It is a pity that it is taken so slowly, but probably that is unavoidable where such a large gathering has to follow the organ. The recording is excellent and the record is full of majesty.

Mr. Jetsam, or Malcolm McEachern, rolls about down in the depths on DX417. He sings The Song of the Volga Boatmen and The Mighty Deep. I prefer the latter, for Jetsam has too much to live up to in Chaliapin's "Volga Boatmen" to be able to get away with it as he sings it in the record under review. His diction is never good at the best of times, and slovenly singing ruins a song of that description faster than it does the ordinary sort of hail-fellow ballad.

And talking of diction reminds me of the finest dance-band vocal singing from a clarity point of view I have ever heard. The singer is, I believe, Val Rosing, and the band Henry Hall's B.B.C. Dance Orchestra.

The fact that the record is really intended for kiddies may account somewhat for the exceptionally good pronunciation by the vocalist, but whatever the cause, the disc is a real tonic to any who deplores the tendency of many modern dance-band singers to be audible but inarticulate. The numbers are The Teddy Bears' Picnic and Hush, Hush, Hush, Here Comes the Bogey Man, and the catalogue number is DB955. You should not miss this; it is tuneful and the recording is, as the singing, well-nigh perfect.

I have no room to go fully into the other records I have received from this Company, but advise you not to miss hearing Nos. DX418 and 385. The first is a Layton and Johnstone Negro Spiritual Medley, with fine singing by fine artistes, and the other is a lively Convivial Medley by Debroy Somers' Band.

H.M.V.

There are several specially fine records in the latest batch of H.M.V.'s, and one of them is being played by my radiogramophone as I write. I refer to that made by Richard Crooks and issued shortly before Christmas. It contains The Star of Bethlehem and The Holy City on a red label twelve-inch disc. The recording is excellent and Richard Crooks' voice rings out with a fullness too often missing from recordings of tenor vocalists. Whether you like sacred music or not, and despite the fact that Christmas has passed now, you should get this disc. It is a record that will give endless pleasure. (DB1798.)

Then we come to another red label twelve-incher, made by the B.B.C. Symphony Orchestra assisted by the organ on one side, and alone on the other. The record contains Elgar's Pomp and Circumstance Marches No. 1 in D major (containing the famous "Land of Hope and Glory") and No. 2 in A minor.

The recording itself is perfect in both, and the record makes a most dramatic example of the power of the radiogramophone. The drums and the brass instruments in the latter number of the record are especially well brought out. Again I advise you to get the disc; it will be a revelation in good "canned" music. The orchestra is under the direction of the composer, so that we may rest assured that the interpretation is just right. Sir Edward Elgar has passed his 75th birthday, and may rightly be regarded as the grand old man of British music. (DB1801.) He is now writing a Symphony dedicated to the B.B.C.

Of lighter calibre is the Snacks in Bars, which is the title chosen by the New Mayfair Orchestra for disc No. C2486. It is described as a super medley, which it undoubtedly is, for it ranges all over the place among popular airs of merely theatrical to classical style. I do not know whether H.M.V. are prepared to send lists of the tunes incorporated in the record, but if so it would make an excellent competition test. I cannot call to mind the names of all the pieces, though their airs are well enough known to me.

(*Continued on page* 100)

MY BROADCASTING DIARY

Our Own Broadcasting Correspondent keeps a critical eye on the affairs of the B.B.C., and each month, for the benefit of listeners, comments frankly and impartially on the policies and personalities controlling British broadcasting.

Studio Organisation

I HAVE been hearing about a development of B.B.C. organisation which is particularly interesting. After a period of investigation and experiment, it has been decided to appoint a studio manager who will function in the same way as a night editor in a newspaper office.

The idea arose from a consciousness that a great many little errors could be prevented by the presence of a properly qualified and sufficiently senior co-ordinating official. The scheme has now been applied, and already the programmes have benefitted.

Television Development

There is renewed activity on the television front. Mr. Isidore Ostrer, the head of the British Gaumont group, who is now in control of the Baird Company, is pressing forward both in research and in the production of receivers. Simultaneously electrical musical industries are launching a new method of television on ultra short waves with what is believed to be the cathode-ray principle.

There is no immediate competition for the reason that the latter process is still concentrated on the reproduction of films, whereas the former still specialises on direct transmission of images on middle wavelength channels.

Trouble in Scotland

Again there is trouble in Scotland, whence come rumours of discontent and ructions. The difficulty this time, however, is internal and not external.

Mr. Cleghorn Thomson, the ambitious and versatile director of the B.B.C. work in Scotland, has managed to acquire for himself and his staff a large measure of independence and initiative. He has gathered round him a little group of young and talented men and women, most of whom are in sympathy with Scottish Nationalism, either on the artistic or the political side.

The exercise of this " new freedom " is bound now and then to lead to differences of opinion with the B.B.C. headquarters in London. The most serious of these so far appears now to be in progress.

London officials, both singly and in groups, are visiting Edinburgh almost weekly when previously they went about once a year. There is danger of a public explosion which certainly would play into the hands of those listeners, particularly in the Highlands, who are discontented with the present service provided by the B.B.C.

More Announcers

It is understood that the B.B.C. has decided to strengthen its corps of announcers at Broadcasting House. The strain on the comparatively few announcers formerly employed is believed to have prejudiced their efficiency.

The report now is that several more permanent announcers will be added, and the individual task lightened to that degree.

B.B.C. and Overseas Press

Having solved the main problems of copyright and performing rights connected with the Empire Broadcasting Service, the B.B.C. is now faced with a new difficulty. This arises from the attempt to prevent Overseas newspapers from reproducing programme details a whole week in advance.

The B.B.C apparently hoped to retain this copyright for one of its own publications. The reply of the Empire newspapers, in particular the weeklies, is that if any such restriction is imposed, they will boycott all references to the Empire Broadcasting Service.

RADIO AS A RELAXATION

Quite a lot depends upon Roosevelt who recently " won out " in the U.S.A. election, and he in turn depends quite a lot on his radio—and his cards—when not engaged in strenuous duties.

Candid Comments on Radio Topics of the Day

My hope is that the B.B.C. will give way, recognising that it will need all possible publicity to carry the Empire Service to a lasting success.

Wireless Exchanges in Crown Colonies

The Empire Broadcasting Service has created an opportunity for the development of wireless exchanges in a great new field. Many of the Crown Colonies have no broadcasting of their own and therefore cannot relay the Empire Service. Also, conditions of direct reception on short-wave sets are extremely difficult in several of the more thickly populated tropical areas.

It is therefore logical to conclude that in these places local distribution by wireless exchanges is easily the best method. I understand that a big syndicate is being formed to deal with the situation on a comprehensive scale.

More Money for Broadcasting

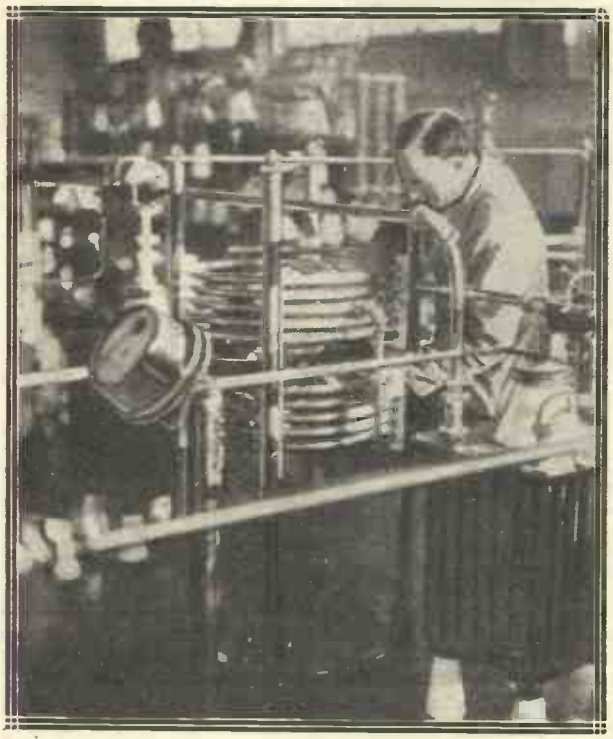
There is good reason for believing that Sir John Reith has done very well for the B.B.C. in his new deal with the P.M.G. and the Treasury over the distribution of licence revenue. Negotiations lasting nearly a year have come to an end in a sense highly satisfactory to the broadcasting authorities.

Details are still secret, but there is no doubt that the B.B.C. will get a new arrangement allowing it more money and on a more permanent basis than at present.

The News Bulletin

The reorganisation of the B.B.C. News and Topicality Talks, which I forecast some months ago, is now taking shape. Additional staff has been acquired, and the News Department given more independence and resources. This is a decided advance.

BRESLAU'S BIG BROADCASTER



A close-up inside the great 60-kw. Breslau station which is now getting over extremely well on 253 metres. It uses a new telefunken type of "non-fading aerial."

The only anxiety remaining is that news will retain its independence and avoid submergence in the main body of talks. Incidentally, the disappearance of the provincial news bulletins is greatly regretted by Regional listeners,

A RADIO TELEPHONE CONVERSATION

In simulating someone speaking over the telephone, a special mike and earpiece are employed, the latter being held close to the microphone. A most realistic effect is obtained in this way.

amongst whom an agitation has begun for its restoration on an extended scale.

Ultra Short-Wave Work

Interesting results are being obtained from the ultra short-wave experiments which are taking place from the top of Broadcasting House. These are concerned with much more than television.

Although it is early days yet to speak with certainty, I have a feeling that these experiments will lead to big changes in the whole system of national distribution, solving, in particular, the vexed problem of how to deal adequately with local interests.

Visitors at Broadcasting House

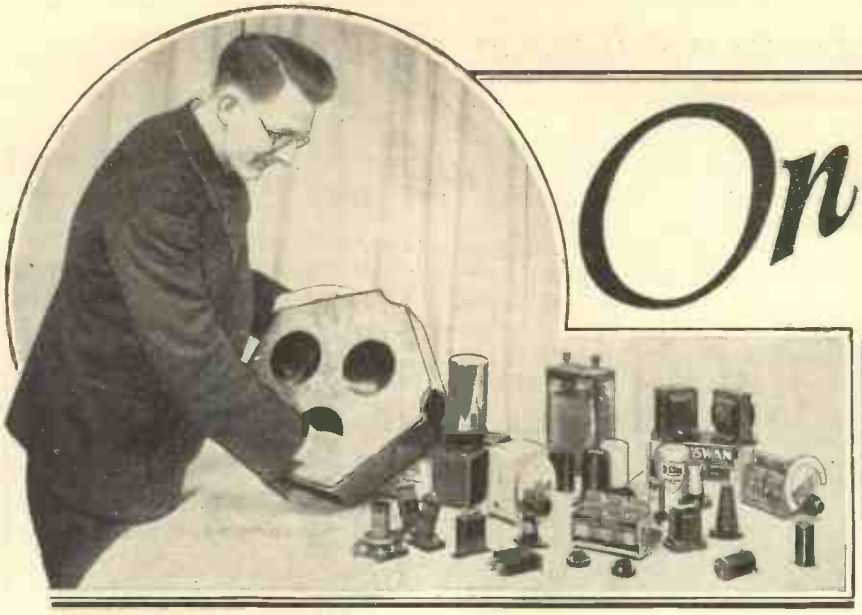
There is no slackening in the popularity of Broadcasting House as one of London's show places. Royalty has been well represented, Prince George being the latest member of the Royal Family to be reported as a visitor to B.H. Distinguished men and women clamour for admission, and it is a matter of no little embarrassment to the staff of B.H. to gratify their wish.

The difficulty is not made any easier of solution by the discovery that the regularly organised tours of the building have been interfering with studio work.

Removal of Television

Problems of congestion are already beginning to arise at Broadcasting House which have prompted the B.B.C. to consider seriously how best to accommodate its television activities.

The suggestion has been made that television should be conducted at some suitable place outside the B.B.C. Headquarters in Portland Place. It is understood that a search is now being made.



On the TEST BENCH

Our comments regarding some interesting new components.

Goltone H.F. Coupling Unit

THE screening and compactness afforded in the Goltone H.F. Coupling Unit make it a most attractive article. It is approximately the size and form of a screened coil, and contains a high-efficiency H.F. choke, a decoupling resistance and condenser, and a coupling condenser. A screened anode connector is taken through the top of the "can."

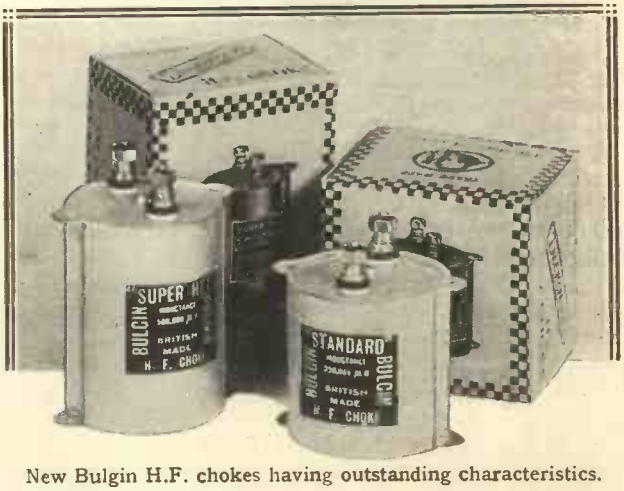
The unit is well designed and constructed both as to its component parts and as a whole. In addition to the increased efficiency and freedom from coupling troubles which may reasonably be anticipated from its use, it should be noted that its price, 9s., is such that the individual components could hardly be purchased as cheaply separately. A further gain is the simplification of wiring that results.

We have also had the opportunity of testing further samples of the new Goltone H.F. choke, which achieves a high inductance and low self-capacity through the employment of special methods of construction. We find them to be perfectly satisfactory in every way.

FOUR IN ONE!

This Goltone unit contains four components in a shielding "can."

SMALL SIZES—LARGE INDUCTANCE



New Bulgin H.F. chokes having outstanding characteristics.

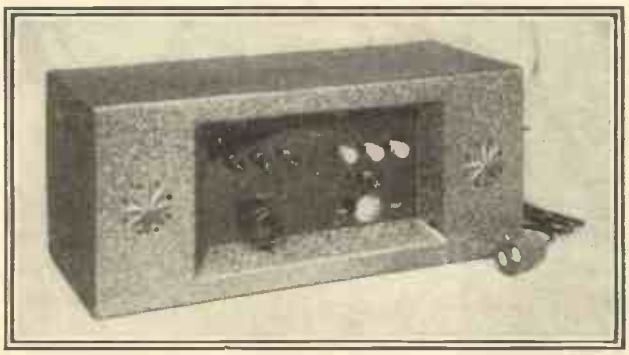
A Heayberd Mains Unit

It is not a coincidence that one of the new Heayberd mains units is styled the M.W.1. It is catalogued as such as a graceful tribute to the MODERN WIRELESS Research Department, to whose suggestions it mainly owes its existence.

Its special feature is that it has an alternative output switch which enables it to operate to full efficiency with either a battery set or in conjunction with an A.C. receiver.

Obviously this adaptability is extremely valuable. Many, perhaps a majority of A.C. mains users, start their mains set experiences by running mains H.T. for a battery set. But when they come to change over to A.C. valves they discover that a unit which may be adequate for battery valves is not likely to prove suitable for running A.C. ones to advantage.

A COMPLIMENT FOR "M.W."



A magnificent Heayberd mains unit, known as the M.W.1 and designed in accordance with a suggestion from the "M.W." Research Dept.

Observations on Some Interesting Components

The Heayberd M.W.1. is perfect for both tasks.

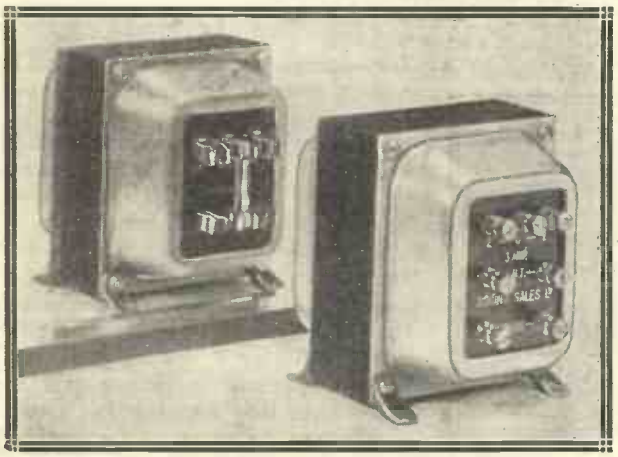
It has three tappings, including a widely variable one, and its maximums are 150 volts, 30 milliamps. (for battery sets), and 200 volts, 50 milliamps. (for A.C. sets). Its smoothing is first-class, and hum does not creep through from it even with the most sensitive of sets.

Its construction is robust, and it meticulously conforms with the I.E.E. and other recommendations. We can unhesitatingly recommend it to the attention of the keenest constructor or to any set possessor wishing to take power from A.C. mains.

AN EFFICIENT COMPONENT

A Slektun H.F. choke for the short waves.

FROM BOTH SIDES



A photo of the Sound Sales transformer taken in front of a mirror.

Bulgin H.F. Chokes

A. F. Bulgin & Co. have produced a striking range of screened H.F. chokes. They are all of unusual smallness, and must rank as among the neatest radio apparatus of the season.

But despite their dimensions, or perhaps we should have said in addition to them because compactness is in itself an advantage in almost any radio component, these Bulgin chokes have outstanding characteristics. The H.F.8, which sells at only 2s. as a general purpose choke, has an inductance of no less than 198,000 microhenries and a self-capacity of about 3·5 mfd.

The H.F.9 lists at 3s. 6d., and with its 250,000 henries, and even lower self-capacity, it can undertake practically any duty in a set, including that of S.G. inter-valve coupling.

The H.F.10 has twice the inductance of the H.F.9 and only about half its self-capacity. Retailing at 5s. 6d., it is a super-choke in every sense of the word.

On test these chokes gave performances fully up to what their specifications promise.

Slektun Short-Wave Choke

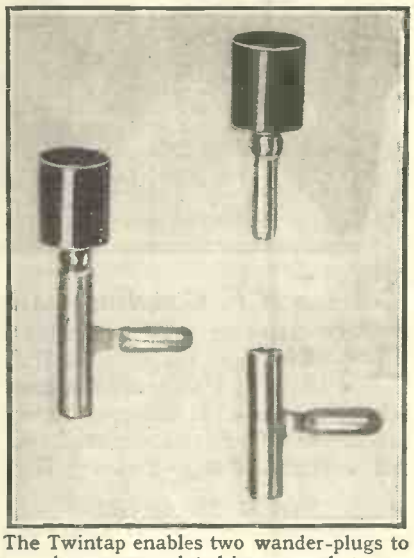
Short-wave enthusiasts should bear in mind the Slektun short-wave choke when selecting components for their sets and adaptors. It is a well-made and highly efficient component. It is wound sectionally, and its two terminals are widely spaced, one being at the bottom and the other at the top. The bottom one is inclined outwards to facilitate connections to it.

We used one of these Slektun short-wave chokes in a set covering the wide waveband of from about 12 to 100 metres (with coil changes), and no difficulties due to "choking" of any kind were experienced.

Sound Sales Transformer

The Sound Sales H.8 Super-Shielded Mains Transformer embodies an ingenious and useful feature. Unlike any other transformer which has come to our attention, it has a fuse, and this is held in any one of three pairs of clips in accordance with the mains voltage with which the transformer is to be used.

BELLING-LEE TWINTAPS



The Twintap enables two wander-plugs to be accommodated in one socket.

The three clips correspond with 210, 230 and 250 volts. These are useful figures, and the 230 is, of course, the voltage at which the grid scheme is being standardised.

SMOOTH AND CERTAIN

The Lissen potentiometer volume-control.

Although the transformer is very compact in construction, its performance is above the average. Indeed, its voltage regulation is superior to all but a mere one or two of the many which we have tested during the past year or so.

We should certainly advise constructors to acquire full details of the Sound Sales productions.

(*Continued on page* 96)

SPOTLIGHTS ON THE PROGRAMMES

The Banished Audience—New Play Technique—A Hint on Manners—What's in a Name?—This Copyright Business.

Applause on Tap

THE B.B.C. has had a great deal to say in its 1933 Yearbook about the uninformed and irresponsible criticism of the Press. On the subject of studio audiences, however, most of the critics and many of the B.B.C.'s own artistes have been in complete agreement.

Some of these audiences have behaved, during recent months, in such an extraordinary way that it has been seriously suggested that the applause in vaudeville programmes was supplied by a gramophone record, operated at will by the producer.

Be that as it may, I am glad to see that the B.B.C. has so far deferred to public opinion as to try the experiment of abolishing applause in all programmes by staff producers.

It is a bit early yet to give an "informed and constructive criticism" on this very sensible departure—but I *should* like to know what you think about it.

Radio and Orange Blossom

The merry month of May seems to have been transferred to the frosts of December, judging by the number of radio romances last month.

The most interesting, of course, was the engagement of Harold Warrender and Ann Todd. This has a very special radio connection, since Louis Goodrich—well known as a wireless playwright—seems to have played the part of fairy godfather.

Do you remember his play, "Ann and Harold," and its sequel, "More About Ann and Harold"? Well, Louis Goodrich told me the other day that, having been responsible for introducing Mr. Warrender and Miss Todd, he wrote those plays especially for these two talented artistes.

It is so rarely that "make-believe" romances come true that we are extra hearty in wishing "Ann and Harold" every happiness.

True To His Reputation

John Tilley, whom I always consider as my special discovery, is a participant in radio's other romance.

True to his reputation of droll humour, John Tilley has solemnly announced that he proposed to Miss Kathleen More in a taxi! The worst

RADIO RACONTEUR'S ROMANCE

Mr. John Tilley, who sprang into fame overnight after a broadcast of one of his "mock" lectures, with his fiancée, Miss Kathleen More, to whom he proposed in a taxi!

of being a popular radio and stage star is that it leaves so little time for the lighter side of life.

So here's all the best to Mr. Tilley and Miss More—with the pious hope that he may keep his lectures for stage and microphone!

A Pretty Problem Indeed!

Here's a pretty problem for one of you to solve. Why it is that Christopher Stone, with the aid of an album of gramophone records, can produce variety programmes which are so very much better than studio productions?

It's no good your saying that he has a much wider range of artistes to choose from, because the majority of his lighter programmes contain records by the same people whom we are always hearing in the studio.

And another thing—records seem to "get over" so much better than the real thing; much clearer and altogether better in tone. For this I can find no excuse.

Can it be that Christopher Stone knows something of public entertainment, and knows, too, how to put it over? I hardly dare to make the suggestion when I think of the talented young University men who have charge of the programmes—but there it is!

As an afterthought, I never seem to have heard a complaint that Christopher Stone's variety programmes suffer through lack of applause. Queer, isn't it?

Where Are The Playwrights?

At quite regular intervals I bewail the fact that new names so rarely appear underneath the titles of radio plays. At the present moment I can think of only six playwrights whose work is worthy of attention in the field of radio drama.

Louis Goodrich, du Garde Peach, Dulcima Glasby and Philip Wade are four of them—the other two you can fill in for yourselves!

Dance Bands That Fail to Amuse

Philip Wade's last play, incidentally ("Family Tree" it was called), was not only well up to his usual standard, but also introduced quite a new piece of technique—the reading by a principal character of entries in a diary taking the place of the usual commentator between the scenes.

The secret of the success of these few playwrights is, of course, that they write about ordinary people who do ordinary things in an ordinary way.

Some time ago a play called "Waterloo" was broadcast, and opened up a new line in radio play construction; the re-creation of the past.

The play was not too well handled on that occasion by the producer—but that is no reason why the experiment should not be repeated to our entire satisfaction.

In the Programmes

4.—PHILIP WADE

Philip Wade, radio dramatist and actor, aged 36. Born at St. Annes-on-Sea, Lancashire; educated at Arnold House School, Blackpool, and the United College, Bradford.

Served in Mesopotamia as an officer with the 6th Batt. Loyal N. Lancs. Regiment.

Began his acting education in 1919 under Sir Frank Benson, in whose company he later met his wife, Alice de Grey.

First broadcast a small part in a Howard Rose production in 1925, and has played characters, big and little, in broadcast plays regularly ever since.

After playing in C. B. Cochran's New York production of "This Year of Grace," acted in the B.B.C. Repertory Company in 1930, during which year he wrote his first radio play, "Boss," which was produced by the North Regional station last August.

This was followed by "Oranges and Lemons" and "Family Tree," both of which were produced by Howard Rose with great success.

Is one of the few radio exponents of "simple plays about everyday people."

My Little Grumble

I am afraid that my little grumble against the B.B.C. this month is rather a big one—breach of promise, in fact!

I wonder how many of you cancelled appointments, as I did, to hear Evelyn Waugh in the "Unnamed Listener" series? And again the following week to hear his father's reply.

Actually neither of the Waughs came to the studio; this was disappointing. Their talks were read for them; this was a pity. The B.B.C. offered no explanation or apology; this was an insult to listeners.

Accidents will happen, even in the best regulated families. But the B.B.C. will never win the respect and the admiration of licence-holders so long as it pursues a policy of puerile self-righteousness.

(Yes, Mr. Yearbook Editor, you may call me irresponsible; you may say that my criticism is destructive and of no help to the B.B.C. But I retort that I do know bad manners when I meet 'em.)

Don't you often sigh for the days when announcers were so very apologetic if things went wrong, and Miss Cecil Dixon was always ready to fill up the awkward pauses with piano music? Or do you prefer the death-like "tick-tock" which is our present reward for patient listening?

Those Dance Bands

It is always a popular move when some famous dance band comes to the studio during the early part of the evening programme. But I do implore the B.B.C. to show a little discrimination.

A certain band—which out of the kindness of my heart I will not name—was almost unbearable recently for two reasons.

First its announcer had a voice like a very mournful parrot; and, secondly, it considered that the non-dancing listener could be entertained by what are known, I believe, as "comedy numbers." But what there is of comedy in a number of bandsmen indulging in unmusical backchat, I fail to see.

This Modesty Business

There is a very funny rule at the B.B.C.—I have mentioned it before—which says that members of the staff shall remain anonymous, so far as the listening public is concerned.

The rule, for some extraordinary reason, seems to apply to announcers, engineers and paragraphists in the "Radio Times," but *not* to producers, orchestra conductors, actors or staff playwrights.

Unfortunately the situation is complicated by the extreme modesty of certain members of the staff.

When you were enjoying the recent "Communications" programme, weren't you annoyed that the author and producer was called merely "The Outside Broadcast Director," instead of being given his real name,

This was no fault of the B.B.C., since Mr. Cock was given a free hand with the programme, even to the extent of being permitted to publish his name. But Mr. Cock was too modest, with the result that one of the best programmes of the year was veiled under a cloak of anonymity.

The rule is a silly one, anyhow. There should be no question of "giving permission to publish a name." Credit should be given either to everyone or to no one. This half-and-half business is a farce.

A B.B.C. Triumph

What a fine example of the B.B.C.'s technical methods the recent relays from the Savoy Theatre have been.

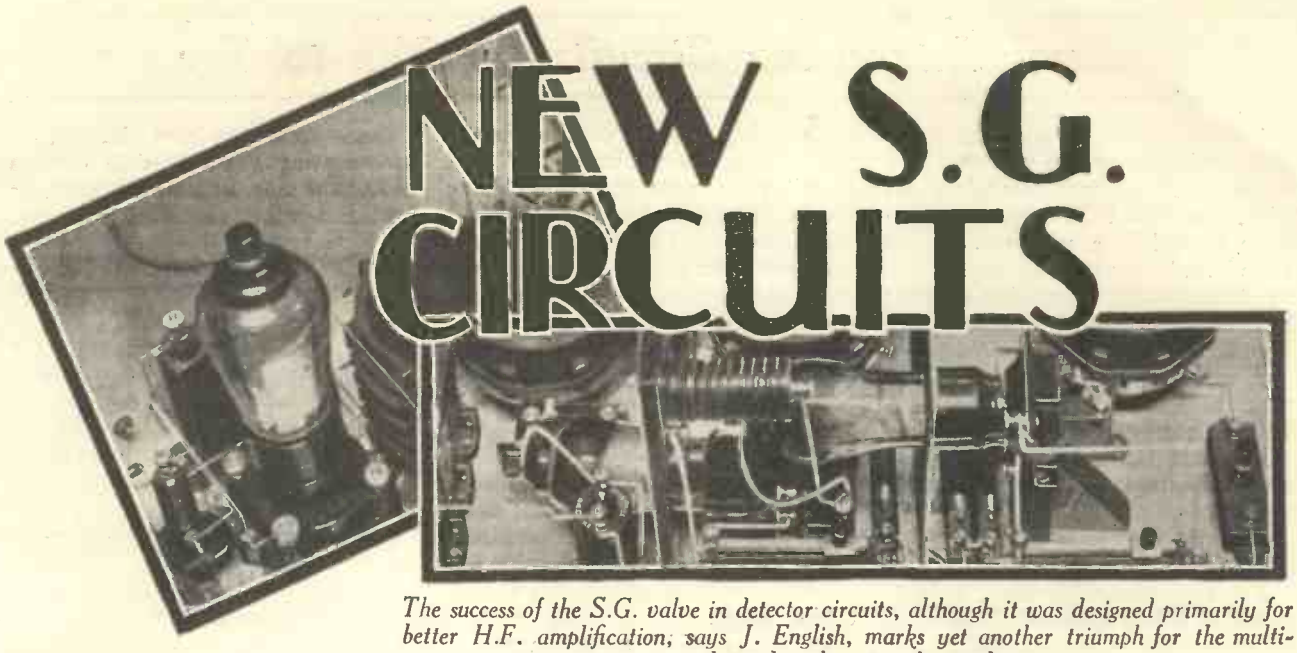
The Gilbert and Sullivan performances were so perfectly done that they might have come from the studio. There was never any suggestion that the singers were moving away from or coming closer to the microphone. Congratulations to all concerned.

What a nuisance this copyright business is! Ten years to wait for a full relay of a Gilbert and Sullivan opera; and then the promised radio version of "Sunshine Susie" cancelled because the rights could not be arranged.

Our Best Thanks

Our congratulations this month are shared between Philip Wade and Gerald Cock. The former for his brilliant play, "Family Tree," and the latter for the Savoy relays.

NEW S.G. CIRCUITS



The success of the S.G. valve in detector circuits, although it was designed primarily for better H.F. amplification, says J. English, marks yet another triumph for the multi-electrode valve over the triode.

I HAVE already given an account, in two recent articles, of some of my experiments on the S.G. valve as detector with particular reference to resistance-capacity coupling. The success of this new application of the valve, which was designed primarily for better H.F. amplification, marks yet another triumph for the multi-electrode valve over the triode.

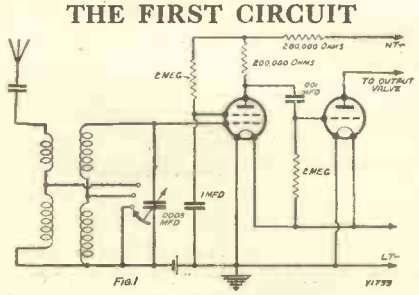
At an early stage in the development of the R.C.-coupled S.G. detector certain indications led me to believe that there might be possibilities in the same scheme as an H.F. amplifier. I knew that if the idea worked at all well it would possess certain definite advantages, not the least practical being the very small H.T. current required.

Tried Before

Any appreciable economy that can be effected here is of vital importance to all users of receivers powered from H.T. batteries, especially so if the receiver is a portable.

Resistance-coupled H.F. stages have been tried before, right back in the early days of radio, when long-wave reception was the rule. This method, however, was quickly dropped in favour of tuned-anode and transformer couplings when medium-wave transmissions became more prominent, as on these wavelengths the old R.C. amplifiers were no good at all.

THE FIRST CIRCUIT



It was not very sensitive, but results were distinctly promising.

Promising Results

You can well imagine, therefore, that when, some months later, I set up the first resistance-coupled S.G. stage, it was not in a particularly hopeful mood that I commenced experiments.

The first circuit to be investigated, the idea for which, as I have already mentioned, came from the S.G. detector, is shown in Fig. 1.

You will notice that it is practically identical with this S.G. detector scheme: the same resistances were used with a slightly smaller coupling condenser between S.G. and detector. The H.F. input was obtained from a simple tuning circuit, a dual-range coil tuned by an Extenser, so that high selectivity was not expected!

However, rather to my surprise, the performance of the receiver definitely indicated that the S.G. was giving appreciable H.F. amplification, especially on strong transmissions. Although this trial H.F. stage displayed nothing like the high sensitivity of the normal S.G. stage, I was not disappointed.

No Back-Coupling

From this hopeful beginning I had now little doubt that a much better performance could be developed step by step.

It is worth noting that a slight negative bias was found essential for the proper functioning of the S.G., while the potential of the screen grid appeared to have a marked influence on the effective H.F. amplification.

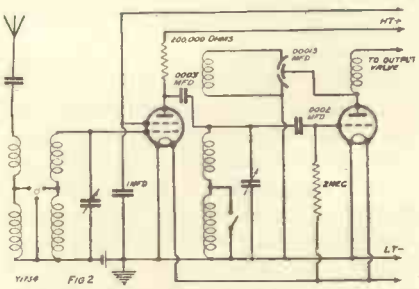
In a circuit such as this there is no helpful regenerative back-coupling into the input circuit, such as you get in the normal S.G. stage and which accounts for much of the sensitivity of the latter.

Subsequent Tests

The next step was to find out what were the best operating conditions as regards resistances and voltages for the S.G. itself.

I suspected that the optimum resistance values of the S.G. detector scheme, as used here, were not the best for the S.G. as an H.F. amplifier, and this subsequent tests confirmed. A higher screen potential was found desirable with a reduction in the anode resistance.

THE NEXT STEP



The circuit as modified after the first experiments.

D

Some Interesting Circuits for You to Try

For the latter, an average value found suitable for the valve used (a Cossor 215S.G.) was 200,000 ohms when the total H.T. current was no more than half a milliamp. at 150 volts H.T. ! You should compare this with the total consumption of your S.G. stage, which may be anything from 2 to 3 m.a. or more.

It was also found that the adjustment of screen potential was more critical than in the normal S.G. stage. Above and below a certain narrow range of voltages sensitivity was much reduced.

Outstanding Feature

For convenience of rapid adjustment the screen potential was derived at this stage from a potentiometer (100,000 ohms) across H.T.+ and L.T.—, although the original scheme of a tapped anode resistor and series screen resistance is equally effective, but not so convenient for experimental requirements.

After making these modifications in the conditions affecting the valve itself, I noticed an immediate improvement in the performance of the H.F. stage, but results, although quite good, were still below normal, except for the reception of strong signals.

The next step, an important one, was to insert a tuned circuit before the detector with reaction from the latter into this grid coil. The circuit with modifications at this stage is shown in Fig. 2.

QUITE INTERESTING

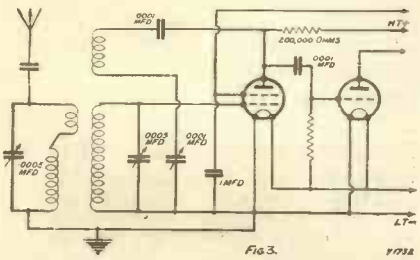


Fig. 3.

It is simple and easy to operate, but lacks the punch of Fig. 2.

I had anticipated that this addition to the R.C. coupling would improve the sensitivity of the S.G. stage, but I did not expect quite such an all-round improvement in reception. The receiver now behaved excellently, sensitivity being only slightly below normal, while adequate selectivity was obtained with perfect stability.

The latter quality proved to be the outstanding feature of the circuit, there being no tendency to "spill over" even near the zero tuning condenser positions. No shielding was incorporated in this experimental receiver, other than a screened dual-range coil for the tuned-grid circuit.

Even this screening would hardly seem necessary with a suitable lay-out of the two coils and associated components.

Perfect Stability

As a direct comparison, I replaced the anode resistance by the usual H.F. choke, restoring normal screen volts, when uncontrollable oscillation resulted over the lower half of the tuning range.

Obviously this arrangement of resistance-coupled S.G. has, compared

ANODE-CURRENT-GRID VOLT CURVES

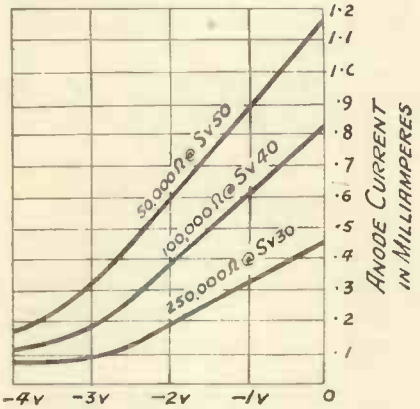


FIG. 4 A2778

The operating conditions were closely investigated with the aid of these curves.

with the popular H.F. choke-feed system, the advantages of simpler layout, perfect stability and reduced H.T. current consumption. All three are of some importance and amply compensate for the slight loss of sensitivity.

You will perhaps get a better idea of the general behaviour of the three-valve receiver of Fig. 2, the third valve being the output stage, from the following results.

Satisfactory on Long Waves

Many foreign stations were received at good speaker strength, without interference from the locals, reception being particularly satisfactory on the long waves. Altogether the performance of the S.G. itself at this stage of experiments was definitely pleasing.

Some time was now devoted to investigating other possible circuits to find the most suitable arrangement for this new S.G. amplifier.

THE TEST RECEIVER

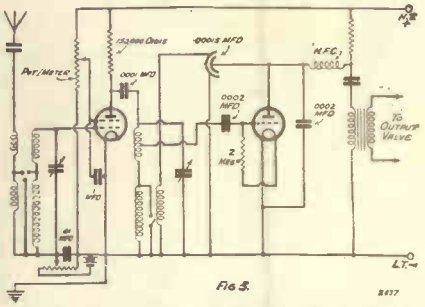


Fig. 5. 8117

Marked improvement in results followed this modification of the Fig. 2 circuit.

However, after testing several possibles, I finally returned to the tuned-grid cum resistance coupling, as this appeared to give the best results. Nevertheless you may be interested in some of these circuits which have certain advantages.

For instance, the circuit of Fig. 3 is quite interesting.

Easy to Operate

Here we have only one tuned circuit, the input to the H.F. valve, with reaction from the S.G. itself through quite a small condenser. As there is only one tuned circuit, satisfactory selectivity can only be obtained by using a band-pass tuner or the Moderator tuner shown in the diagram.

The circuit is simple enough and easy to operate, but it lacks the "punch" of the arrangement of Fig. 2, unless, of course, a specially sensitive detector is used.

Plotting Curves

Although at this stage in my experiments I was getting a better performance from the R.C.-coupled S.G. stage than had been anticipated, I was not yet satisfied that its fullest possibilities had been realised. Further progress could now only be made by more detailed experiment.

Accordingly, the operating conditions of the S.G. valve were closely investigated. Possibly a few brief references to this work will interest you.

To begin with, anode-current-grid volts curves were plotted for different anode resistances, other series of curves being taken to observe the

(*Continued on page 92*)

Graham Farish says :—

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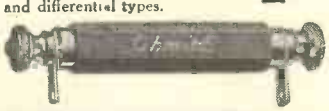

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TROUBLE TRACKING

JUDGING from the letters I get, one of the most common troubles with the modern high-magnification, battery-operated receiver is instability. I am, of course, referring to home-built sets used with H.T. batteries in varying conditions, and with mains units.

Those sets which give trouble are usually ones with two L.F. stages. In some cases the first L.F. stage may have a decoupling resistance and by-pass condenser, but no attention seems to be paid to the second stage.

I wonder why, when all that is needed is a 10,000-ohm resistance and a 2-mfd. condenser. My advice to constructors who are up against instability is this.

Cramped Components

First of all, go over the layout and make sure that the trouble is not due to a faulty disposition of components or bad wiring. For instance, components that are cramped together—grid and plate leads practically touching—these are factors which produce instability.

"TRACKING TROUBLE"

Another form of "trouble tracking"—P.C. Thistlewaite, of the Bradford Constabulary, with the portable receiver he has evolved for anti-bandit use by mobile police.

Suppose the S.G. valve tends to oscillate when the circuits are brought into tune. The first question to ask oneself is whether the screening-grid has any decoupling.

An Effective Remedy

If the answer is no, the obvious procedure is to insert a 1,000-ohm resistance between the screening-grid and its H.T.+ terminal and to connect a 1-mfd. non-inductive condenser between the screening-grid and the L.T.— filament terminal on the valve holder.

Every month the Chief of the "M.W." Query Department discusses some of the common difficulties which can often be so troublesome. This time he deals with the need for adequate decoupling

An easily applied scheme but very often an effective remedy.

On the L.F. side, if there is only one stage, a 15,000 or 20,000-ohm resistance in series with the H.T. lead to the detector, together with a 2-mfd. condenser connected to earth, should be sufficient. If there are two stages, then a second decoupler is an advantage.

The value of this resistance is, of course, lower, because the valve following the detector is normally an "L" type and takes a higher anode current.

If the set is not stable when thoroughly decoupled in this way, there is something seriously amiss.

Speaking of decoupling reminds me of a query I had from a reader who wanted to supply his set from a single H.T. tapping. His idea was to use the 150-volt tap on his mains unit for the det. and two L.F. valves in his receiver.

Not Difficult

There is nothing very difficult in this provided the characteristics of the valves are known. For example, we will suppose that the current taken by the detector at, say, 80 volts, is 2 milliamps. Then by simple arithmetic the resistance required in order to break down the voltage should have a value of 35,000 ohms. The method of arriving at this figure is simple. By Ohm's Law the volts to be dropped multiplied by one thousand and divided by the current in milliamps gives the value of the resistance in ohms.

Convenient Scheme

In this case the volts to be dropped are 150 less 80, which equals 70. 70 times 1,000 divided by 2 gives us the answer.

The scheme is a convenient one because the resistance also forms part of the decoupler, which is completed by a 2-mfd. by-pass to the L.T. negative filament.

So far as the first L.F. stage is concerned, suppose we decide to apply 120 volts to the anode, the current taken at this voltage being, say, three milliamps (at the proper grid bias).

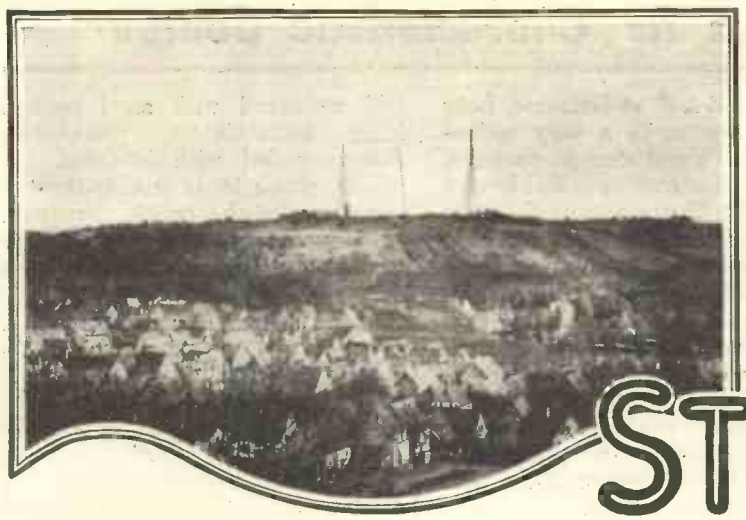
Marked Advantages

Getting down to arithmetic once more we find that the volts to be dropped times a thousand divided by 3 is 10,000. This is a nice figure for a second stage decoupling resistance, and we can again complete the scheme by adding a 2-mfd. condenser as before.

On the last valve we shall need all the available volts and no "breaking down" will be necessary here.

The method can be applied to any set, but only holds good for a given combination of valves.

The advantages are specially marked in those instances where accumulators are employed for H.T., because multiple tappings mean an uneven load on the cells—that is, one batch of cells will be giving out more current than the others.



Facts About FIELD STRENGTH

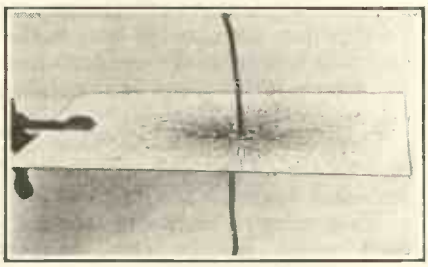
By J. F. CORRIGAN, M.Sc., A.I.C.

There's something more than mere valves and circuits in the efficiency of a transmitting station. The surrounding country has quite a lot to do with the "service area."

A WIRE carrying an electric current is surrounded by a "field" or area of electro-magnetic energy so long as the current flows.

You see this elementary principle illustrated at Fig. 1. Here a wire carrying a fairly heavy current passes through a sheet of thick card upon which some iron filings are scattered. The filings arrange themselves along

"SEEING ENERGY"



Although it cannot be seen, a field of energy surrounds a wire carrying current. The simple experiment shown above (which you can perform yourself) makes the force demonstrable.

the lines of electro-magnetic force, thus demonstrating the existence of a field of energy surrounding the wire.

Now, a broadcasting station may be likened in some way to a wire carrying a current, for it is surrounded by a somewhat similar field of energy, and it is, of course, upon the fluctuations of the intensity of this field of electro-magnetic energy that we depend for the signals which we receive.

Equal in Strength

A wire carrying a current has, as you will notice from a glance at Fig. 1, an energy field which is equal in strength at equal distances on every side of it.

Ideally, the energy-field of a radio transmitter would be similarly equal in strength at equal distances on all sides of the transmitter.

However, to get these ideal conditions the earth's surface would have to be flat and of uniform electrical properties, and the transmitting aerial would have to be freed from all possible screening influences. Under these conditions the energy field surrounding the transmitter might be represented by a series of concentric circles of ever-increasing radius, the signal energy at any point of the same circle being the same. Fig. 2, perhaps, will serve to illustrate more clearly what I mean.

Nothing Like It

In actual broadcasting practice, however, you get nothing approaching this ideal of uniform field-strength. Instead of having concentric circles drawn round a broadcasting station to represent its field-strength, you get irregular "contours," of the sort drawn at Fig. 3, all points on the same contour line receiving the transmitting station at equal strength.

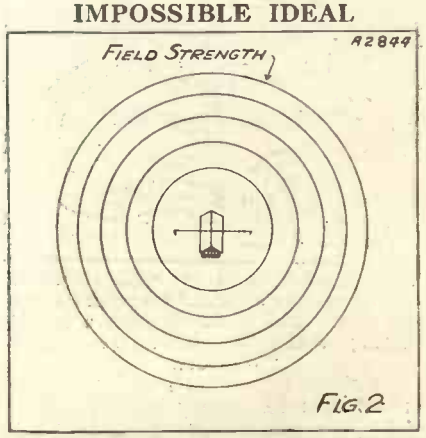
During the last few years a lot has been done to eliminate these signal-strength contours which exist around every broadcasting station. Practically every station in the world has been re-designed. The majority of them have sought more suitable sites for their aerial structures, and the electrical characteristics of the areas which these stations serve have been more thoroughly studied.

Nevertheless, there is not a station in the world which has not its own particular field-energy contours, although in a large number of instances these contours have, by careful study and research, been roughly pulled into approximations to irregular concentric circles.

Screening Effects

The presence of areas of unequal signal energy in the electro-magnetic field surrounding a broadcasting station is due to several causes, chief among which are the electrical characteristics of the earth in local areas, and, also, the screening effects to

IMPOSSIBLE IDEAL



The perfect energy distribution of a transmitter shown here would do away with "blind spots," but the surrounding country would have to be flatter than the Sahara!

which ether waves travelling outwards from the station may be subjected.

Screening effects may be caused by the presence of high building;

Every Transmitter Has Its Characteristic Contour

containing a preponderance of steelwork. These will absorb some of the broadcast energy of the transmitter and will cast a "shadow" in the path of the ether waves.

In the days when the old B.B.C. used to sling up its provincial aerials between convenient factory chimneys, there used to be a good deal of this particular type of screening in the transmission. Nowadays, however, when the B.B.C. favours greatly elevated sites for the aerials of its transmitters. local screening of this sort is practically eliminated.

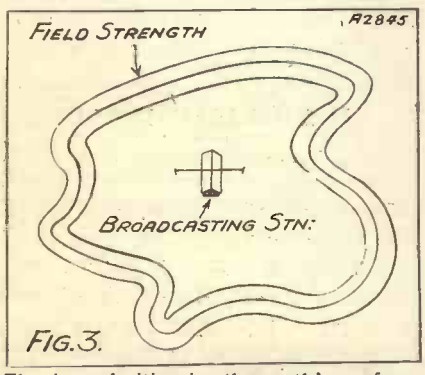
Suppose, however, a mountain gets in the way of the outgoing broadcast waves? You cannot remove the mountain. Therefore, the mountain casts a "shadow" in the path of the waves, a "shadow" which results in a certain local area adjacent to that mountain being made into an area of permanent low-field strength.

Highly Absorptive

There are areas of this nature among the metalliferous mountains of Cornwall, along the valleys of South Wales, and in the hills of Central Wales.

In some of these districts owing to the presence of metalliferous ores, the land is rendered highly absorptive of electrical energy, and a consequent de-

THE SHAPE OF THE "FIELD"



The irregularities in the earth's surface and its varying electrical properties cause the distribution of energy from a transmitting aerial to follow the erratic "contours."

crease in signal energy takes place.

The presence of large inland stretches of water sometimes has a similar effect upon radio waves travelling outwards from a transmitting station. The water, being conductable and absorptive, attracts the waves and passes them to earth more easily than the land.

The authorities of the New York station, W E A F, at Bellmore, Long Island, have made a very serious study of the signal strength variation of their station's waves in and around New York. They measured the varying intensities of their transmissions in microvolts per metre, and they found quite an extraordinary series of field-strength variations within a comparatively short radius of the station. Such variations were attributed to the presence of enormous masses of steel in the high New York buildings. Other station authorities, following suit, have conducted similar tests, and obtained similar results.

Very Little Complaint

As a matter of fact, however, in this country, if high city buildings do throw radio "shadows" in the path of the waves, these "shadows" are usually wiped out within a very short distance owing to the refraction and defraction of the waves from the surrounding areas into the shadow area. Consequently, in these isles we now hear very little complaint concerning this trouble.

SERVICING L.T.

Some accumulator tips which will keep your L.T. in good order.

By J. UTTLEY

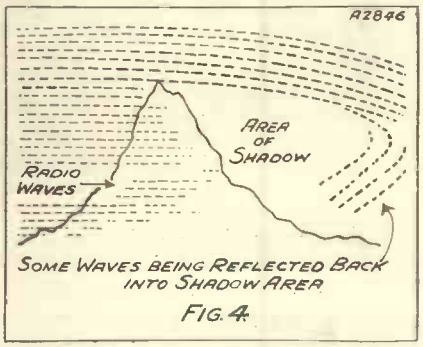
WHEN sediment begins to collect at the bottom of an accumulator it is usually in a pretty bad condition, for through careless handling or charging the plates have begun to disintegrate.

If the sediment is not removed there is a risk that the plates will short-circuit, when the accumulator will be ruined. In many cases it can be removed by draining off the acid and filling with distilled water, and then up-ending it in a basin of distilled water. By gravity a lot of the sediment will drop out and the operation can be repeated several times.

A Good Job

If the plates are very close together this cannot be done, but if the casing is made of celluloid, a piece of the bottom can be cut out with a brace and a centre bit. After the sediment has been washed out through this hole the piece can be replaced and a good job made with a patch of celluloid moistened with amyl acetate. Many accumulators, particularly those supplied with insulated terminals, give a lot of trouble through corrosive deposits on the terminals. In some cases it becomes so bad as to interfere with the making of a

IN THE SHADE



The presence of a mountain or high building between receiving and transmitting aerials causes weak reception because an electrical "shadow" is cast by the obstruction.

proper connection. This seems to be due to the use of lead and brass in the connection.

When a liberal application of vaseline does not cure the trouble, the best plan is to scrap the terminals and to attach Clix plugs of suitable colours to the battery leads.

These can be screwed into threaded lugs of the plates and will make a first-class connection.

When using an extra large accumulator, which has to stand on the floor, it will be found that the usual battery leads covered with cotton or silk are not very suitable. In such circumstances, rubber-covered wire, as used by motorists and known as low-tension wire, is much safer and stronger.

Don't Use a Jug

The trouble with this is that the double lengths of wire cannot be twisted together to form a cable. If, however, a piece of string of approximately the same diameter be combined with them, it then becomes a simple matter to plait them together and produce quite a presentable cable.

When topping-up accumulators or high-tension batteries of the wet type, it is better not to use a jug, but to employ a pipette or a hydrometer filled with distilled water.

By this means an exact quantity of liquid can be added and there is no risk of slopping water over the outside of the casing.

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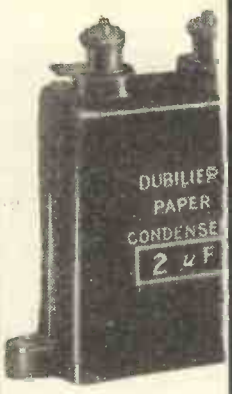

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P.3.

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BEHIND THE SCENES of the BIG ORCHESTRA

IF you are in London and go to the Queen's Hall, you see the B.B.C.'s big orchestra in full force and in "party" attire of full evening dress. You see Dr. Boult, or maybe Sir Henry Wood, or Sir Landon Ronald, in the place of honour and handling the baton in true concert style.

On the other hand, if you are one of the lucky ones, with your name on the B.B.C. waiting list for a visit to a broadcasting studio, you may see the Symphony Orchestra in quite a different light. You may see the orchestra, or at least a section of it, giving a Sunday evening concert from one of the big studios, or playing in interludes of musical comedy.

Did you know that there are occasions when the B.B.C. Symphony Orchestra includes saxophones and banjos? A B.B.C. correspondent here explains the when and how of this strange circumstance.

New York and Berlin are proud of their giant orchestras, but there is surely none so versatile as the group of one hundred and fifteen players sponsored by the B.B.C. On a Friday they may be tackling the orchestral part of a big choral work in the Queen's Hall. On Sunday afternoon it may be Bach, and in the evening Brahms.

Several Separate Jobs

Of course, the full total of one hundred and fifteen is not always at work. The big orchestra can be subdivided, and that is where it has a big pull over any other National orchestra for concert work, broadcasting or gramophone recording.

Dr. Boult, who, of course, directs the B.B.C. musical policy, helped by Mr. Owen Mase, the B.B.C. Assistant Musical Director, has arranged for the orchestra to do several separate jobs.

It can tackle symphony concerts requiring a full modern orchestra of at least one hundred—that is, on Queen's Hall nights. It can carry out symphony concerts requiring a medium-size orchestra of eighty or so, as in the big studio on Sunday evenings.

One section tackles dramatic programmes, musical comedy and so forth, requiring between thirty and forty players, while another does light orchestral and light symphony concerts, with anything from forty to seventy players.

For these jobs there are two alternative subdivisions of the orchestra. These are 79 and 36, and 68 and 47 players respectively.

The B.B.C. Theatre Orchestra, with S. Kneale Kelley as leader, and conducted by Stanford Robinson, has twenty-four players, and it is this orchestra which you hear so often in modern vaudeville. The Theatre Orchestra is not in any way a subdivision of the Symphony Orchestra, but consists of separate picked players who make it a whole-time job.

It is a little "lighter" than the main B.B.C. Orchestra. Some of the players combine 'cello, banjo and guitar, while one clarinet player and one 'cellist also play saxophones.

In Full Muster

The full B.B.C. Orchestra of 115 is led by the popular Arthur Catterall, and last year the band turned up in full muster to more than twenty Queen's Hall concerts.

Music of this kind is at least a ten-hour-a-day job, The big fees said to be earned by the principal players are worth while, and, in any case, it must be remembered that the Queen's Hall concerts pay for themselves.

If you go often to B.B.C. concerts, you will know that

the official method of styling the sections is A, B, C, D and E. A is the full 115. B and D are the two larger subsections of 79 and 68 players, C and E the smaller divisions. Each works under the title of the B.B.C. Symphony Orchestra, followed by the appropriate letter denoting which section is playing.

You may have heard of the B.B.C. Bach Orchestra. This is made up from the strings of the C section of the main orchestra.

A difficulty with all these sections is rehearsing. While rehearsals are on for a Queen's Hall concert, the members of one subdivision may be needed to tackle a light musical programme.

The interest in big orchestral items has been increased by inviting a number of well-known conductors to certain of the concerts given by the big orchestra. In addition to a number of distinguished foreign conductors from many countries, Sir Henry Wood and Sir Landon Ronald are also counted as among the "guest" conductors. Many of these have officiated at the Queen's Hall during the week and in one of the big studios on Sunday evenings.

Ultra-Modern Chairs—and Shirtsleeves

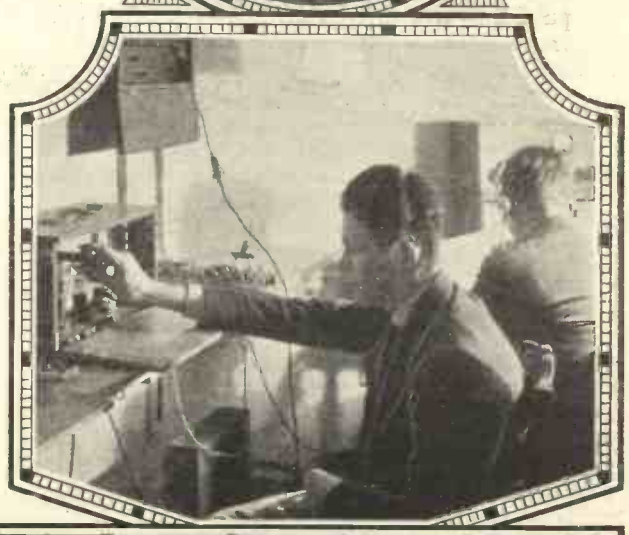
The B and D sections of the orchestra turn up for these big studio broadcasts, and after the polished appearance of the big orchestra at the Queen's Hall public concerts, it is an interesting sidelight to see the members of the first section seated on their ultra-modern metal chairs and playing at their ease in shirtsleeves—at least, so far as the males are concerned!

Dr. Boult conducts as many rehearsals as possible, and it is in order to relieve him from some of the executive work connected with a big orchestra that Mr. Mase was appointed Assistant Musical Director. During rehearsals he is assisted by Mr. Stanton Jefferies, of the Balance and Control staff. (Mr. Jefferies was the Musical Director of the old British Broadcasting Company, and his musical knowledge is invaluable in getting the right microphone "balance" for the orchestra.)

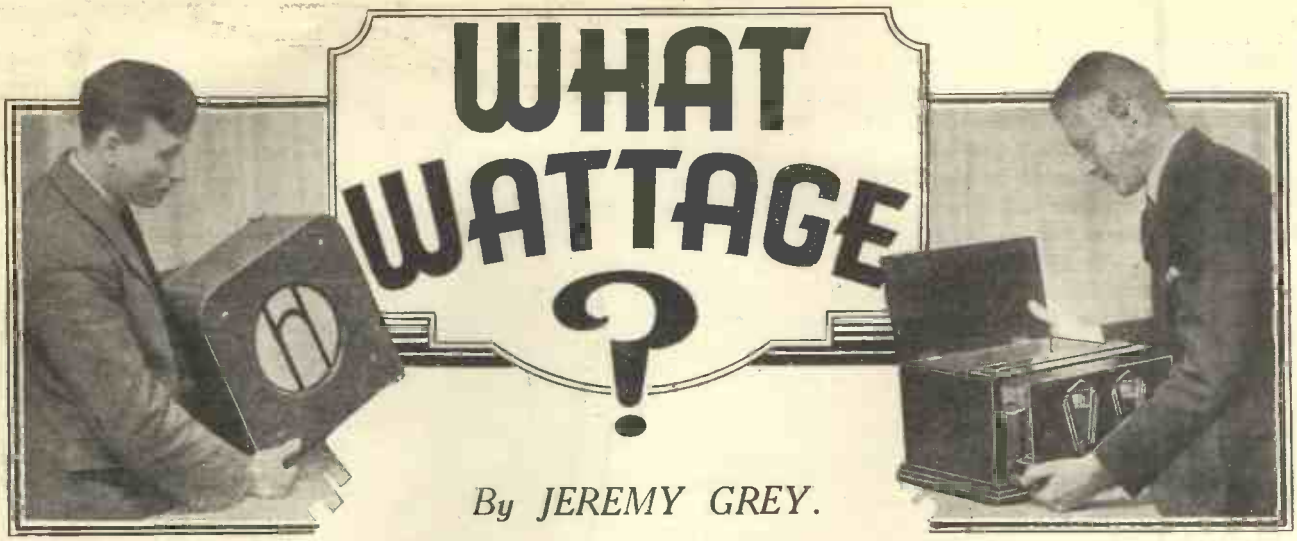
The Queen's Hall positions for the players are now fixed, but they are altered considerably at each big studio

(*Continued on page* 100)

DR. ADRIAN BOULT



The Wireless Symphony Orchestra at the Queen's Hall and (above) the B.B.C. control room adjacent to the hall.



By JEREMY GREY.

THE A.C. power output obtained from the last stage of a receiver or amplifier is a measure of the volume of sound; an output valve is used for the sake of its output and is judged on its output—and yet valve manufacturers do not publish figures giving the output obtainable from their valves. Which seems absurd.

No Unanimity

It is generally understood, however, that this secretiveness is due to the fact that there is not complete unanimity among the principal valve makers concerning the correct method of ascertaining the maximum output of a valve. Admittedly, any method is bound to be something of an approximation, but it would surely be wise to waive academic precision and to adopt some formula known to be sufficiently accurate for all practical purposes.

The amusing part of it all is that though members of the B.R.V.M.A. are precluded by their rules from publishing output information in printed form, they are permitted to give this information either verbally or in writing to anyone who cares to make a personal inquiry!

Percentage of Distortion

One solution to the difficulty would be to "grade" valves according to their maximum output, allowing for a definite percentage of distortion, say 5 per cent second harmonic distortion in the case of triodes and the same amount of third harmonic distortion for pentodes.

But the laws of the B.R.V.M.A. are, apparently, as unchanging as those of the Medes and Persians, and it is probably too much to hope that the near future will see such a scheme of grading, let alone an official rating of valves on an output basis.

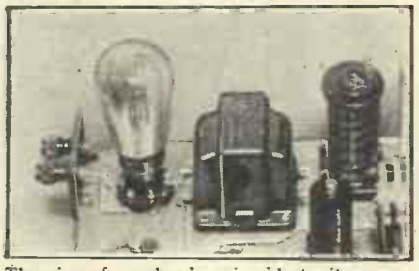
Fair Comparison

At the same time, serious amateurs and experimenters definitely require to know what output they may expect from a given valve when fully loaded, not only to assist them in the design of receivers and in judging the efficiency of their equipments, but also to permit fair comparison between valves of different types.

Fortunately it is not difficult to arrive at a fairly accurate determination of the maximum output by a method which, although open to certain objections on the part of sticklers for absolute mathematical precision, is sufficiently correct for all practical purposes.

How much power can you get from your power valve? That is, undistorted power. It's a useful item to know, and can be calculated quite easily in the manner described by our contributor, who also explains his method.

IS IT BIG ENOUGH?



The size of a valve is no guide to its power properties. You must know something about its characteristics if you want to be sure that it will handle enough without distortion to suit your purpose

The method is based on the well-known anode volts—anode current curve and load-line construction, but has been simplified to avoid the complications of trial-and-error attempts. The actual mode of procedure is described below, while a simple explanation will be found at the end of this article.

All that is necessary is a set of anode volts—anode current curves of the valve under review, and the usual working data supplied by the valve manufacturer—namely, the recommended grid bias and working anode current at maximum anode voltage, and the optimum value of the load.

Enlarged Drawings

Fortunately it is now the general practice of valve makers to publish in their catalogues anode volts—anode current curves for all output valves. Although the printed curves are usually on a somewhat small scale, it is possible to use them for this calculation, but for greater accuracy it is advisable to make an enlarged drawing on squared paper, increasing all dimensions about three times.

Only two of the complete family of curves need be drawn, namely; those corresponding to zero grid volts, and to grid volts equal to twice the recommended maximum grid bias.

The diagram on the next page shows curves drawn from the characteristics of the Mullard D.O.24 output valve, which is a three-electrode valve designed to operate at an anode voltage of 400. The maximum grid bias for this valve is 34 volts, and as no curve at twice this voltage

Applicable to Both Pentode and Triode Valves

is shown in the published graph, the appropriate curve at grid volts equals 68 has been sketched in between the curves taken at grid volts 60 and grid volts 70.

The next step is to take some convenient voltage occurring somewhere about the middle of the anode volts scale of the graph. In this case 400 volts has been taken. This is marked "B" in the diagram.

Operating Point

Divide this figure by the optimum load of the valve, which for the D.O.24 is given as 4,000 ohms, and multiply the result by 1,000:

$$\frac{400}{4{,}000} \times 1{,}000 = 100.$$

Call this number milliamps., and mark it on the anode current scale as at A in the diagram.

Next plot the "operating point," i.e. a point on the graph corresponding to a voltage equal to the maximum anode volts, and the working anode current at maximum grid bias. For the D.O.24 these figures are 400 volts and 63 milliamps., and the operating point is plotted at 0 on the diagram.

Join the points A and B by a straight line, and then draw a line parallel to AB and passing through the point 0, terminating on the grid volts 0 curve at X and on the "grid volts equals twice maximum grid bias" curve at Y.

The output is calculated as follows: Scale the points X and Y in milliamps. and in volts.

In the diagram, X corresponds to 117 milliamps. and 175 volts, while Y corresponds to 16·5 milliamps. and 587 volts.

Simple Explanation

Subtract the voltage values and milliamp. values as follows:

587 − 175 = 412 volts.

117 − 16·5 = 100·5 milliamps.

Multiply these two figures together and divide by 8:

$$\frac{412 \text{ v.} \times 100{\cdot}5 \text{ m.a.}}{8} = 5{,}176 \text{ milliwatts},$$

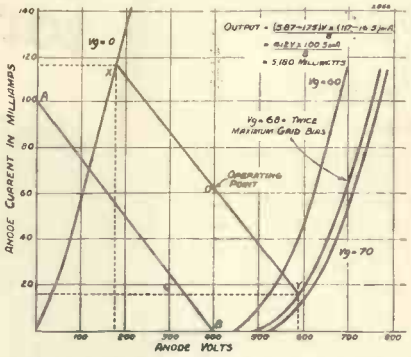
which is the maximum output.

The explanation of this method of calculation is really quite simple.

In our calculation we have assumed a voltage of 400, and we know the resistance of the load to be 4,000 (the optimum recommended load for the D.O.24), so that under these conditions the current flowing in the load circuit would be 400 divided by 4,000 equals ·1 amp. By multiplying by 1,000 this is converted to milliamps., namely, 100 milliamps.

The points A and B therefore correspond to the load current and voltage across the load respectively,

WORKING FROM CURVES



It is as well to re-draw the valve curves on a bigger scale so that readings may be made thoroughly accurate.

and it is obvious that corresponding values for any other set of conditions with the same load would be represented by lines parallel to AB.

We know that under working conditions the anode current of the D.O.24 when operated at 400 volts H.T. and at the recommended grid bias of 34 volts will be 63 milliamps., and therefore the "load line" for the valve under working conditions must not only be parallel to AB, but must pass through the point 0.

Again, because we are assuming the voltage applied to the grid to be the maximum permissible (namely—equal to the grid bias, we know that the load line must terminate on the anode volts — anode current curves taken at zero grid volts and 68 grid volts.

The difference between the anode currents at X and Y gives the vertical distance between the crest and the trough of the anode current variation, i.e. twice the amplitude of the anode current variation.

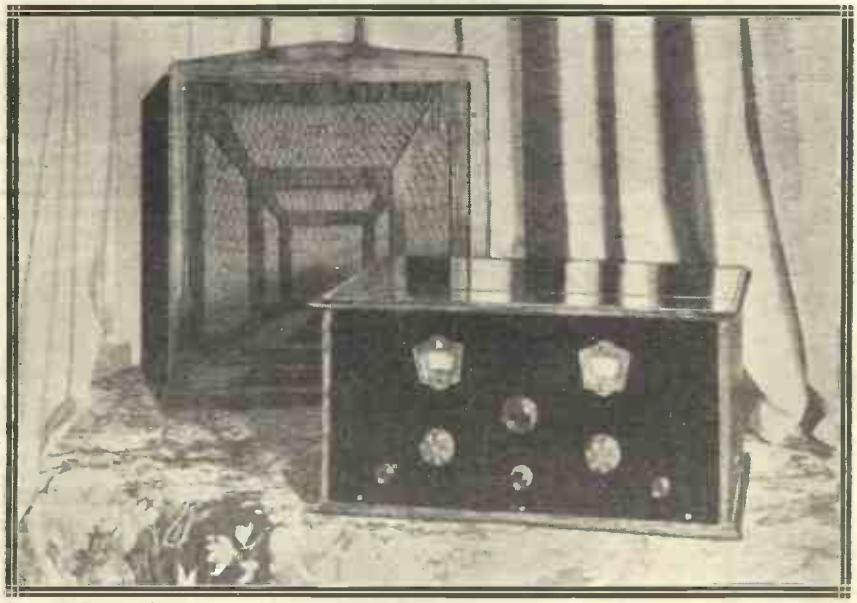
The Effective Value

Similarly, the difference between the voltages represented by X and Y gives twice the amplitude of the voltage variations across the load.

The effective or "R.M.S." values of the anode current variation of the alternating voltage across the load are equal to the amplitude $\div \sqrt{2}$.

The maximum output in milliwatts, therefore, which equals R.M.S. volts multiplied by R.M.S. milliamps., must be equal to (Y volts − X volts) divided by $2\sqrt{2}$, multiplied by (X milliamps. − Y milliamps.) divided by $2\sqrt{2}$, and a simple mathematical deduction shows that this is equal to (Y volts − X volts) × (X milliamps. − Y milliamps.) $\div$ 8.

IS IT LOUD ENOUGH ?—A MATTER OF TASTE



The question of what is a desirable level for loudspeaker volume is a matter of individual preference. What may be considered loud by some would be just right for others, but it is most important that whatever volume you desire a valve capable of handling it should be used.

USING PENTODES

Valuable hints on the working of this type of output valve that will enable you to get better results with it.

By R. W. HALLOWS, M.A.

THE pentode is one of the most interesting valves that we have, and if given a fair chance it can produce astonishing results. But it is no exaggeration to say that a very large proportion of the pentodes in use are not operated in such a way that they can show their real powers.

You have read, of course, of the way in which the pentode works, but let me briefly refresh your memory. It is really a screened-grid valve adapted for use as a low-frequency amplifier by the provision of a third or auxiliary grid. The screened-grid valve, plain and simple, cannot be used for work on the low-frequency side, since its peculiar characteristics make it unable to handle anything beyond a very small input.

Currents That Rise and Fall

What actually happens in a screened-grid valve is this. Suppose that we set the screening-grid voltage at 75, and start with the plate at 10 volts positive, gradually increasing the plate potential. To begin with, the plate current rises as the positive plate potential is increased. Then comes a fall in the plate current, accompanied by a rise in the current flowing in the screening-grid circuit. This continues until plate and screening-grid potentials are very nearly equal, after which the plate current rises and the screen current falls.

Why does the plate current fall off whilst the plate voltage is rising between certain values? As the plate is made more positive the speed of electrons from the filament is increased. Some of them strike the plate with such velocity that they smash other electrons out of it.

Saturation Point

On leaving the plate these come within the pull of the screening grid (remember that an electron is attracted by a positive charge) and fly to it. Thus the screening-grid current rises, whilst the plate current, starved by this secondary emission of electrons, falls. When the plate potential becomes only a little less than that of the screening grid the capture of electrons by the latter tails off, and the more positive the plate is made now the greater is the plate circuit current, until the saturation point is reached.

In the pentode an auxiliary grid is placed between the screening grid and the plate. This third grid is connected usually to the mid-point of the filament, and is thus strongly negative with respect to the plate.

Electrons knocked out of the plate are repelled by the auxiliary grid and sent back to their proper place. The pentode's characteristics, then, are without the kinks that occur in those of the screened-grid valve.

DROPPING THE SCREEN VOLTS

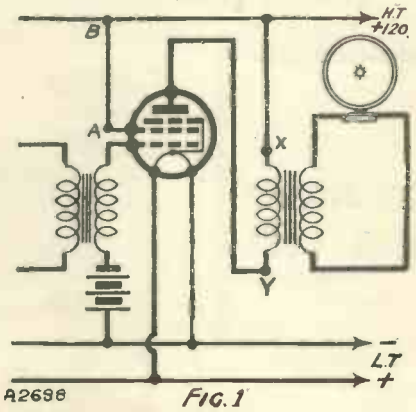


FIG. 1

We can bring down the volts on the priming grid by inserting a resistance between A and B.

Should It Be Less?

One of the most important points of pentode work concerns the relation of the voltages on the screening grid and on the anode. Most valve-makers tell you that it is best, as a rule, for the screening-grid potential (for some reason this is usually called the priming grid in a pentode) to be a little less than that of the plate. Therefore, if we are to have one H.T. tap, as in Fig. 1, we must drop the voltage to the screening grid.

Having decided that this is to be done, do not try, as some people do, to bring down the priming-grid voltage to a more proper figure by the expedient of inserting a plain resistance between points A and B in Fig. 1.

Decoupling Required

But why not? It looks perfectly easy. In fact, we can work out the value required. Suppose that the priming-grid current is 2 milliamperes

How It Works and How to Work It

and we decide to bring the voltage down to 100; then, to find the required resistance we divide the voltage to be dropped (say, 20) by the current passed—that is, ·002 ampere—and the answer is 10,000 ohms.

Up in the Air

But if you try to use such a resistance you will find that the valve goes, metaphorically, of course, right up in the air. You cannot employ it without a full decoupling circuit, and by far the simplest way is to use a separate high-tension positive tapping for the priming grid of your pentode.

With some of the modern pentodes the results obtainable where correct plate and priming-grid voltages are used are simply astonishing. Take the Mazda Pen.220. The priming-grid voltage with this valve should be about 10 per cent less than that actually applied to the plate.

If, therefore, the plate voltage is actually 116, that on the priming grid should be about 102. With the average impedance (transformer primary, choke or loudspeaker windings) in the plate circuit you will obtain something very like these values if you use the 120-volt tapping for the plate and the 102-volt for the priming grid. Connected in this way, and given a negative grid bias of 3 volts, this little valve is capable of delivering a third of a watt of undistorted output, or quite as much as most people require from the loudspeaker in rooms of average size.

A valve with very similar characteristics, and a very jolly one to use, is the Marconi P.T.2. Both of these valves when treated in the way described deliver this amazing output for a total high-tension current consumption in the neighbourhood of 5 milliamperes.

Why Not Try It?

Whatever kind of pentode you use, remember that you are wasting high-tension current if you don't keep the priming grid a little less positive than the plate. You are also shortening the life of the valve to some extent, for the smaller within reason the plate current the longer is it likely to last.

I would recommend you therefore to do a little experimenting with your pentodes. Fit a separate high-tension positive lead for the primary grid, and see how much you can reduce the potential without adversely affecting reproduction.

One meets a number of people who have fitted pentodes to existing sets and have been grievously disappointed with the results obtained. They expected a tremendous increase in the volume; they found sometimes very little increase; sometimes actually a decrease; and they wondered—they still wonder—why. The reason is that the pentode is a valve of very high impedance.

Speaker Impedance

The figures are not often given nowadays by makers, but they range from about 30,000 to 60,000 ohms, according to type. The impedance of the loudspeaker naturally varies with the frequency. At 100 cycles it may be taken as roughly equal to the D.C. resistance, but for matching purposes it is desirable to know the figure for about 1,000 cycles.

TAKING OFF "TOP"

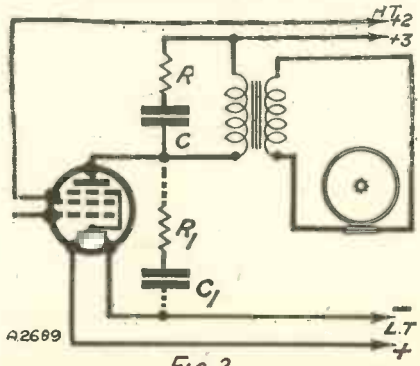


FIG. 2

A fixed condenser (C) and resistance (R) are usually connected as shown to correct excessive "toppiness" in a pentode.

Too Much Treble

This can usually be obtained from the makers. In any case, it is immensely lower than that of a pentode valve, and it follows that to match the two a big step-down must be provided in the output circuit. Unless the loudspeaker is specially wound for these valves a pentode output choke is not usually sufficient; a transformer is required as well. The difference in the volume (and, of course, in quality) obtainable is simply astonishing when the pentode is properly matched to the loudspeaker.

It is also urged against the pentode that its reproduction is apt to be on the shrill side. It gives far too much treble and not sufficient bass. This is perfectly true if you do not take steps to correct the "toppiness" of the pentode. And what steps can be taken?

A High-Note Filter

They are very simple. The components required are a fixed condenser with a capacity of about ·002 mfd., and either a variable resistance with a maximum of 50,000 ohms or a set of fixed resistances ranging in 5,000-ohm steps from 20,000 to 50,000 ohms. The resistance and the condenser are connected in series and wired as a rule as shown at R and C in Fig. 2; that is, across the primary of an output transformer, between the plate and high-tension positive terminals of an output choke, or straight across the loudspeaker terminals if a specially wound loudspeaker is used without filter circuit or transformer.

Alternative Method

You can, though, if you prefer it, connect them between the plate and L.T. —, as shown by the dotted lines in the drawing. The effect of this combination of resistance and capacity is to weaken the high notes and to make the response of the valve much more level to the whole range of musical frequencies. Experiment will show you just the value of resistance which gives the reproduction that appeals to you.

One last point. It is not a bad thing to make a regular practice of providing a five-pin valve holder for the output stage of any wireless set that has only one L.F. stage, fitting an extra high-tension positive lead for the fifth terminal. You can then use either a power valve or a pentode in the set without the slightest alteration in the wiring, though, of course, it will be necessary to employ an output circuit suitable for the valve in use.

Pentode or Power

The advantage of being able to insert a pentode or a power valve into the last holder at will is that in summer time, when the strength of the more distant stations falls off, you can exchange your winter power valve for the summer pentode and thus compensate to a very great extent for the seasonal decline in volume.

Do S.G. Valves Amplify?

To raise a question such as the above is rather astonishing in view of the general use of screened-grid valves. But our contributor

—Oliver Hall, D.Sc.—

gives some extremely enlightening facts, figures and experiences in this connection.

THE question which forms the title of this article may, at first sight, appear a little ridiculous. During the last five years the screened-grid valve has become more and more popular, and its efficiency has increased in truly remarkable fashion.

In high-frequency amplification the screened-grid valve has no rival. Why ask, then, if the screened-grid valve really does amplify ? It must amplify, or we should never use it as freely as we do in our modern receiving sets.

Worth Looking Into

Quite so, but if we may assume that all screened-grid valves amplify, we most certainly should not assume that all the S.G. valves in use amplify as much as they ought to.

Some of our modern screened-grid valves have amplification factors of two and even three hundred. How many such valves amplify two or three hundred times ?

This question of S.G. amplification is one which is well worth looking into, especially if, in so doing, we learn how much it is possible to make such a valve amplify under varying conditions.

As we all know, the S.G. is a valve with an extra electrode in the form of an open-mesh screen between the grid and plate.

It has the usual three electrodes—filament, grid and plate. But it has, in addition, this extra electrode, the purpose of which is to shield the operating, or control, grid from the plate or anode of the valve.

There is no need for us to worry ourselves as to the manner in which this additional elcctrode, or screen-grid, reduces the capacity between the plate and the control grid of the valve. It is sufficient for us to realise that we have this extra electrode in the screened-grid valve, and that we give it a positive potential from our high-tension battery.

Balanced-Valve Rectifier

Thus we give the plate or anode of our S.G. one positive potential, and the screen-grid electrode a different positive potential. It is by varying these two positive potentials to the plate and screen-grid of a screened-grid valve that we can learn that this ingenious valve gives us an amplification factor which varies between very wide limits.

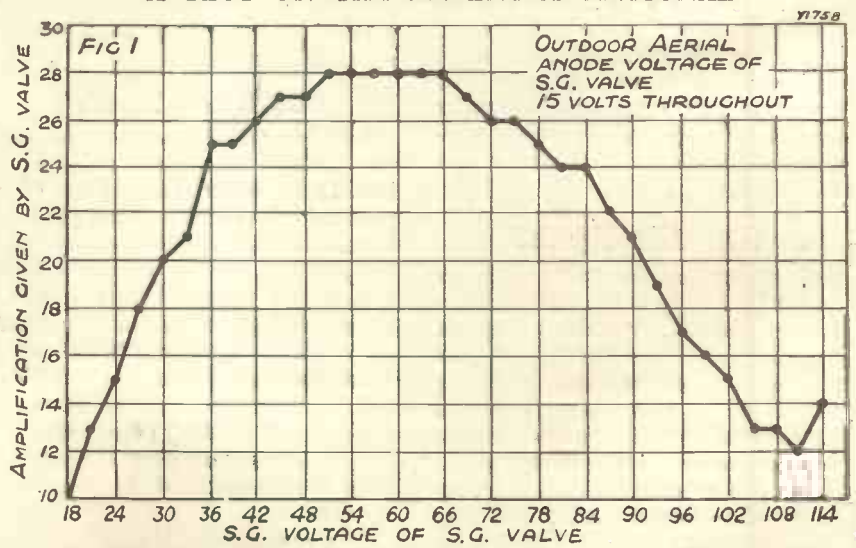
To measure the amount of amplification it is necessary to have some reliable instrument of the valve-voltmeter type.

Table 1

Aerial series condenser (mfd.) ..	·0001	·00005	·000025
Strength of Daventry National in micro-amperes	5	2	1

The writer uses an instrument which is usually described as a "balanced-valve rectifier." In this type the steady plate current of the valve is balanced out by a current in the reverse direction from the filament-heating accumulator. The balancing-out current is adjusted to the correct value by means of a variable resistance, and the actual measurement of the rectified current is made on a sensitive galvanometer, reading from 0 to 120 microamperes.

A TEST ON THE DAVENTRY NATIONAL



By means of this graph it was quite easy to work out the actual amplification obtained under the conditions outlined.

Connecting the balanced-valve rectifier to outdoor aerial and earth, and tuning to Daventry National, readings were taken with three settings of the aerial-series condenser. These readings are given in Table 1.

It should be noted that the highest amplification factor obtained was 42½, and that this highest value persisted from 60 to 78 volts on the grid-screen of the S.G. valve.

In the next set of readings taken on the screened-grid valve are also given in Table 3, and these amplification factors are illustrated in the form of a diagram in Fig. 1.

Perhaps the most interesting feature of the diagram in Fig. 1 is the way in which the amplification factor of the S.G. valve rose quite sharply from 10 to 28 as the screen voltage was increased from 18 to 51, and then fell almost equally sharply as the screen voltage was further increased from 66 to 111.

Table 2

Large outdoor aerial. Aerial series condenser, ·00005 mfd. Anode volts of S.G. amplifying valve, 120.

S.G. voltage of S.G. valve ..	0	22½	45	48	51	54	57	60	63	66	69	72	75	78
Strength of Daventry National (microamps.)..	0	45	74	75	75	77	78	85	85	85	85	85	85	85
Amplification of S.G. valve ..	0	22½	37	37	37	38	39	42½						

A stage of screened-grid high-frequency amplification was then placed in front of the balanced-valve rectifier, the coupling between the S.G. valve and the rectifier being the familiar choke-condenser, or tuned-grid coupling, which is without doubt the most popular type of high-frequency coupling in use today.

Highest Amplification

The aerial-series condenser was fixed at ·00005 mfd. With the anode potential of the screen-grid amplifying valve fixed at 120 volts, the screen-grid voltage was varied in steps of 3 volts from 45 to 78 volts, and the strength of Daventry National was taken at each voltage step.

Readings of the strength of Daventry National were also taken with screened-grid voltage at 0 and 22½ volts. The whole of the readings are given in Table 2.

Since the strength of Daventry National with aerial-series condenser ·00005 mfd., and the balanced-valve rectifier alone was 2 microamperes (Table 1), it is easy to work out the amplification factor of the S.G. valve for each screened-grid voltage in Table 2.

This has been done, and the amplification factors are given in Table 2.

Daventry National the anode voltage of the screened-grid valve was fixed at 15 volts. The screened-grid voltage was varied in steps of 3 volts from 18 to 114 volts.

The readings taken of the strength of Daventry National at each step of 3 volts are given in Table 3. The corresponding amplification factors of

Table 3

Large outdoor aerial. Aerial series condenser, ·00005 mfd. Anode volts of S.G. amplifying valve, 15.

S.G. voltage of S.G. valve..	18	21	24	27	30	33	36	39	42	45	48	51	54
Strength of Daventry National (microamps.) ..	21	26	31	36	40	43	50	50	52	55	55	56	56
Amplification of S.G. valve	10	13	15	18	20	21	25	25	26	27	27	28	28
S.G. volts	57	60	63	66	69	72	75	78	81	84	87	90	93
Strength of Dav. Nat. ..	56	56	56	56	54	53	52	50	48	48	45	42	38
Amplification	28	28	28	28	27	26	26	25	24	24	22	21	19
S.G. volts							96	99	102	105	108	111	114
Strength of Dav. Nat.							35	32	30	27	26	25	28
Amplification							17	16	15	13	13	12	14

Transformer Coupling

The highest amplification factor, 28, persisted from screen volts 51 to 66. This highest amplification factor, 28, should be compared with the highest factor, 42½, in Table 2.

As a next experiment, transformer coupling was tried for the S.G. valve in place of the choke-condenser tuned-grid coupling.

The transformer was of ratio 1:1, the primary and secondary windings being of equal length, and being wound on the former simultaneously. The amplification given by this high-frequency transformer was immediately seen to be very much greater than that given by the choke-condenser coupling.

In order to make measurements of the strength of Daventry National, the aerial series condenser had to be turned almost to its minimum capacity position.

The readings taken of the strength of Daventry National are given in Table 4, and the amplification factors given in that table were worked out

Table 4

Large outdoor aerial. Aerial series condenser, ·00001 mfd. Transformer coupling. Anode volts of S.G. amplifying valve, 15.

S.G. volts of S.G. valve	18	21	24	27
Strength of Daventry National (microamps.)..	25	52	95	120+
Amplification of S.G. valve	33	69	127	160

Table 5

Indoor aerial. Aerial series condenser, ·0001 mfd. Anode volts of S.G. amplifying valve, 15.

S.G. volts of S.G. valve	18	21	24	27	30	33
Strength of Daventry National (microamps.)..	2	3	5	14	41	120

Superiority of H.F. Transformer Demonstrated

on the assumption that the normal strength of Daventry National on aerial-earth alone was ¾ microampere for that position of the aerial series condenser.

Next, instead of the outdoor aerial, a small indoor aerial, 10 ft. long, was used, the earth connection being retained. Readings taken of the strength of Daventry National are given in Table 5. The 1 : 1 high-frequency transformer was used, and the aerial series condenser was set at ·0001 mfd.

Comparing Results

Table 4 brings out very clearly the superiority of high-frequency transformer coupling for a screen-grid valve. Comparison with Table 3, in which the highest amplification factor is 28, shows that transformer coupling gives many times more amplification than choke-condenser coupling.

Tables 4 and 5 also show how much more sensitive to voltage transformer coupling is than choke-condenser coupling. In Table 2, when the anode voltage of the screened-grid valve was 120, the highest amplification occurs for a screen voltage anywhere between 60 and 78 inclusive. Similarly in Table 3, with anode volts of the S.G. valve 15, the highest amplification occurs with screened volts anywhere between 51 and 66 inclusive.

Table 6

Indoor aerial. S.G. voltage of S.G. amplifying valve, 75 volts.

Anode volts of S.G. valve	0	3	6	9	12	15	18	21	24	27	30	33
Strength of Mid. Reg. (microamps.)	0	0	0	0	0	0	0	0	½	½	1	3
Anode volts	36	39	42	45	48	51	54	57	60	63	66	69
Strength	34	41	60	75	93	105	60	50	50	44	44	47
Anode volts	72	75	78	81	84	87	90	93	96	99	102	105
Strength	60	65	65	60	63	55	30	10	4	3	3	5
Anode volts				108	111	114	117	120	123	126	129	132
Strength				8	15	32	52	70	88	105	120	120+

When transformer coupling is used the voltage adjustments to anode and screen of the S.G. valve are much more critical. This is shown in Table 5.

For the readings given in this table, the anode voltage of the S.G. valve was kept at 15 volts. Changing the screen voltage from 18 to 33 volts increased the strength of Daventry National from 2 to 120 microamperes; that is to say, this change in screen-grid voltage from 18 to 33 increased the received strength of Daventry National sixty times.

Table 7

Indoor aerial. S G. voltage of S.G. amplifying valve, 69.

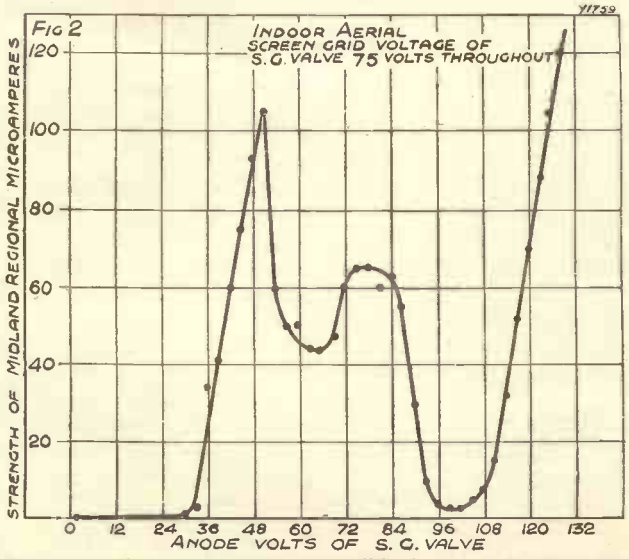
Anode volts of S.G. valve	18	21	24	27	30	33	36	39	42	45	48	51	54
Strength of Mid. Reg. (microamps.)	0	0	1	2	5	42	49	65	82	102	52	53	48
Anode volts	57	60	63	66	69	72	75	78	81	84	87	90	93
Strength	42	41	42	38	38	35	33	33	13	5	2	2	3
Anode volts	96	99	102	105	108	111	114	117	120	123	126	129	132
Strength	5	11	20	34	45	55	67	75	85	93	98	104	107

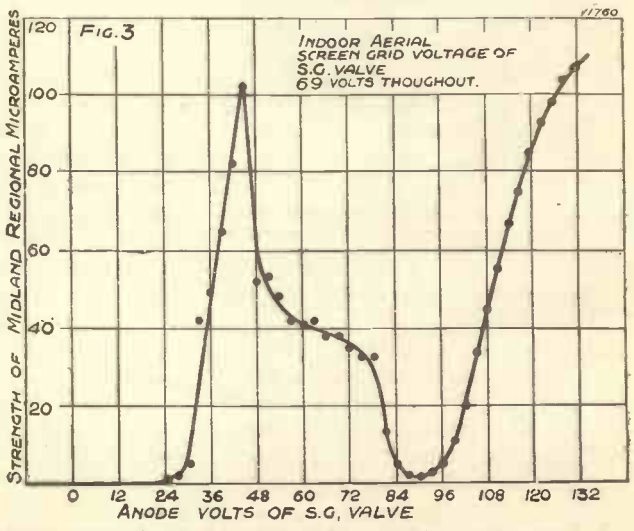
Medium-Wave Experiments

In the next experiments, a change was made to the Midland Regional. Transformer coupling was again employed.

(*Continued on page 92*)

THE MIDLAND REGIONAL PROVIDES SOME MORE STRIKING FIGURES





The effects of screen voltages are strikingly shown in these two figures, which depict the readings in graph form when an indoor aerial was used for receiving the Midland Regional.

IN PASSING

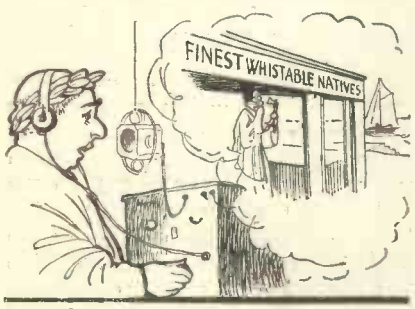
Looking Into the Past and Future

I HAVE observed from time to time in the public prints articles by gentlemen with speculative minds, dealing with the possible effects on history which might have occurred if our forefathers had known how to telegraph by radio.

A General Omission

In most instances these articles have been concerned with wars or battles, and I may point out, in passing, that they generally omit to take account of the fact that *both* belligerents would possess radio; thus Nelson would have been advised by wireless that Villeneuve had skedaddled to a certain port, but Villeneuve would have been warned by the same means that Nelson was after him, thirsting for glory,

BETTER THAN FIDDLING



"——Nero would have been less of a villain."

"warm work" and a spot of the "Nelson touch."

But wars are only certain threads of history; there are other components of the pattern, notably peaces and treaties, ladies, marriages and divorces, murders, discoveries, trade, literature, religion, art, cookery, sports and science.

I leave to a more leisured writer the interesting task of describing medieval and Renaissance scenes in a radio setting. All I can say is that if Nelson had had radio the Great War would have been fought in early Victorian days and the Treaty of Versailles would have been revised before we were born.

This month our contributor takes you back into the Middle Ages and amusingly surveys radio's probable position in the brave days of old. What, too, he asks, would happen if we could see into radio's future?

Much more fruitful would it be to cogitate upon the doings of our ancestors in times of peace. I imagine that Nero would have been less of a villain if he had been able to keep in radio communication with Whitstable and secured the best of the oyster crop.

Again, Henry the Eighth would have found radio very convenient in his traffic with the Pope over divorces; indeed, if matters were so advanced that radio was in common use, no doubt the modern craze for "forms" was also coexistent with it, and Henry had a pad of blank divorce forms in a loose-leaf folder.

But I am afraid that radio would have fitted ill into the brave days of old, when there was so much time and it ran so slowly. Undoubtedly the pioneers of the art would have been severely discouraged—burnt at the stake, as likely as not—in their efforts to induct indecent speed into the methods current at the time, when wars lasted thirty years, and men lay in dungeons half a lifetime before being brought to trial.

Free From Danger

Broadcasting, perhaps, might have found a footing in the baronial halls and manor houses, and the jesters would have been able to crack their most outrageous jokes free from the danger of being stunned by a marrow bone or tied up by the thumbs. The Talks Department of the period would have "put over" piquant discussions, in Latin between John of Wadham and William of Ware.

And the songs—oh, dearie, me! Highbrows, with low brows and matted hair, would twangle on the harp or lute, and yowl something like this:

Sith ye londis withouten feere,
Engelischmanne schall trinken beere;

and lots more like it.

Giving the News

It is easy to conjure up visions—or should I say auditions?—of the News Bulletins. "Hugh of Highbury hath ge-scoren ys nyne scowre and ten

A PROGRAMME CRITIC

"Broadcasting might have found a footing in baronial halls."

geol thys seesonne, to ye grete bane of Jack of Wollwhyche, wot hath pyled uppe but a meeslye ate scowre." "Hys majestie ye Kynge weds ye fourthe tyme." (By the way, the newspaper placards would at the same time appear with "Bluebeard Does It Again.")

"Sporte. Roger of Runcorn hath defeaten ye recorde for ye longe-distance walke, having ge-walken from Caring Crosse to ye Aldegatte Pumpe in ye space of fyvve houres and two scowre minuts of ye clocke."

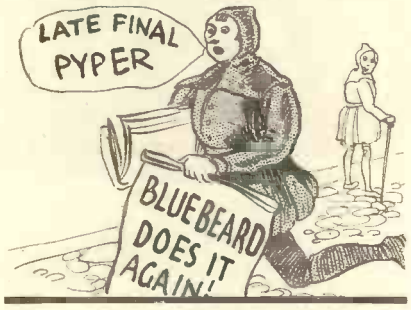
Having let my imagination play round the idea of running commentaries on bear-baiting and witch-burning, I hasten to obliterate the

Not a Great Step Between Knowing the Future and Seeing It

horror by suggesting that for the space of two minutes we should in silence consider the England of Elizabeth with bicycles, top-hats and a Communist party. That's better.

The persistent hankering of some folk for communication with Mars,

THE FIRST EDITION



"Hys majestie ye Kynge weds ye fourthe tyme."

and their assumption that the Martians are much more advanced than we, makes me wonder whether we are to the Middle Ages people what the Martians may be to ourselves. If, like Mark Twain's Yankee, we found ourselves suddenly plunged back five centuries, eh ?

Desire to Escape

Tripping over a lot of garden cuttings on the floor of the drawing-room, placed there in lieu of a carpet, and ducking under the halberd of the man-at-arms on duty on the other side of the keyhole, we should pass shiveringly up and down dozens of stone steps, including a corkscrew stairway with a rope banister—finding a mastiff with bloodshot eyes and a long-distance odour, *coming down*—and make our way to the study through a dark passage smelling like a family vault and embellished with fungi.

We should rush to turn on the radio —and it would not be there ! Nothing but a fat monk kicking up a din on some sort of primitive ukulele !

We should desire to escape for a few hours at the Palladium, hastening away in a nice little saloon car. But we should be invited to ride forty miles through mud to witness a "miracle play," our steed being a carthorse, one of those big chaps with hairy feet and plaited grey moustachios.

We should write with quills dipped in charcoal and water ; we should wait three years to get a message taken to Turkey and the reply brought back. The chickens would sneak the water from the water-clock and the rats wax fat on the bedroom candle.

We should sleep on odd bits of mangy fur, stark naked, in a draught, and we should die quickly of plague, cholera and typhoid superimposed on appendicitis, and wake up where we belong—in a world of radio.

Professors of Foresight

If those Martians were able to project themselves to earth by beam wireless or rocket post, they would be puzzled till their tentacles curled into knots. I am ready to bet that if they were placed in front of, (*a*) a grid leak, (*b*) a haggis, (*c*) an assistant inspector of holes in watering-carts, and (*d*) a pair of charlady's button-up boots, they would be unable to suggest to what use any one of those objects could be put, except, perhaps, the inspector, who they would probably mistake for a giant woodpecker.

Of this I am quite certain ; they would laugh themselves into spare parts at the sight of the human eyebrow, and would be deeply concerned to have an explanation why a horse's back leg hinges point to the rear and those of an elephant point forrards ! And they would not omit to inquire why Society does not execute men who use "moustache cups." (*Ugh !*)

H. G. Wells' idea about professors of foresight brings to us a vision of brass doorplates inscribed: "Prophecy in all its branches." If the faculty of knowing what will eventually be written on the pages of the future really exists and can be developed, many remarkable results would ensue if it were brought to a practical stage.

Very Gratifying

Betting and sweepstakes would disappear, and there would be a deal of running off to non-extradition countries. Weddings would be rare events, so my next-door neighbour tells me. (I can hear "her" through the wall !) Some of our jolliest pals would immediately become teetotallers in an effort to save ole man liver, and thereby would perhaps alter their destinies to that of drowning.

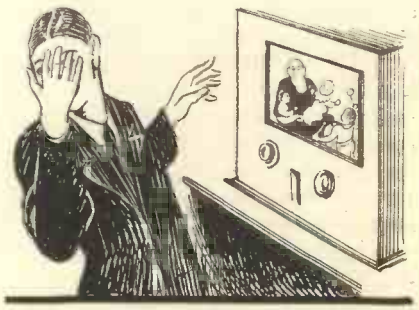
Personally I should find it very gratifying to be able to say to the B.B.C., "Look here ! I see that in 1933 you will broadcast a lot of Stravinsky, Honegger and Mossolov. Well—don't do it ! "

Not a great step between knowing the future and *seeing* it. Wells' own story, "The Time Machine," tells you a lot about this sort of delirium. The thought of seeing one's self twenty years hence, bewhiskered and surrounded by grandchildren, or in Dartmoor—or perhaps tuning-in to next year, only to gaze on a *blank screen*, is too far removed from my philosophy of life for me to harbour it. It wouldn't do me a bit of good to know what a fix I shall be in to-morrow, nor would the information help me out of to-day's soup.

Fruit Before Blossom

It seems to me that generally speaking Dr. Pangloss was right and that everything which is, is O.K., because this is the best of all possible worlds ; not that it couldn't improve if the human race didn't exist !

SEEING'S BELIEVING



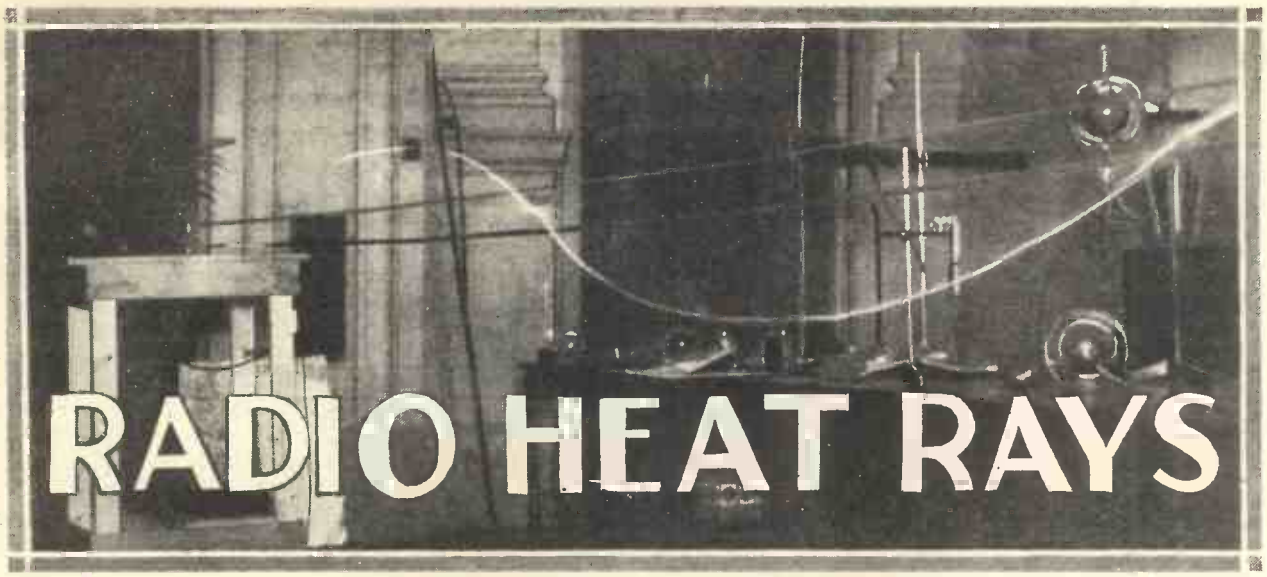
"The thought of seeing one's self twenty years hence."

The Middle Ages did not enjoy radio because you cannot have the fruit before the blossom. And we ourselves have just about as much as we can bear. Possibly our posterity may be strong enough to gaze with equanimity upon a scroll of future misfortunes and await smilingly the kick to come. But not so your obedient servant.

Here's to 1933 !

I want to relish my victuals until they or myself are suddenly snatched away, rather than that every beat of my heart should sound to me like the ticking of a clock nearing The Hour.

So, here's to 1933 ! Let it do its darnedest, but it will not get us down. It's another year and the suns and seas of holiday are waiting for us.



RADIO HEAT RAYS

As wireless develops so do we find that its uses become more and more varied. In addition to ordinary communication we can now locate deposits of gold, silver, copper and other minerals buried far beneath the surface of the earth, guide battleships, transmit photographs and pictures, sound the depth of the sea or ascertain the height of an aeroplane, to mention only a few of radio's accomplishments.

An Intriguing Dream

And now we find that wireless is leading us into the realm of heat, for recent investigations have shown that, under certain conditions, ultra-short wireless waves can be made to generate heat.

Does this mean that we shall be able to broadcast heat by wireless as we broadcast concerts? It is an intriguing dream, and there are many competent investigators who think that it will come to that some day. On the other hand, there are sceptics who ridicule the idea.

"Shall we be able to broadcast heat by wireless as we broadcast concerts?" asks G. H. Daly in this illuminative review of the possibilities of the future.

Merged Into Light

Let us examine the possibilities one way or the other. While transmitting heat by wireless may be in the far-distant future, there is no doubt that our investigations into short wireless waves will enable us to learn a great deal more about heat waves than we know at the moment.

It is, indeed, perfectly natural that short wireless waves will produce heat, because as the frequency of the wireless waves increase so do they approach nearer to the frequency of heat waves. In fact, somewhere in the depth of the spectrum infinitely short wireless waves (and by "infinitely" is meant waves far shorter than the ordinary ultra-short waves) must merge into the ordinary heat waves.

For the first time investigation is being carried on in this region of the spectrum, and it is more than likely that some new rays will be discovered which are partly wireless and partly heat waves.

The only form of heat ray which we know is the ordinary ray transmitted by fire; yet there must be quite a number of different kinds of heat rays just as there are a number of different kinds of light rays. At another part of the spectrum heat waves merge into light waves, and we know a good deal about light waves.

Ordinary white light, for instance, can be split up into a number of colour rays—green, blue, indigo, violet, red, orange, and yellow. Ultra-violet light makes popular photography possible and cures rickets, while the infra-red rays enables us to see in the dark.

The Unknown Area

In the same way there must be a more or less corresponding number of various kinds of heat rays if we can but isolate them. It is interesting to note here that the light ray was in some respects responsible for the discovery of wireless.

The first wireless waves were generated by the German, Hertz, when he was endeavouring to verify the results of Clerk Maxwell's electro-magnetic theory of light. Hence, light waves led to the discovery of wireless, and now wireless waves are leading us towards new discoveries in the field of heat waves.

There is what might be called a vast unknown area between ultra-short waves and heat rays which yet remains to be explored fully. It is true that some of these rays have been produced in the laboratory, but their possibilities have not yet been fully exploited, and in this area must lie some very interesting rays which we might call wireless heat-rays.

Secret of the Sun

The possibilities of wireless heat-rays are very interesting. At present the ordinary heat ray is quickly damped out by the atmosphere, unless, of course, it comes from some tremendous source of natural energy such as the sun.

We have not yet discovered why the sun is capable of transmitting such a tremendous amount of energy, and it must not be regarded as a big bonfire in the sky which sends out its heat by reason of its size. There is something much more mysterious and complicated than that responsible for the eternal heat of the sun—something to do with atomic disturbances and ether rays.

Thus in probing into the realm of the heat ray we may discover some new and extremely powerful manner of radiating heat energy.

The most interesting possibility of all is in the creation or discovery of a heat wave which we can transmit by wireless just as we transmit a sound wave at the moment by

"Two Ways In Which We May Transmit Heat By Radio"

converting it into electrical impulses. That is to say, the heat wave would be radiated into the ether, but would be undamped and unperceived until it was picked up by some detecting apparatus like the wireless set.

There are two ways in which we may transmit heat by wireless. We might superimpose a new type of heat ray on to the ordinary wireless waves; transmit it through an ordinary wireless transmitter and then reconvert it back to heat at the receiving end. This would follow the present practice of converting speech and music into wireless waves, radiating them and then reconverting them back to the original sound at the receiving end.

Romantic Possibilities

Although this method is not entirely out of the question, the ether is already overcrowded; and even if a system were developed for converting heat energy into ordinary wireless energy, there would be no room for it as matters stand at the moment, to say nothing of the atmopherics which also might result!

A second method is to discover a wireless heat-ray which uses a part of the spectrum entirely different from ordinary wireless waves. It is conceivable that this ray would remain in the ether until detected by some special form of detector, and would not cause interference to ordinary communication at all. This second type of wireless heat-ray is the least unlikely, and if the present scientific age continues to develop then this is the manner in which we may expect our heat to be broadcast.

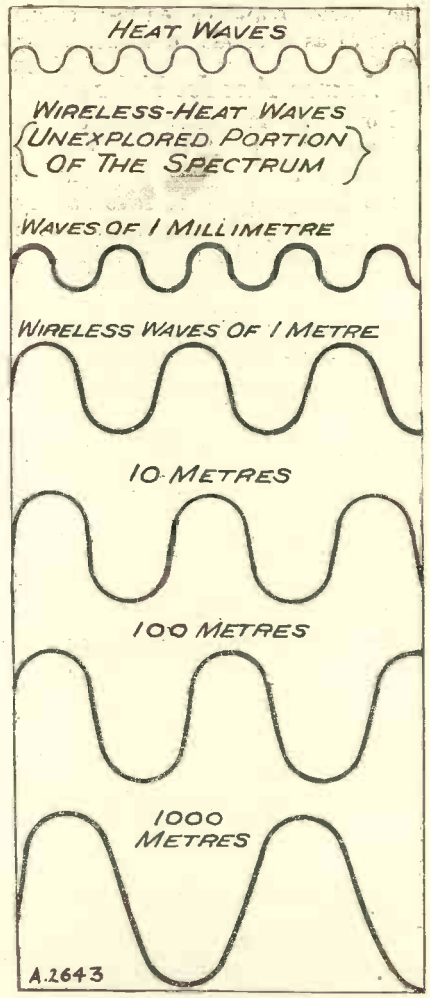
The romantic possibilities of broadcast heat are almost beyond the powers of imagination to describe. Polar wastes would be made habitable, overcrowded countries, such as China and Japan, could send their surplus millions to these new countries.

Warming the Arctic

Our northern winters could be made much less rigorous; it would be quite easy to warm up our streets and parks even in the coldest weather; we could walk about in winter in light summer clothing, and heat would be transmitted to our homes as cheaply as concerts are at the moment.

Such possibilities may sound somewhat exaggerated, but man is ever seeking after more and more comfort here below, and nothing is so likely to accomplish this as the discovery of wireless heat-rays which can be radiated to the farthest corners of the earth.

ESSENTIALLY THE SAME



There is an essential similarity between heat waves and radio waves—but a vast difference in frequency—and between these two effects there is an unknown area of the spectrum to be explored and exploited.

BEHIND THE SCENES OF BROADCASTING

Some glimpses of past and present control-rooms.

THE control-room is the nerve centre of broadcasting. It is here that the programme material from outside sources, different studios, and sets of studios, is moulded into a suitable form for passing on to the transmitting station.

Whatever this material may be, a programme relayed from some distant country or a talk from an adjacent studio, it is all regulated and, when necessary, corrected so that it forms electrical impulses of a consistent strength and, as far as possible, quality.

You will have noticed that the B.B.C. aims at maintaining as even a volume level in your loudspeaker as it can. This is the work of the control-room engineers.

Sometimes you can detect when they are increasing the amplification under their control because there is a step-up in the breathing, rushing background noises which are always present though usually not in sufficient power to be obtrusive.

Past and Present

On another page in this journal you will find some details of B.B.C. control technique, in an article entitled "From 'Mike' to Aerial." And also pictures of some of the apparatus in use at broadcasting headquarters.

It all looks very pleasing, and yet, while complimenting the B.B.C. on its efficiency, I sometimes sigh for the freedom of the past.

In earlier days, control-rooms were often rough-and-ready affairs operated lightheartedly if not haphazardly.

I have sat in a British broadcasting control-room smoking a cigarette and chatting to the men on duty while they were actually engaged in handling big broadcast features.

But such a thing is not likely to happen in the magnificent control-room at Broadcasting House. This is all very official, scientific, and elaborate.

Preventing Breakdown

Everything is duplicated and triplicated so as to eliminate the possibility of a complete breakdown.

There are hundreds of "telephone terminals"—the ends of telephone lines which radiate from Broadcasting House to all parts of London and Great Britain.

Practically all those hotels, theatres, cinemas, etc., from which broadcasts are given have private lines to radio's headquarters.

But no direct connection is made between these buildings and Brookmans Park. There is just a preliminary amplification to build up a standardised volume level, and then there is the control engineer's apparatus with which incidental volume variations are carried out. G.V.D.

DO S.G. VALVES AMPLIFY?

—*continued from page 87*

A short indoor aerial of 20 ft. of wire was used, the aerial wire running across a room to the top of a door and thence out to a staircase, the height of the open end of the aerial being 12 ft. An ordinary earth connection was used, and the tuning coil consisted of 45 ft. of wire wound in three sections of 15 ft. in a three-slotted former.

Indoor Aerial Readings

The high-frequency transformer used to couple the screen-grid valve to the balanced-valve rectifier was of ratio 2 : 1, the secondary winding being twice as long as the primary winding. The two windings, primary and secondary, were wound simultaneously on the former until the primary winding was complete. The secondary winding was then continued alone.

With this indoor aerial two sets of readings were made of the strength of Midland Regional. In the first set of readings, given in Table 6, the screened voltage of the S.G. valve was kept at 75 volts, and the anode voltage was varied, in steps of 3 volts, from 0 to 132 volts.

These readings are illustrated in the form of a diagram in Fig. 2.

The second set of readings was made with a screen voltage on the S.G. valve of 69 throughout. These readings are given in Table 7, and they are shown in the form of a diagram in Fig. 3.

Important Features

Since it was impossible to get a reading on the strength of Midland Regional on the indoor aerial without the screened-grid amplifying stage, actual amplification factors cannot be given in Tables 6 and 7. The diagrams in Figs. 2 and 3, however, show several important features.

First of all, Fig. 2 shows that when the screen voltage of the S.G. valve was left at 75 volts, the amplification of the valve rose very sharply and uniformly as the anode voltage was increased from 33 to 51 volts. After this latter anode voltage the amplification fell, rose again and fell again, until at anode voltage 99 the amplification was as low as it was at 33 volts.

From 102 volts on the anode, the amplification began to increase, and after 111 volts there was the same sharp and uniform increase as there was from 33 to 51 volts.

It is most interesting to note that the two straight lines in the diagram in Fig. 2, showing these sharp and uniform increases in amplification, are practically parallel. It is equally interesting to note that the S.G. valve used in these experiments gave the same amplification at anode volts 51 as at anode volts 126.

Lower Anode Voltage

Round about anode volts 51 the voltage adjustment is very critical, otherwise the suggestion might be made that, in order to save battery costs, this particular S.G. valve might be used with screen voltage 75 and anode volts 51, instead of anode volts 120.

The first point to note about Fig. 3 is that with 69 volts on the screen of the S.G. valve instead of 75, the amplification given is not so great. Fig. 3, however, shows the same general features as Fig. 2. There is the same sharp, uniform rise in amplification in the first part of the curve, though the maximum amplification is reached at a lower anode voltage, 45 instead of 51.

The S.G. Does Magnify

From the maximum amplification at anode volts 45, the amplification given falls unevenly until anode voltage 90 is reached. Then it increases sharply, but not uniformly, as the bending of the curve shows. In the corresponding part of the diagram in Fig. 2 we had a straight line, showing uniform increase of amplification.

A comparison between Figs. 2 and 3 shows that a screen voltage of 75 volts, as specified by the manufacturers of this particular valve, is much better on the whole than 69 volts.

Glancing through the results which have now been described, tabulated and illustrated in this article, we see that our title-question is answered most emphatically. The screened-grid valve does amplify, and in no small measure.

High Amplification

With choke-condenser tuned-grid coupling, the amplification given by an S.G. valve may easily exceed the figure 40 (see Table 2). Even with inverse voltages—that is, with the anode voltage of the S.G. valve less than the screened-grid voltage—the S.G. valve may give an amplification factor of over 25 (see Table 3).

NEW S.G. CIRCUITS

—*continued from page 70*

effect of variation in screen potential and grid volts. From these curves much information of interest was gleaned.

A few of them are reproduced in Fig. 4, each for optimum screen volts. Notice that these curves are, over the major part of their length, straighter than the corresponding curve for normal voltage conditions.

This improvement is, of course, brought about by the combination of high anode resistance and the special ratio of screen and anode volts. In the case of the lower anode resistances, the straight portion is of sufficient length to accept a strong signal without rectification or cross-modulation.

These curves also show that the value of anode resistance should be chosen with regard to signal input strength, amplification required and any restrictions of H.T. current consumption.

Incidentally, all the anode resistances used in these experiments were of the metallised type with a very small self-capacity. Other kinds of resistor either gave poor amplification or none at all.

A Little Too Involved

Examination of curves similar to those of Fig. 4 gave me a clue to the necessity for a particular screen voltage, but this is a little too involved to go into here. It was found, however, that the optimum screen voltage, which increases with decreasing anode resistance, was not really critical; 10 volts or so either way makes little difference, although any marked divergence from this best voltage range results in a noticeable reduction in volume.

After further study of these characteristics I chose as the best all-round value for practical test, with an S.G. of normal type, an anode resistor of 150,000 ohms, when the optimum screen potential is between 30 and 40 volts, for 150 volts H.T., and the *total* H.T. current no more than ·9 m a. This is so small that there is not much object in reducing it farther, while in view of its performance the S.G. certainly earns its keep here!

A test receiver was now set up incorporating this anode resistor with provision for the required voltages just mentioned, the circuit being

(*Continued on page 94*)

FROM "MIKE" TO AERIAL

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one group with their inputs and outputs brought out to jack fields, so that any amplifier can be used for any studio should a particular amplifier develop a fault during a transmission.

It may be of interest to note that separately-heated cathode valves are used in these amplifiers, and that great care has been taken to avoid "valve-ponging."

R.C. Coupling

The "B" amplifiers are of the three-stage type, with resistance-capacity interstaging coupling, the inputs and outputs being fed through transformers. The gain of each of these amplifiers is 46 decibels, and is variable over a range of 35 decibels by means of a volume-control potentiometer, but they are set normally for a gain of approximately 38 decibels.

Immediately preceding each "B" amplifier is a main volume control, which gives a variation of 2 decibels per stud, and this is used for controlling the strength of the transmission and for fading-out purposes.

The range covered during controlling is about 30 decibels, but for fading out a total loss of nearly 50 decibels is introduced before the circuit is actually broken. This ensures that the programme is reduced almost to inaudibility before the circuit is disconnected.

The function of the land-line amplifiers is two-fold. In the first place, they act as "trap" valves with all their inputs connected to the outgoing programme (i.e. the output of the "B" amplifier), but with their inputs isolating each trunk-line connecting to the various transmitters or distribution points. Thus trouble of any sort on one line is prevented from interfering with the service on another.

Flexible Volume Control

Secondly, if the volume is insufficient on, say, the London-Leeds S.B. circuit, the gain of that "C" amplifier can be increased without a corresponding increase occurring in the volume of the programme on, say, the London-Daventry land-line.

The need for the flexibility of such an arrangement needs no stressing, since careful adjustment of the output levels to lines is essential. There are in all twelve "C" amplifiers, each having two 10-watt type power valves in the output stage.

There is also installed in the control-room a fourth type of amplifier which is used when an incoming transmission from some distant point, such as a provincial studio centre or an O.B. point, is received in the control-room. The "D" amplifier raises the incoming transmission to the same level as the average level output of the "A" amplifier. Thus it can be fed directly to the "B" amplifier and controlled in the manner to be described later. There are in all six "D" amplifiers, each designed for a maximum gain of 36 decibels.

Trap valve amplifiers are provided in the control-room to avoid the possibility of any fault on a local circuit affecting the outgoing transmission. The trap valve amplifiers are arranged with their inputs across the chain of transmission, their outputs feeding loudspeakers in listening-rooms, house 'phone circuits, etc., in the building. Thus, if a short-circuit occurs on the house wiring it does not affect the outgoing transmission.

No Interference

All amplifiers are designed to give a flat response curve over a band of frequencies of 30 to 8,000 cycles per second. Elaborate decoupling arrangements are incorporated to ensure that there shall be no mutual interference between amplifiers, and that switching operations on one bank shall not cause noises in another chain already in use.

There are six transmission and eight rehearsal control positions or desks in the control-room, and these are novel.

In addition to the usual studio signalling keys and lights, each control position is fitted with a complete set of punching keys. These punching keys operate a series of relays which enable any studio circuit to be set up from any control position in one operation.

By "set up" is meant that the microphones are polarised, the various power supplies switched on to that studio's "A" amplifier, and the necessary connections made between the output of that studio's "A" amplifier and that particular control position.

Certain of the control positions are provided with more than one channel, and it is thus possible to set up a studio a few minutes before it is actually required, and merely to fade-over from the outgoing to the incoming studio by the turning of one handle.

NEW S.G. CIRCUITS

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shown in Fig. 5. This may not appear very different from Fig. 2, but certain minor changes in the latter, plus the improved valve conditions, produced a marked difference in results.

Apart from the experimental potentiometer control of screen volts we have a small coupling condenser of ·0001 mfd. (actually a semi-variable was used), while the detector grid is tapped down the tuning coil with a small condenser shunting its anode to earth in addition to the differential reaction condenser.

Tapping down the detector grid noticeably improved selectivity without loss of volume, while the beneficial effect of the anode shunt condenser was quite marked on the long waves.

The potentiometer control of grid bias for the S.G. is very useful; alternatively a 9-volt cell would be suitable.

Now for some actual results. Selectivity was of a very satisfying order, while cross-modulation was not noticeable, a slight increase in negative bias assisting here. It was also found that the G.B. potentiometer acted very well as a volume control.

Hand-Capacity

Tuning was slightly more critical than with the normal S.G. stage, both circuits requiring to be exactly in tune for full sensitivity. Tuning, however, is by no means difficult.

Then as regards stability the receiver was entirely satisfactory, no "spilling over" occurring at any wavelength, while reaction was quite smooth and hand-capacity troubles altogether absent.

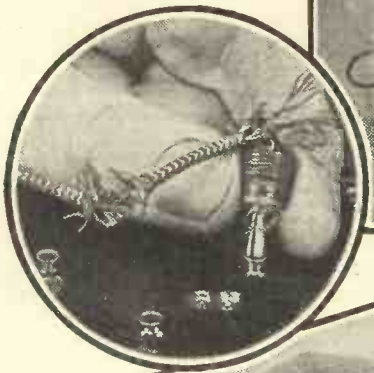
On distance reception the receiver behaved even better than before, numbers of foreigners being received at excellent volume (bar fading) and quality.

As far as I could judge, this new H.F. stage was now working just as well as the standard S.G. amplifier. In fact, by comparison, the latter was neither as selective nor as stable.

To sum up the advantages of this new type of S.G. stage, we have, first, reduced H.T. current consumption, which means greater valve efficiency; and, secondly, secured rocklike stability without complicated screening or critical layout. In addition, we eliminate the more expensive and less certain H.F. choke for an easy choice of resistances to suit different valves and conditions.

An Invaluable Book for THE HOME CONSTRUCTOR

Tracing Trouble



How Your Set Works

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How to Build a Simple Receiver
Television Developments
How Your Set Works
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PRACTICAL RADIO

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ON THE TEST BENCH

—continued from page 66

Useful Devices

One of the most ingenious of the smaller radio devices of the season is the Belling-Lee Twintap. This retails at only one penny, but its usefulness is out of all proportion to its price. Briefly, it enables two wander-plugs to be connected to a single socket.

The Twintap is, in effect, a plug having two sockets. It is often a source of irritation to the constructor that he cannot insert more than one plug in a grid-bias or H.T. battery socket, and frequently there must be some loss of efficiency on that account. The Twintap completely overcomes the obstacle, and all constructors should be in possession of at least one or two.

The Lissen Potentiometer

The Lissen volume-control potentiometer is one of the best units of what is probably the most comprehensive range of radio products made by any one manufacturer in this country.

And what a marvellous exhibition of twentieth-century craftsmanship this range constitutes. There is polish and finesse on every single item bearing the name of Lissen, from the simplest gadget to the larger of the complete radio receivers.

Comparatively simple though a volume control may at first sight appear to be, its complete success demands very high standards of mechanical and electrical skill. A smooth knob rotation must be backed up by a smoothly continuous resistance change, and the one without the other is useless.

The Lissen potentiometer volume control does not fail on either count, and in action it gives an even gradation and a complete freedom from noises.

As would only be expected of such a firm, Messrs. Lissen are well to the fore in the manufacture of those comparatively recently introduced components—completely canned coils. These, by the way, are not to be confused with their less efficient predecessors—more or less ordinary coils with "tin hats" on. Modern screened coils are specialised productions, as different from these as any ostensibly similar things could well be.

In addition to single units, Messrs. Lissen are making a useful two-coil assembly, both coils being mounted on the one chassis and operated by the one wavechange knob.

Such an assembly has, of course, several advantages over two single coils. We have used Lissen two-coil assemblies in various types of sets with conspicuous success.

Permcol Panels

We have been asked to give our opinion regarding Permcol panels. This we do not find difficult, for we have employed a large number during the past year or so. Permcol panels have beautifully polished surfaces, and they "work" easily without undue chipping.

They retain their attractive surfaces unimpaired even after exposure to sunlight and other trying conditions. Electrically they reach high standards, and surface leakages are not encountered when they are used.

Preh Resistances

These well-known components are now being made in this country, and the range covered is said to include every form of resistance, variable and otherwise, for all normal purposes, including double- and triple-ganged resistances and potentiometers, combined resistances containing two separate strips operated by concentric knobs, variable resistances with switch combined, heavy-duty types with abnormally high current-carrying capacities, potential dividers, etc.

We have had the opportunity of thoroughly testing two of the variable types of Preh resistances. They embody excellent actions, smooth and positive, and both mechanically and electrically they conform with high standards.

PRACTICAL POINTS

Measuring Bias—Improvised Trimmer

Voltmeters are not much use for measuring automatic bias voltages, but a milliammeter in series with the resistance itself affords an accurate guide, the current passing (in amps.) being multiplied by the ohms of the resistance to decide the voltage across the resistance.

* * *

Quite a good emergency trimming condenser can be made from a short length of twisted flex wire, one end being left free and the other connected to the fixed and moving vanes respectively of the main condenser. The capacity of this trimmer will depend upon the length of the twist, so it is easily varied, as may prove to be necessary.

IN THE ANNOUNCER'S ROOM

—continued from page 5

"Now, as there is no programme on, I can take you into the announcing-room," he continued. "While I am using this studio group for a programme, the red light glows outside the announcing-room."

This announcing-room idea is quite new. There used to be little cabinets at the side of the Savoy Hill studios where the announcer could talk on the house 'phone while a broadcast was going on from the studio. The cabinets were too tiny and too echoey for him to use a microphone.

Complicated Wiring

The new announcing-rooms are padded just like the studio and there is a special microphone for the announcer in charge of each studio.

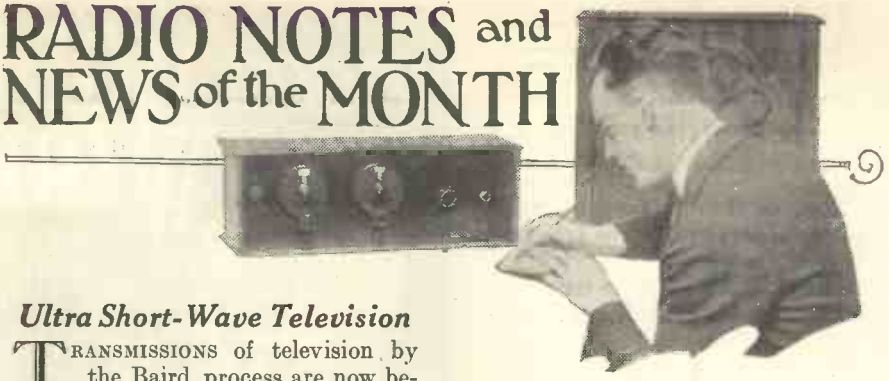
"Here you are," he said, "this is my abode while the main studio is in use. For all important broadcasts there is an operator in the listening-room, and he signals to me that everything is going O.K. Here is my microphone for inter-spacing announcements in the main programme, and here is the potentiometer, which changes over from the microphone to the studio microphones."

The announcer showed me the wiring of his control desk. It is really amazing that just one small unit of the new studio should entail so much complication. Apart from all the control switches and faders, there is a complicated decoupling circuit for the announcer's microphone.

In addition to the microphone "fader" there is a dual control for cutting down the 300-volt high-tension supply to the condenser "mike" amplifier.

"These controls are just as accurate as those in the main control-room upstairs," explained the announcer, "and it is possible for the balance of the artistes in the main studio to be adjusted here. It means that an efficient announcer must not only have cultivated a B.B.C. accent (sic !), but must be a dramatic and musical critic!"

RADIO NOTES and NEWS of the MONTH



Ultra Short-Wave Television

TRANSMISSIONS of television by the Baird process are now being sent out on Wednesday and Friday from 3 p.m. to 5 p.m. on the 7·3-metre B.B.C. transmitter at Broadcasting House.

These transmissions are entirely experimental, the subjects transmitted being, for the most part, the artistes rehearsing in the television studio in preparation for the regular television transmissions.

Images with 90 lines up to as many as 240 lines in place of the present 30-line pictures have been transmitted experimentally in the Baird laboratories, and when ultra short-wave broadcasting becomes established the result of this research will become available to the public. In the meantime amateurs within range with ultra short-wave receivers will be able to take advantage of the test transmissions from the B.B.C. aerial.

The Baird Company will welcome any reports.

New Year Gift

Every listener should get a copy of the B.B.C.'s 1933 Year Book, which has just been published by the B.B.C. at 2s. Besides a wealth of information of a statistical kind regarding broadcasting, there is an enormous amount of general information which should prove of fascinating interest to every type of listener.

An Illuminating Review

Many eulogistic reviews have been published concerning this Year Book, most of which we agree with, but in particular do we agree with Captain Ernest H. Robinson, who, writing in the " Observer " recently concerning the Year Book, said : " We see in it a self-satisfaction which often approaches the smug, and it would be alarming were it not offset by light from another facet which shows us high ideals and a sense that there is a long way to go before they can be attained."

That one sentence is probably the most illuminating which has yet been written concerning the Year Book.

Lord Ponsonby's Talk

A good deal of nonsense was written in the Press about Lord Ponsonby's recent talk, but as Lord Peel was allowed to give a reply it is difficult to see how the B.B.C. can be accused of allowing a one-sided talk to be broadcast which, according to the " Patriot," allowed Lord Ponsonby to " deliver a philippic against our whole social system."

The " Patriot " expresses the view that " for such purposes a noble gift of science has been used, and it may be questioned whether Hollywood films of Jewish manufacture, reeking of sex and vividly portraying crime and vice in many aspects to our youth and maidens, have done more harm to the national moral than the B.B.C. What it will do next, unless it is brought under the control of British patriots, who can tell ? "

The National Viewpoint

Well, of course, that is gross exaggeration, and it certainly makes clear-thinking people sincerely hope that the sort of British patriot extolled by the writer of the above quotation in the " Patriot " will never be allowed to have any control of the microphone.

The B.B.C. has always proved itself amenable to correction, when correction is necessary ; and, although it has allowed certain people to be indiscreet before the microphone, there is no real justification for saying that the B.B.C. is unpatriotic or that it is in any way biassed in its views on national and international affairs.

B.B.C. Baiting

Anyway, B.B.C. baiting is poor sport, and is certainly overdone these days. It is small wonder that a writer in the Year Book reproaches the Press for its lack of constructive criticism.

Under One Metre

Marchese Marconi, in a recent talk before the Royal Institution, directed

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RADIO NOTES AND NEWS OF THE MONTH

—*continued from page* 98

attention to the only partially explored range of wireless waves under 1 metre in length, and emphasised the increasing interest in the importance and use of short waves, indicating to some extent a return to the earliest days of wireless when such wavelengths were employed.

First Practical Results Below One Metre

The Marchese went on to point out that the application of micro-rays to practical communication beyond the limits of laboratory experiments was first made by International Telephone and Telegraph Laboratories, who, some eighteen months ago, gave a demonstration of telephony across the Straits of Dover, using the remarkably short wavelength of 18 centimetres.

The quality of the speech transmitted on that occasion was better than that of a normal telephone conversation between two subscribers in the London area, and no fading was detected.

Curbed By Curvature

As a result of these tests, the Marchese explained, the engineers concerned were of the opinion that the maximum distance between stations must, from the straight line propagation of the waves, be conditioned by the curvature of the earth and the altitude of mountains. In certain cases, between ranges of high mountains, intervals of over 100 miles could be bridged direct; but ordinarily relay stations about fifty miles apart, or less, would be required for long-distance working on these ultra short waves.

Inverted Mirages

Marchese Marconi states that he has effectively demonstrated that these very short waves could overcome the supposed obstacle conditioned by the curvature of the earth and distance between the two stations considerably in excess of the optical range; and the theorists are certainly at a loss to explain such a result, for it is true that whatever wavelength is used, there is always a certain amount of bending, and even with the short-wave lengths of light we can, to some extent, "see round a corner"

It is also likely that extraordinary electrical effects in the atmosphere—for example, magnetic storms and thunder storms—may produce inverted mirage effects.

Further experiments on this subject are to be carried out, and everyone interested in ultra short waves will eagerly await the results.

B.B.C. Governors

As we go to press, it is announced officially that the King has been pleased to approve the following three appointments to the Board of Governors of the B.B.C.:

To be Governor and Vice-Chairman: Mr. Ronald Collet Norman.

To be Governors: Viscount Bridgeman and Mrs. Mary Agnes Hamilton.

For Four Years

The appointments are for a period of four years, from January 1st, 1933, to December, 1936, when the B.B.C.'s present Charter expires. The three retiring Governors are: Lord Gainford, the Vice-Chairman; Viscountess Snowden, and Dr. M. J. Rendall.

Last Year's Extension

Considerable disappointment is expressed at the non-election of Lady Snowden, but it will be recalled that about a year ago the original appointment of Lord Gainford, Lady Snowden and Dr. Rendall for a period of five years was extended in each case for an extra year owing to the special work on which the Governors were then engaged in connection with Empire broadcasting.

New Vice-Chairman Well Known in London

Mr. R. Collet Norman is a brother of Mr. Montague Norman, the Governor of the Bank of England. He has been a member of the L.C.C. since 1907, and an Alderman since 1922; was Chairman of the L.C.C. in 1918–19 and a member of many departmental and other committees.

Viscount Bridgeman

Viscount Bridgeman is a former Conservative Cabinet Minister, and was Secretary for Mines, 1920; Home Secretary, 1922–24; and First Lord of the Admiralty, 1924–29.

An Author, Too!

Mrs. Mary Agnes Hamilton is a politician, novelist and journalist, and the eldest daughter of the late Robert Adamson, Professor of Logic, Glasgow

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RADIO NOTES AND NEWS OF THE MONTH

—continued from page 99

University. She was Socialist M.P. for Blackburn, 1929–31, and was formerly Parliamentary Private Secretary to the Postmaster-General.

She was a member of the British delegations at the League of Nations assemblies in 1929 and 1930; whilst among her many books are biographies of Mr. MacDonald and Mary Macarthur. She has also written several novels, including one thriller, "Murder in the House of Commons." Listeners will remember her chiefly as a B.B.C. critic of new novels.

No Entertainment Representative

So far, no criticisms of the new Governors have appeared in the press, but general surprise is felt that the Prime Minister has not thought fit to appoint at least one new Governor with some definite understanding of the psychology of entertainment.

RECENT RECORD RELEASES

—continued from page 62

The recording is a little thin at times, but on the whole the disc is a good one, and those who are fond of musical switches with plenty of switch will thoroughly enjoy it.

Some of these records have perforce been mentioned before—last month to be precise—when the special Christmas discs were mentioned, but I had not then had time to review them properly. So here goes with a favourite that is bound to have a wide sale—Gracie Fields' Christmas Party. It includes as additional "bait" to the public Gracie's mother, who sings with her famous daughter a couple of duets.

The whole record is one that will have a good general appeal, for it is undoubtedly attractive as an entertainment provider, and Gracie sings several of her most successful songs on it, including "Our Avenue," "Singin' in the Bathtub" and "My Ohio Home" in her own inimitable way. She is a wonderful artiste, isn't she? Whether or not you like her as a singer, you have to admit that. (C2487.)

The idea of Paul Jones in the home is a good one, and several records with the idea of providing that ever-popular dance feature have been issued lately. One of the best, however, is undoubtedly that by Ray Noble and his New Mayfair Orchestra on C2497, being Parts 5 and 6. It includes such favourites as "Gipsy Moon," "Oo, that Kiss," "You're My Everything" and "Mona Lisa" among the sections of the "Paul Jones."

A great deal of fun can be obtained with this type of record if you have a few friends in the house, for quite an interesting dance can be held in one's own room if a small selection of dance records has one or two of these "Paul Jones'" discs included. The sections are not too long and so monotony is never threatened, while they are long enough for one to get quite decent dances out of them.

Jeanette Macdonald is too well known on the talkie screen to need any introduction, but in spite of her fame I must say I do not like her records Isn't it Romantic? and Love me To-night from her film of the latter name. The tunes themselves are not attractive, and somehow the numbers "miss the boat." Jeanette's voice may be O.K. on the talkies, but I do not care for it on wax, though I think the fault lies more with the material at her disposal in the way of a song than in the artiste herself. These two songs are lifeless throughout. (B4288.) It is not a record from the talkie film, I suppose, instead of a brand-new recording? Anyhow, I suppose it was done in America.

One of the funniest records I have heard for a long time is Double Damask, in which the trials of Cicely Courtneidge, not to say a couple of shop assistants, are depicted. The sketch is one that has been broadcast, I believe, but it is one that you can listen to again and again without becoming weary of it. On the other side is that amusing telephone girl sketch, I'll Give Her a Ring, which while not so good as "Double Damask," is nevertheless very good. It is a bit overdone, and Cicely Courtneidge is a bit too fond of rolling those R's of hers, thereby taking away from the possible reality of the character she is impersonating. No 'phone girl carries on quite so much as she. (B4314.)

After Cicely I must mention her husband, who with his brother Claude Hulbert makes an amusing gangster record, entitled The Hulbert Brothers in Chicago. It is fully up to the Hulbert style. (B4332.)

Old Moore's Almanac, a "comedy" dance number by Ray Noble and Co., is not too good. The tune is lively enough but the vocal refrains are poor. By the way, is that Leonard Henry taking the vocalist's part? It certainly sounds like him. (B6269.)

BEHIND THE SCENES OF THE BIG ORCHESTRA

—continued from page 77

broadcast. Large chalk cross marks are made on the floor to show the positions of the strings and the brass soloists.

Very often before the hundred or so players of one of the subdivisions start to do any serious rehearsing in the morning, the engineers have to spend over an hour in deciding where the trombones shall be or where the pianist can be put so that the piano does not "blast."

Our Orchestra Abroad

These are only a few of the trials of modern broadcast music with a big orchestra. Special tests have had to be made for cross-Channel broadcasts of the B.B.C. Orchestra and for International relays.

A number of programmes have been given recently in the big studio for either the National or Regional programmes at London and also for distribution on the European landline circuit. A number of German stations have been particularly anxious to include relays of the B.B.C. Orchestra in their programmes, and we, in return, have "borrowed" an occasional German orchestral broadcast.

A Big Hook-Up

Five European countries were recently covered by a big studio broadcast of the B.B.C. Orchestra. All but one took the programme by landline link on the cable which runs under the Channel, but Norway took the B.B.C. Orchestra broadcast by radio link, and an official Norwegian receiver tuned-in to 5 X X.

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