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AND TELEVISION REVIEW

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CONTENTS

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

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0-100 ,,	0- 2 megohms
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	0-10 ,,

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0-30 ,,
0-120 ,,

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THE EDITOR'S CHAT

THE WIRELESS CONSTRUCTOR AND TELEVISION REVIEW

Mr. Scott-Taggart's New Set Design—The 24-hour Clock Experiment

ONCE again it is "Radiolympia" time, and the roads, trains and the tubes will be full of eager thousands making their way to the great exhibition, where the latest sets and components will offer another striking testimony to the energy, foresight and inventive ability of the British radio industry.

Come and See Us

And once again we have the privilege of extending to all our readers, and to their friends, an invitation to visit us at Stand No. 12. There we shall be delighted to answer your technical queries, and to show you a fascinating array of famous sets, some of which have appeared in this journal and in our sister journal, "Popular Wireless."

Conspicuous in this collection of home constructors' sets, you will be able to investigate at close quarters the original model of the "S.T. Super-Gram de Luxe," which is fully described by its designer, Mr. John Scott-Taggart, in this issue. And we very much doubt whether in the whole of Olympia you will find a more magnificent piece of work than this "Super-Gram de Luxe." Mr. Scott-Taggart has been informed—and correctly informed—that this is the most powerful receiver ever designed by the Technical Press.

The Very Last Word

The "Super-Gram" is not only extremely powerful, but extremely sensitive. Furthermore, as Mr. Scott-Taggart rightly points out, "tremendous" output is not good enough by itself; "tremendous" purity is also required; and having heard the set, we can vouch for the fact that its output is about six times that of the average mains set, and that, as regards purity of tone, it is a revelation of what can be done in creating a new sensation of realism and power.

You will undoubtedly find the "S.T. Super-Gram de Luxe" an ideal set for record or radio entertainment in the home, for it is a set which may be described as the very last word in receivers, whether commercial or home constructed.

* * *

No doubt many of our readers read with amusement the announcement made recently in the House of Lords that the Government does not yet see its way to introducing the 24-hour clock system of telling the time. The B.B.C.'s misguided attempt to foist this method of telling the time upon the public was doomed to failure from the very start, for, as we pointed out in these columns some time ago, the attempt was analogous to trying to teach vehicular traffic to obey Continental rules; such an attempt would be laughed at (apart from the tragic chaos it would cause in the streets) if any Minister of Transport were foolish enough to sponsor such a scheme.

In short, when Lord Templemore stated in the House of Lords that the Government had come to the conclusion that there was not sufficient evidence of a general public demand for a change to the 24-hour clock system to justify their taking any action in the matter, he was telling the people of Great Britain something they could have told him, when it was first announced that the B.B.C. intended to make the experiment.

The Government's Idea

Nevertheless, it is not generally known that the B.B.C. was inspired to make this ludicrous attempt at the Government's instigation. There is an old adage about "trying it on the dog," and the Government persuaded the B.B.C. to make the attempt to see if the public would "stand for it."

Despite Lord Templemore's statement, a B.B.C. official when questioned the other day, said: "At present there is no evidence of either widespread opposition or support. The B.B.C. will announce in due course to what extent it will continue to use the 24-hour clock system."

Strong Opposition

If this statement is an accurate representation of the B.B.C.'s views, then it is certainly one of the most amazing statements ever issued from Broadcasting House, for it indicates how hopelessly out of touch the B.B.C. must be with public opinion if it really believes there is no evidence of opposition to the 24-hour clock system.

True, public antagonism to the B.B.C.'s policy may not be active, taking the form of letters of protest, but the spirit of opposition is there all the same, as every reader of this journal must know.

Let us hope by the time this issue is in your hands the futile experiment will have been dropped for good and all.

The S.T.

The author, holding the chassis containing the radio section of the receiver.

By JOHN

Tremendous output, if of exquisite purity, can give an extraordinary thrill, and the S.T. Super-gram here described will give its hundreds of purchasers a new sensation of realism and power.

It is only fair, however, to warn everyone that if the set is used in a house adjoining another house, considerate use will have to be made of the set. In other words, it should not be worked at maximum output except at convenient times. It may also be necessary to close the windows. But the results will be grand. If you think a neighbour may complain, invite him in to listen. The only disadvantage of this is that he will probably never be off your doorstep.

Nothing can give quite the same thrill to listening—the same sense of amazing reality—as enormous power coupled with exquisite purity of tone. All this, and much more, is achieved by this magnificent de-luxe superheterodyne receiver. It is capable of filling a large hall on any station that provides programme value, and yet, with its single-knob tuning and marvellous flexibility, the "S.T. Super-Gram de Luxe" is an ideal set for record or radio entertainment in the home. Truly the very last word in receivers—commercial or home-constructed. Read what the designer has to say about it.

THIS, I am told, is the most powerful receiver ever designed by the technical press.

For years I have been secretly annoyed by dear old ladies who have talked of "powerful" receivers when what they really meant was "sensitive."

But the Super-gram here described is not only highly sensitive, but is extremely powerful, in that its output is about six times that of the average mains set, and about sixty times that required to produce comfortable room strength loudspeaker results.

"An Extraordinary Thrill"

When I handed the set over to the publishers of this journal, I carried out a test on their aerial at Tallis House, and at 1 a.m. the police hammered on the front door three floors beneath and reported that the chief of the fire brigade in the Fleet Street area was complaining vehemently about the loudness of the signals which prevented his off-duty men from getting to sleep.

The receiver will certainly fill any hall and receive practically any station—certainly any station having programme value.

Several thousand readers will probably now be saying: "I do not want a receiver that will shake the walls, bring out the fire brigade, and rattle every picture and ornament in the house." On the other hand there are thousands of readers, hitherto not catered for, who want to be able to do exactly these things, and a drug maniac's craving for morphine is as nothing to the passion for volume developed by the "output addict."

The undistorted output from this Radiogram is 12 watts. About 150 milliwatts will work a loudspeaker comfortably, so you can imagine what 12,000 milliwatts will do! This output is obtainable on either radio signals or gramophone records, but I do not wish to suggest that the full output is obtained on every note of music heard. The range of loudness in music is extremely wide, especially in the case of certain passages. There may be very quiet passages which progressively

SUPER-GRAM de Luxe

SCOTT-TAGGART, F.Inst.P., A.M.I.E.E.

rise to a grand crashing climax in which the receiver is working "full out." It is at such points that a powerful receiver gives such glorious satisfaction. It is not that we want a very loud signal all the time, but that when there is a sudden burst of volume we want that to be reproduced with absolute fidelity. It may be the crash of a cymbal, the beat of a drum, or the crescendo of massed instruments.

No Fear of Overloading

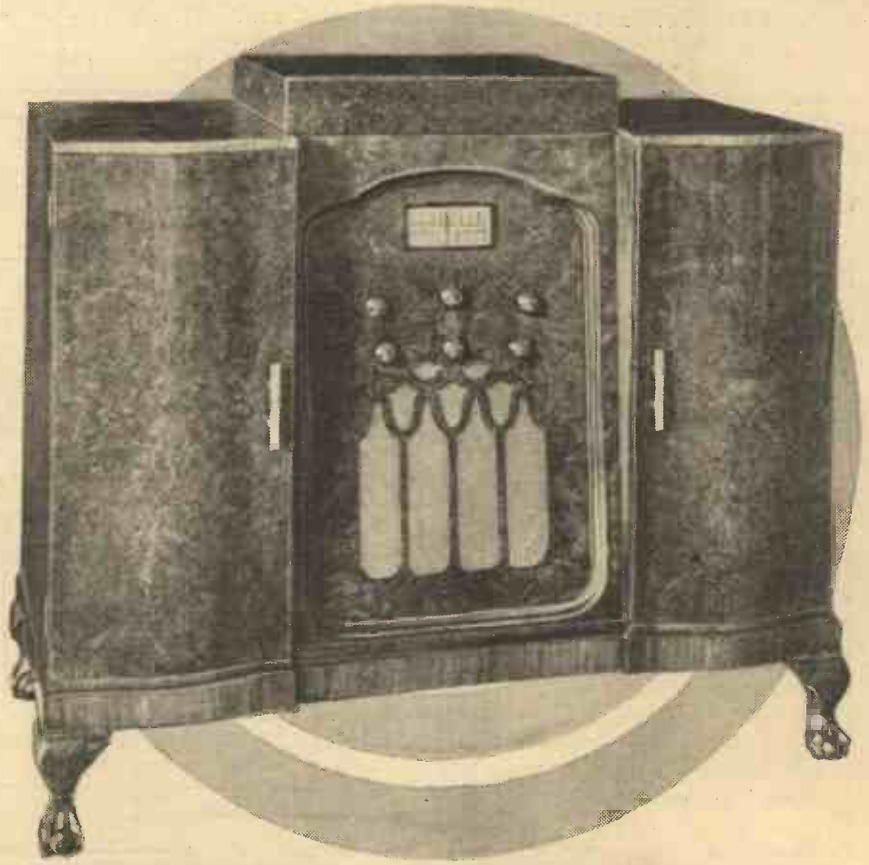
How often has a listener, who knows the limitations of his set, dreaded that building-up of volume which will give agony to any musical soul! Nothing of that kind will ever happen on a well-designed receiver giving a really large output.

It is quite common for American receivers to give 6 watts output. Although 2 watts are given by most British mains receivers, the tendency is definitely towards increasing the available output. An output of 3 watts is now quite common, while a few designs give 6 watts output. As far I know, no design ever published for the constructor has been issued giving an output of more than 7·5 watts.

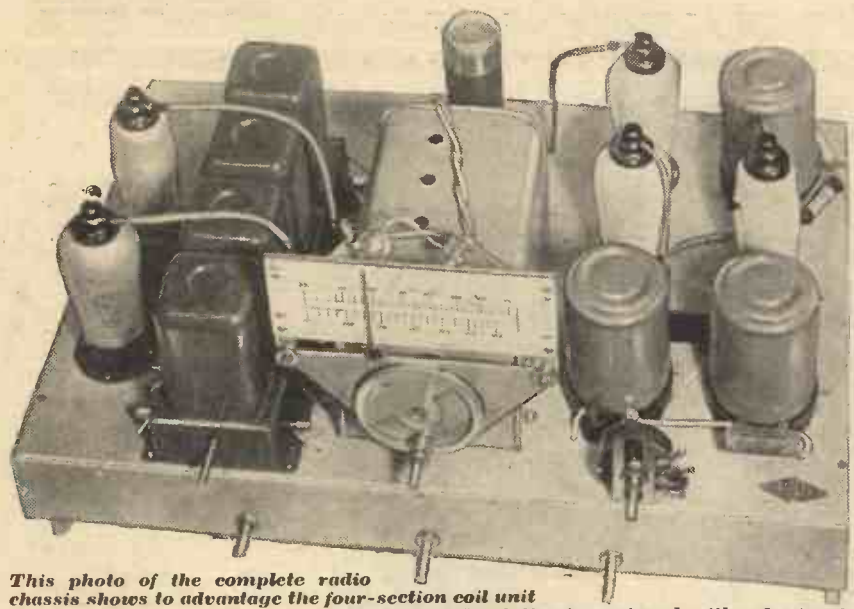
"A Very Perfect Noise"

In setting out to design the most powerful receiver ever designed for the technical press, my object has not been to make a loud noise but to make a very perfect noise. Under normal conditions the volume control will be nowhere near its maximum setting. You can, if you wish, use it to croon the baby to sleep, so you need not fear that the output power is uncontrollable. Signals may be reduced to a whisper if desired, and without any undesirable hum.

You can adjust the volume to what you are accustomed to, but the loud passages will be reproduced far more realistically and in their true proportion without the faintest sign of distortion. At almost any level of volume chosen the reproduction will



The beautiful cabinet of burr walnut is divided into three sections. The right hand cupboard houses the L.F. amplifier and the radio section mains unit, while that on the left is for storing records. The centre part accommodates the remaining apparatus, the lid on top giving access to the automatic record changer.



This photo of the complete radio chassis shows to advantage the four-section coil unit alongside its four-gang tuning condenser. The latter is equipped with a horizontal type of scale calibrated directly in wavelengths. Note the clean appearance produced by under-chassis wiring.

be as near perfect as is commercially practicable.

Before completing the design of this receiver I experimented with probably every known circuit for quality reproduction. It is quite likely that experienced readers already familiar with pure reproduction technique will wonder why I have not used this or that circuit, or this or that combination of loudspeakers. There is a very good reason for every feature of this circuit, but it would take a book to explain every fact which has influenced my design.

As regards the radio portion of the receiver, there are also several schools of thought, each favouring a different arrangement. The differences of opinion as to what is best are evident from the different circuits of equally good commercial superheterodyne receivers. Knowing the merits and demerits of all the possible ways of designing a superheterodyne circuit, I have arrived at the one published and do not think that it can be bettered.

Distortionless Rectification

On the radio side the chief object desired is a high degree of selectivity and linear detection, i.e. distortionless rectification. In search for selectivity I have used three tuned circuits before the first detector, believing that the elimination of second channel interference is an absolute essential. Two tuned circuits, coupled together in the so-called band-pass fashion, appear before the variable-mu screened pentode H.F. amplifier valve, in the anode circuit of which is an H.F. transformer which feeds into the control grid circuit of a triode-pentode.

The triode portion of this combined valve acts as the oscillator, providing the local oscillations which are applied across cathode and earth-line of the triode-pentode. The anode circuit of the pentode contains a tuned I.F. transformer which is coupled to a second I.F. transformer by means of

THERE ARE NINE TUNED CIRCUITS IN THE RADIO SECTION

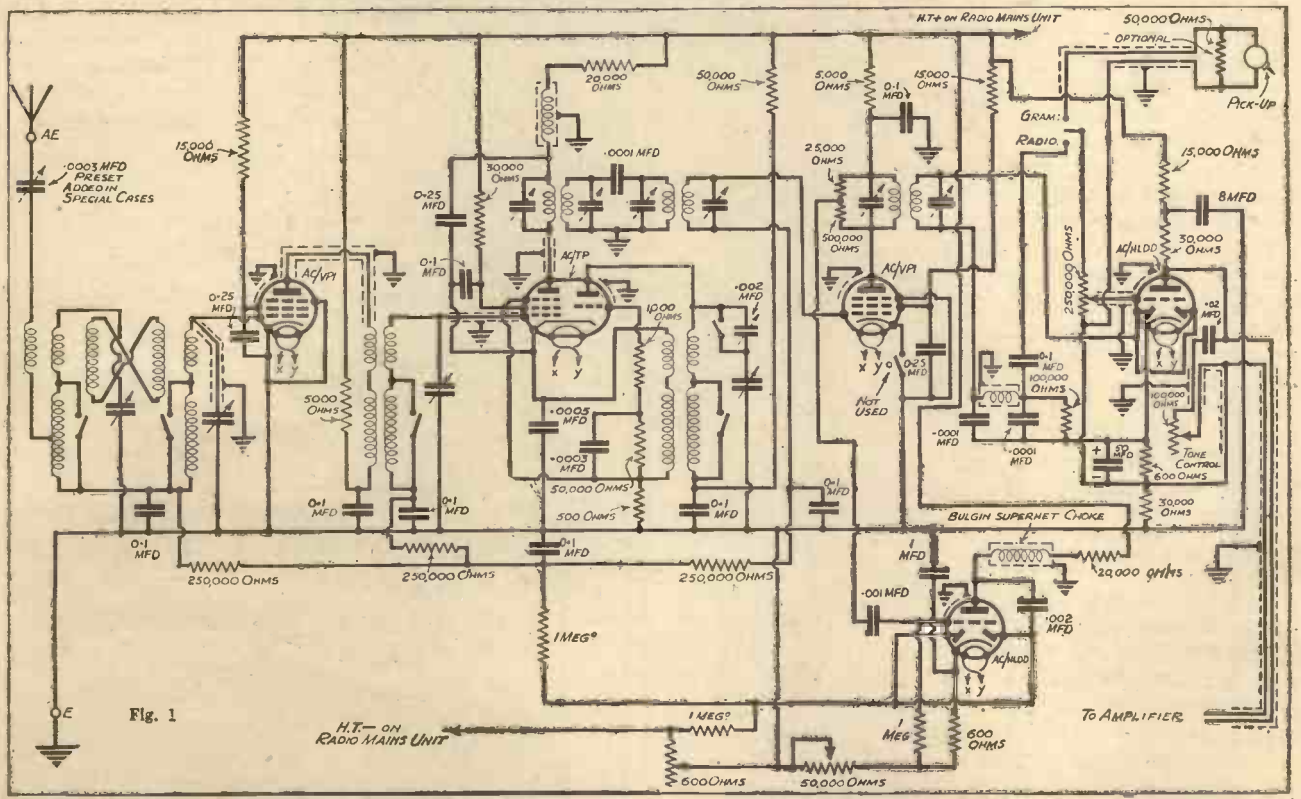


Fig. 1

The whole of this circuit is embodied in the radio chassis, which incorporates the first stage of low-frequency amplification. This latter is carried out by the triode portion of the upper of the two double-diode-triodes. The nine tuned circuits employed to obtain an exceptionally high degree of selectivity consist of six I.F. circuits and three others tuned to the original signal frequency.

An Output Six Times That of the Average Mains Set

a "top capacity," the coupling condenser having a capacity of 0·001 mfd.

We thus have four tuned I.F. circuits all tuned to 110 kc/s. in front of the I.F. amplifier valve, which is a variable-mu screened pentode. In the anode circuit of this I.F. amplifier valve we have another I.F. transformer consisting of two tuned circuits. This transformer feeds into the diode circuit of a double-diode-triode.

From the selectivity point of view, we thus have six tuned I.F. circuits which follow on after the three tuned circuits which are tuned to the original signal frequency. There are, thus, nine tuned circuits in the receiver.

The two diodes of the double-diode-triode are connected together and the rectified output passes through a load resistance of 100,000 ohms. A filter circuit is now provided for cutting out the I.F. currents and the L.F. component is fed to the volume control when the radiogram switch is over to radio. This volume control consists of a ¼-megohm potentiometer, the sliding contact of which is connected to the grid of the double-diode-triode.

I have adopted amplified automatic volume control, but have, for several well-founded reasons, decided against quiet automatic volume control. The disadvantage of not using Q.A.V.C. is that when tuning from one station to another the set is in a highly-sensitive condition, and any background noises which may exist will be noticeable; a reduction of the volume control is, of course, an absolute and certain remedy.

I should in any circumstance recommend that the tuning-in of distant stations should be carried out with the receiver in a condition of fair output volume. Under these conditions the set will be at its most sensitive form from a radio point of view, but the output is kept within modest dimensions until you have tuned in the desired station.

A Separate A.V.C. Valve

This is an obviously desirable move, as one does not wish to change from one station to another and obtain fragments of intervening stations of maximum volume. The obvious procedure is to reduce output volume by means of a volume control and then to "turn" up volume once more after the desired station has been received.

If this commonsense procedure is adopted, greater advantages are obtained than those which would result from a perfectly operating Q.A.V.C.

The I.F. currents used for A.V.C. are taken from a resistance potentiometer connected across the primary of the I.F. transformer in the anode circuit of the variable-mu screened pentode. A portion of the I.F. voltages are tapped off, and are then applied to the grid of a double-diode-triode used exclusively for A.V.C. purposes. This double-diode-triode must not be

THE RADIO-PORTION POWER-PACK

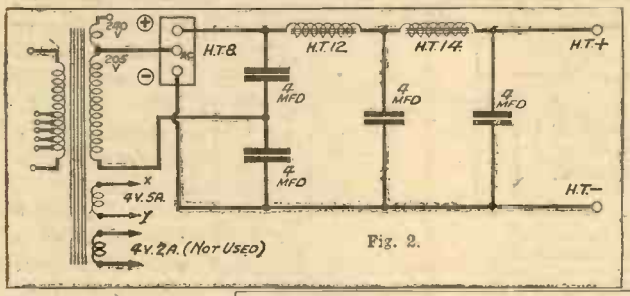


Fig. 2.

The radio section of the receiver has its own power supply unit. A second and more powerful unit is employed for the amplifier. On the left is the circuit of the radio mains unit, and this, as will be seen, incorporates a Westinghouse H.T.8 metal rectifier.

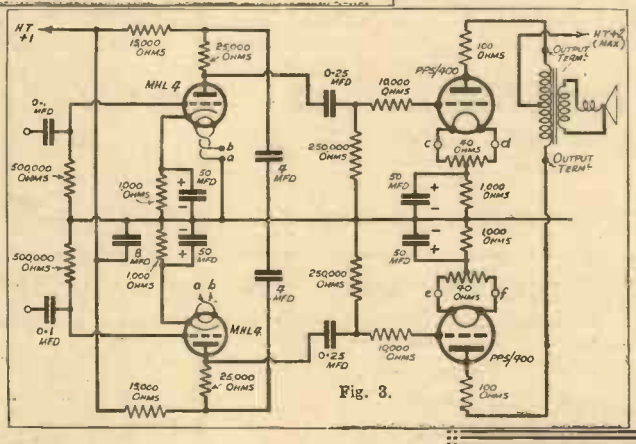


Fig. 3.

The circuit of the power amplifier utilises a double push-pull arrangement of the resistance-coupled type. Among the advantages of this scheme are the absence of both amplitude and second harmonic distortion. The output-valve bias smoothing condensers are type 3003

*

The layout of the amplifier unit (right) is unusually straightforward. But such is its remarkable efficiency that it is capable of giving a straight line response of from 20-10,000 cycles.

"This, I am Told, is the Most Powerful Receiver Ever Designed by the Technical Press."

John Scott-Taggart.

Gives Tremendous Power with Exquisite Purity

confused with the one previously mentioned, and used for second detection. The two diodes on this second double-diode-triode rectify the I.F. currents which are amplified by the triode portion of the valve. In the anode circuit of this triode there is a choke which acts as an aperiodic coupling between the anode and the diodes.

The delayed automatic volume control which I myself patented in 1920 is used, the same method being now adopted which was used then, and which is used in practically every commercial superheterodyne in the world, namely the use of a diode having a negative bias applied to its anode.

Controllable Delay

A 50,000-ohm variable resistance is connected in the cathode lead of the valve, and this enables the operator to set the voltage at which automatic volume control sets in.

The knob controlling the point where the automatic volume control begins is situated on the back panel of the radio chassis. It will ordinarily be adjusted when the set is first installed, and not altered except at very rare intervals.

The rectified I.F. currents from the A.V.C. triode are smoothed out into a direct-current voltage which is applied to the control grid of the first variable-mu pentode of the receiver, to the control grid of the pentode portion of the triode-pentode, and to the control grid of the I.F. amplifier variable-mu pentode. The operation of the A.V.C. therefore results in more negative bias being applied to the three valves before the second detector. The time-constant of the A.V.C. has been adjusted to what I regard as the most satisfactory all-round value.

The standing bias of the three valves mentioned is adjustable, and a control is fitted to the front of the set to enable this standing bias to be varied manually. The control knob is the one at the bottom left-hand corner of the panel of six knobs. The control itself consists of a variable 600-ohm resistance, through which pass the anode currents of several valves.

A merit of this control is that any risk of instability of the first and third valves of the receiver (i.e. the variable-mu screened pentodes) is obviated; this instability might possibly arise through variations in

A WELL-SMOOTHED H.T. SUPPLY

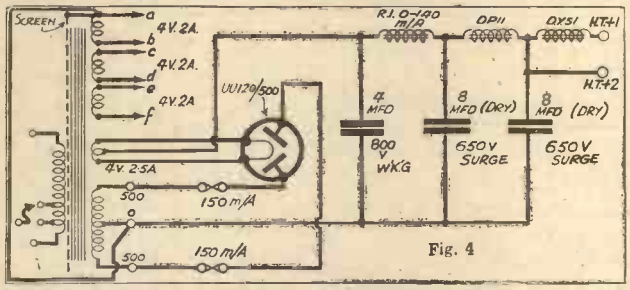


Fig. 4

This diagram shows the circuit of the high voltage mains unit which supplies power to the amplifier. To ensure absolute absence of hum three smoothing chokes are employed.

EVERYTHING YOU WILL NEED TABULATED FOR EASY REFERENCE

RADIO CHASSIS.

Valves: Mazda—2, A.C./V.P.1; 1, A.C./T.P.; 2, A.C./H.L.D.D.; 2, 6-volt pilot lamps.
Polar Minor 4-gang superhet condenser, with tracking section at the front end.
Polar V.P. horizontal drive with wavelength scale.
Wearite 4-gang assembly for S.T. Super-Gram.
3 Colverdyne I.F. transformers, air-core type 110.
Valve holders (Clix chassis type, without terminals)
1 9 pin.
4 7-pin.
1 8-mfd. wet electrolytic T.C.C., type 805.
1 100,000-ohm volume control (used for tone control), Polar N.S.F.
1 bracket for same (Peto-Scott).
1 50,000-ohm Graham Farish potentiometer (used for A.V.C. control).
1 250,000-ohm volume control—Polar N.S.F. (used for volume control).
1 600-ohm potentiometer (used for standing bias control), Colvern, type M.T.
1 Semi-rotary double-pole double-throw switch (Claude Lyons).
Brass rods, ¼-inch diameter:
1 10½ in. long (Bulgin).
1 10¾ in. long ,,
2 Coupling links for rods (Bulgin).
2 Bushes for rods (Bulgin).
3 Brackets (overall height 2½ in.), Peto-Scott. (One of these will be bent to act as clip for 50-mfd. condenser.)
1 Nicore H.F. choke (screened).
1 Bulgin superhet H.F. choke, type H.F.10.
1 Goltone screened H.F. choke, type S.H.F.
Dubilier 1-watt resistors (metallised):
1 100,000 ohms.
3 250,000 ohms.
1 500 ohms.
1 1,000 ohms.
Erie 1-watt resistors:
3 15,000 ohms.
1 20,000 ,,
3 30,000 ,,
2 600 ,,
1 5,000 ,,
2 50,000 ,,
1 500,000 ,,
1 25,000 ,,
Graham Farish Ohmite 1½-watt resistors:
1 5,000 ohms.
3 1 megohms.
1 20,000 ohms.
Dubilier type 4,425 condensers:
3 ·25-mfd.
Dubilier, type 4,403:
4 ·1-mfd.
Dubilier, type 4,401:
1 ·002-mfd.
Dubilier, type B.B.
1 ·1-mfd,
Dubilier condenser, type 670:
1 ·0001-mfd.
Dubilier dry electrolytic condenser:
1 50-mfds., type 3002.
5 Graham Farish vertical holders for 1½-watt Ohmites.
Telsen tubular condensers:
1 ·0003-mfd.
1 ·001-mfd.
Graham Farish mica condenser:
1 ·0005-mfd.
Telsen preset condenser:
1 ·002-mfd.
Graham Farish Manshridge type condenser:
1 1-mfd.
T.C.C. condensers:
2 ·0001-mfd. upright moulded type.
4 ·1-mfd. tubular.
1 ·02-mfd. tubular
1 Peto-Scott chassis to specification (or "metaplex," aluminium sheets, etc.).
3 knobs, type K34 (Bulgin).
Screened lead (low capacity), Peto-Scott.
Wire, screws, etc.

AMPLIFIER CHASSIS.

Valves—Mazda: 2 P.P.5/400.
Osram: 2 M.H.L.4.
4 terminals, type B, with insulating washers (Belling-Lee).
Dubilier condensers:
2 ·1-mfd. tubular type 4403.
2 ·25-mfd. tubular type 4405.
2 50-mfds. dry electrolytic type 3002.
2 50-mfds. dry electrolytic type 3003.
T.C.C. condensers:
1 8-mfds. wet electrolytic type 805.
2 4-mfds. wet electrolytic 440 volts D.C. working.
Dubilier resistors:
2 1,000 ohms 1 watt metallised.
2 250,000 ,, 1 ,, ,,
2 100 ohms 1 watt metalised
2 1,000 ,, 3 ,, ,,
Erie resistors:
2 25,000 ohms 1 watt.
2 15,000 ,, ,,
2 10,000 ,, ,,
Graham Farish resistors:
2 500,000 ohmites, 1½ watts.
4 5-pin valve holders, chassis type, without terminals (Clix).
2 40-ohm centre-tapped resistors, Varley type C.P.75.
2 Aluminum sheet clips (home-made).
1 Triangular aluminium sheet (home-made).
1 Chassis of "metaplex" (Peto-Scott).
Wire, screws, etc.

RADIO MAINS UNIT CHASSIS.

1 Westinghouse metal rectifier, type H.T.8.
1 Varley Mains transformer, type E.P.32.
4 T.C.C. 4-mfds. condensers, type 87.
1 Wearite L.F. choke, type H.T.12.
1 Wearite L.F. choke, type H.T.14.
1 Plain wooden board 17¾ in. x 10 in. x ⅝ in. (Peto-Scott).
Wire, screws, etc.

AMPLIFIER MAINS UNIT CHASSIS.

Valve—1 Mazda U.U.120/500.
1 Mains transformer (for this set): R.I.
1 L.F. choke, 28/14 henries, 0-100 milliamps—max. current 140 milliamps (R.I.).
1 L.F. choke, 20 henries, 60 milliamps (type D.Y.51, R.I.).
1 L.F. choke, type D.P.11 (Varley).
1 T.C.C. 4-mfds., 800 volts D.C., working type 101.
2 T.C.C. 8-mfds. dry electrolytic 550 volts peak working, type 902A.
1 Aluminium bracket for mounting dry electrolytics (home-made).
1 Vibrolder, 4-pin (Benjamin).
2 Baseboard fuse-holders, type F.17 (Bulgin).
2 Fuses, 150 milliamps, type R (Bulgin).
1 Plain ply-wood baseboard, 7 in. x 18 in. x ⅜ in. (Peto-Scott).
Wire, screws, etc.

LOUDSPEAKER.

R.K. Senior, with push-pull transformer (B.T.H.), A.C. model.

CABINET.

C.A.C. Cabinets, Ltd.

AUTOMATIC RECORD-CHANGING UNIT.

Garrard (A.C. model).

The Undistorted Output is Twelve Watts

characteristics of the valves used, and might occur at the bottom end of the waveband. It is, in fact, a very useful safety device, but is not ordinarily used in operating receivers.

The radio chassis embodies the whole of the circuit of Fig. 1, which includes also the first stage of low-frequency amplification. This latter is carried out by the triode portion of the double-diode-triode which is one of the main series of valves.

R.C.C. Push-Pull

The anode circuit of this triode portion includes two resistors of 30,000 ohms each, the high-tension supply being situated between the two resistors, the negative terminal of the H.T. being connected indirectly to earth. What is actually done is to connect the second 30,000-ohm resistance in the cathode lead of the double-diode-triode.

By this device it is possible to obtain a push-pull output effect; that is to say, by taking the anode of the valve to an output terminal, and by taking a connection from the second 30,000-ohm resistance (the end nearest the cathode) to an output terminal, it is possible to feed a push-pull amplifier and to obtain the requisite 180° out-of-phase effect.

FOR RECORD PLAYING

The raised lid over the centre section of the cabinet encloses the gramophone mechanism, which is of the self-changing type. The turntable and pick-up are visible in the circle below, the lid having been raised for this purpose.

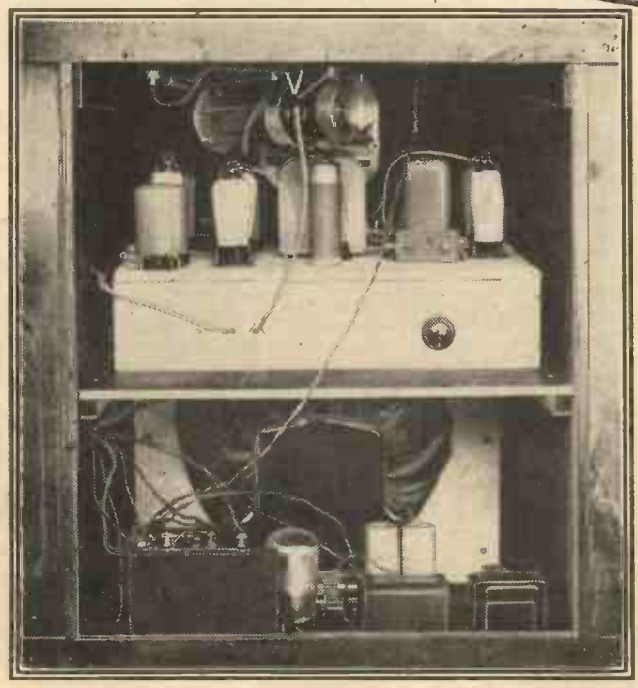
Two doors provide access to the side cupboards. The power amplifier and the mains unit for the radio section of the super-gram can be clearly seen in the right hand department.

It will be noticed from Fig. 2 that effective smoothing is carried out, and this also applies to the amplifier mains unit. When using such an almost perfect amplifier, and when employing a loudspeaker responding to the very lowest notes, it is essential to have a smooth supply of H.T., as otherwise hum becomes obtrusive.

It will be noticed that a standard transformer is used, and that the 4-volt 2-amp. winding is not employed. The mains unit for the amplifier employs a transformer which was made by R.I., Ltd., to my specification.

Remarkable Purity Achieved

THE AMPLIFIER. The second portion of the radiogram consists of a double push-pull amplifier of the resistance-coupled type, the only iron in the circuit being in the output transformer which forms part of the moving-coil speaker. Amplitude distortion can be considered absent, and "second harmonic" is balanced out by the push-pull arrangement. Frequency distortion is absent over the



THE CENTRE SECTION

Taken from the back of the cabinet, this view shows how the contents of the centre section are arranged. Immediately below the turntable motor is the radio chassis, while the amplifier mains unit rests on the bottom of the cabinet behind the loudspeaker.

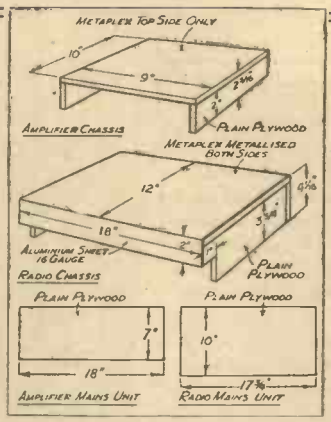
THE RADIO MAINS UNIT. The power supply for the radio portion of the complete receiver is obtained from a rectifier unit of the metal rectifier type, a Westinghouse H.T.8 being used. This mains unit supplies only the radio portion of the complete outfit, a separate and far more powerful mains unit supplying the amplifier portion of the apparatus.

Remarkable Selectivity with Distortionless Detection

useful range, and a straight-line response is given from about 20 cycles to 10,000 cycles. This is more than good enough for radio reproduction or for gramophone work, and the amplifier is so good that it can be used for television.

No Parasitics Possible

The amplifier circuit is given in Fig. 3, which is a symmetrical arrangement. The output valves work at 450 volts each, and are of the directly-heated cathode type. Self-bias is, of course, used in the case of these valves, as well as in the case of the preceding ones. It will be noted that there is an 8-mfd. condenser across the high-tension supply. I found that it is more convenient to have this condenser in the amplifying unit than in the amplifier mains unit. Note the



Full details of the two chassis and two baseboards required. The radio chassis is of double-sided "Metaplex," and the Amplifier chassis is of single-sided "Metaplex." Both have plain plyboard runners.

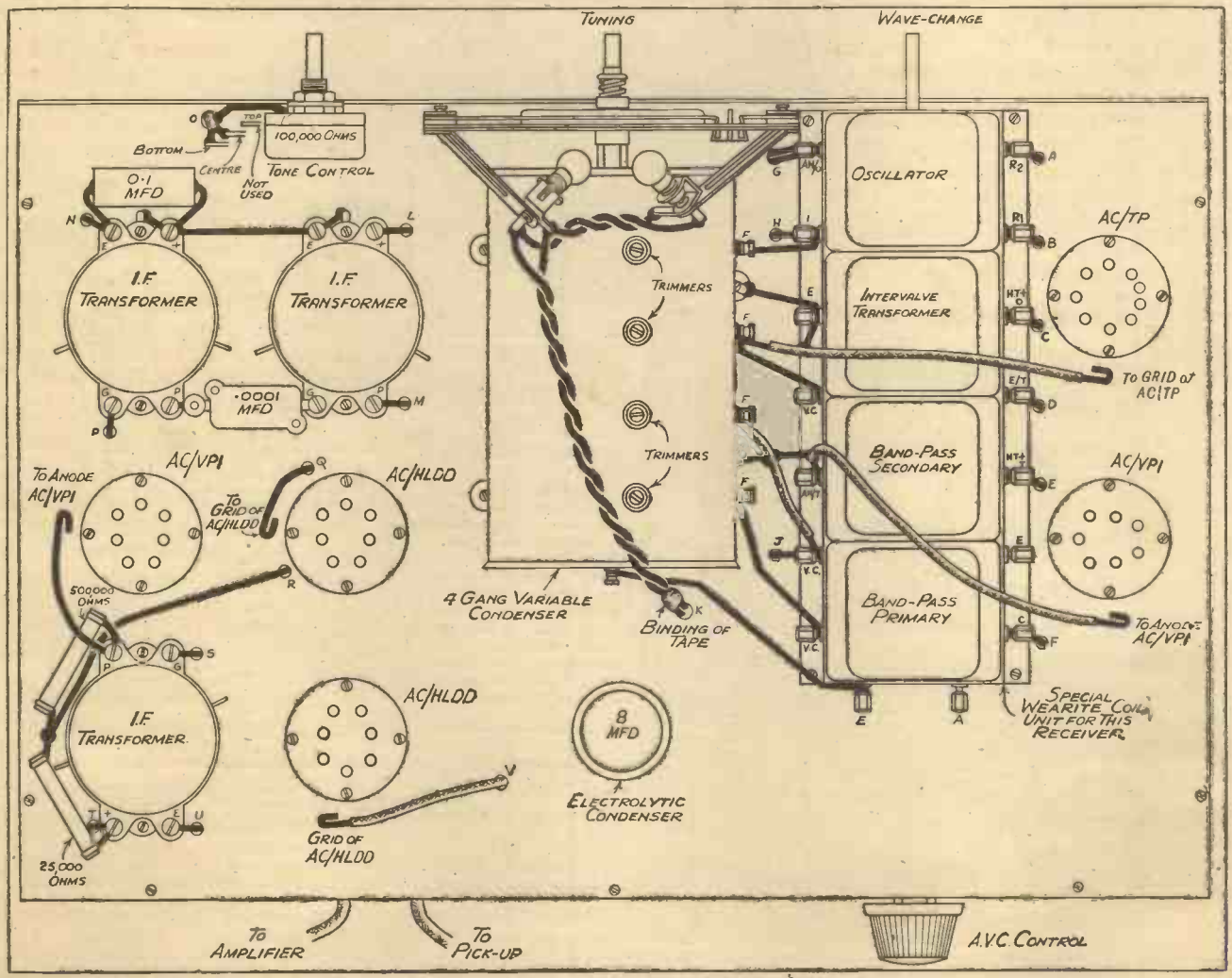
grid and anode "stoppers" in the output valve circuits. These are to prevent parasitic oscillations.

TONE CONTROL. Tone control is effected by means of a 0·02-mfd. condenser and a variable resistance of 100,000 ohms. This is connected across the outer end of the two 30,000-ohm coupling resistances associated with the main double-diode-triode.

Exceedingly Well-Smoothed

THE AMPLIFIER MAINS UNIT: The H.T. and L.T. supply for the amplifier comes from a separate unit. The transformer for this was specially built to my specification, and it carries out its work to my perfect satisfaction. It will be noted from Fig. 4 that three smoothing chokes are used. The output of the transformer is 500 volts for each half-section, the total current being 120 milliamps.

It is important for any builder of this receiver to remember that voltages

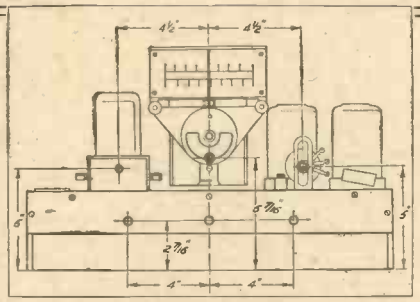


The complete wiring of the radio chassis is indicated by this diagram in conjunction with the one on the opposite page. The run of the leads may be followed from one diagram to the other by means of the letters against the holes in the chassis through which wires pass.

The Year's Most Distinctive Design

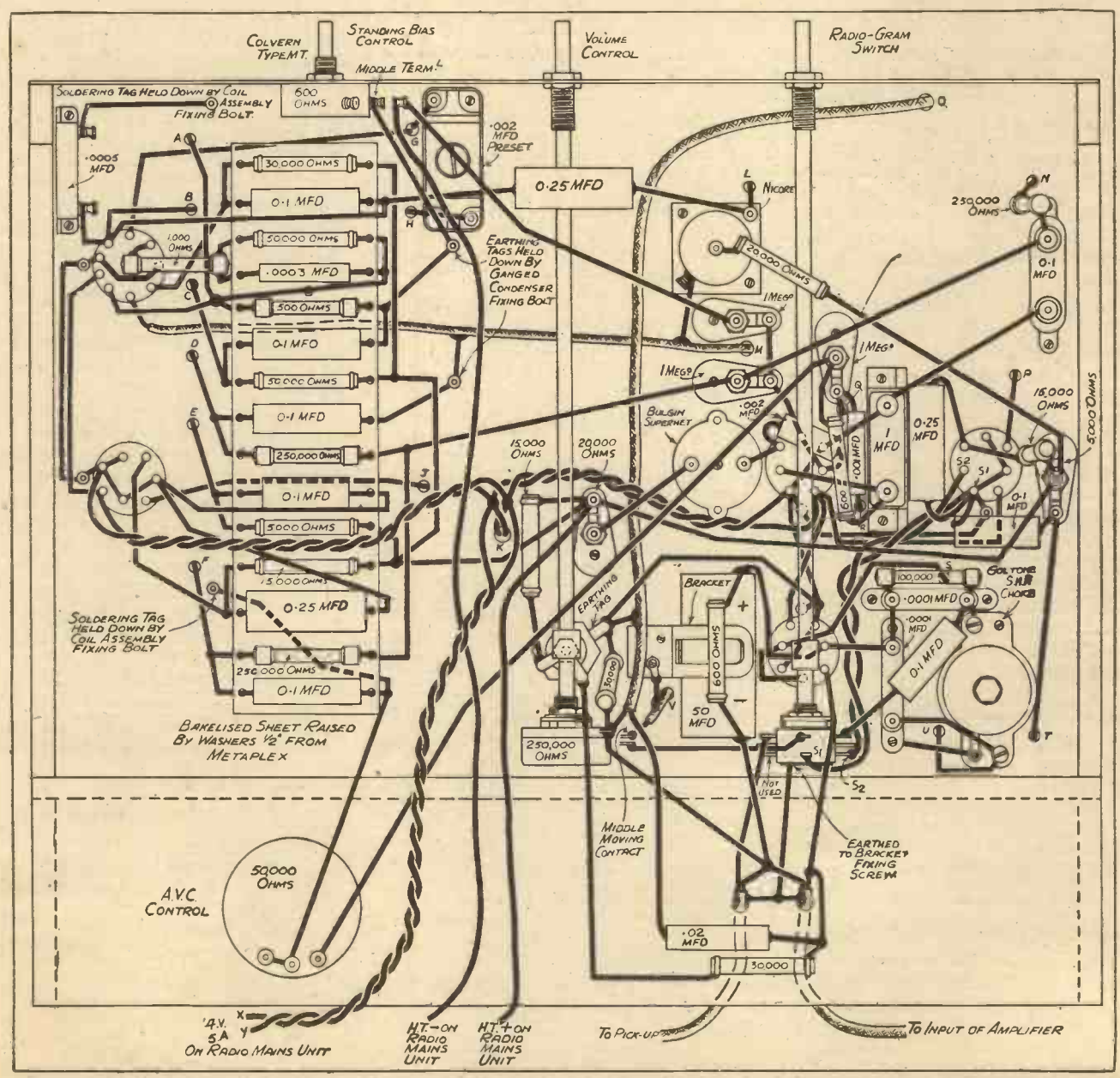
above 1,000-volts peak can be obtained and that injudicious touching of terminals during the working of the set would result in a serious shock. Before touching any parts of the "internals" of the apparatus, it is desirable to short-circuit the 4-mfd. condenser of the amplifier mains unit, although the receiver is switched off.

If the set is working correctly there would be no need to do this, since the valves themselves will discharge the mains unit very soon after switching off. If, however, a fault developed, the condensers might remain charged and give the unsuspecting investigator a most unpleasant reminder. **UNDER NO CIRCUMSTANCES WHATSOEVER SHOULD THE INEXPERIENCED PERSON TAMPER WITH THE INSIDE APPARATUS WHILE THE MAINS VOLTAGE IS APPLIED.** You are dealing with substantial voltages and they deserve respect.

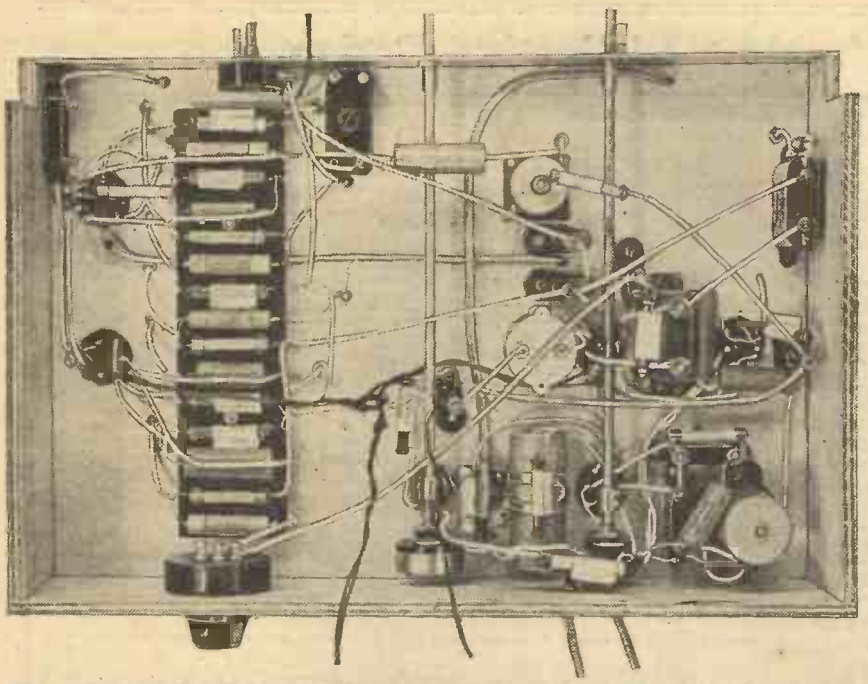


From this elevation diagram of the radio chassis it is possible to obtain the exact dimensions for the relative positions of the control spindles. Mark out the points at which to drill holes in the cabinet front panel according to this sketch.

CONSTRUCTIONAL NOTES. The general construction of the radiogram falls into six sections, namely: the



Most of the wiring of the radio section is below the chassis as this diagram indicates. The "Metaplex" surrounding the holes for the valve holders is removed for a small distance to avoid all possibility of any of the valve-leg sockets shorting on to it.



The extension rods employed for operation of the radiogram switch and the standing bias control, are clearly visible in this photograph of the underside of the radio chassis. The arrangement of the fixed condensers and resistances on the strip of composition material is also well illustrated.

cabinet, loudspeaker, radio chassis, radio mains unit chassis, amplifier chassis, amplifier mains unit chassis.

Placing the Units

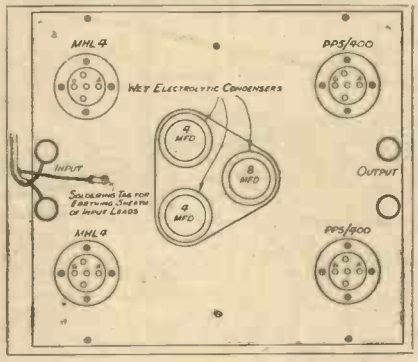
The cabinet used is a very handsome piece of furniture finished in burr walnut. It is divided into three compartments, a central section and two side cupboards. Each cupboard has a shelf. Looking at the cabinet from the front, the left-hand cupboard is used for storing records, etc., while the right-hand cupboard contains the amplifier chassis which is placed on a shelf and the radio mains unit which is on the floor of the cupboard.

The centre compartment stores the radio receiver chassis, which is screwed to a shelf, while the loudspeaker is screwed down to the floor of the centre compartment; a sloping board is provided for the speaker, since the front panel of the radiogram is sloping. This slope improves the appearance of the whole radiogram, and also results in better quality reproduction, since the sound comes directly to the listener instead of along the floor of the room. The floor of the centre compartment also holds the amplifier mains unit.

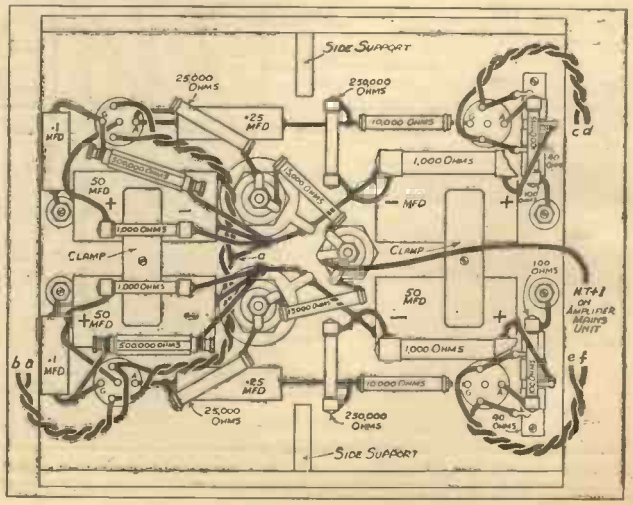
The gramophone outfit consists of the Garrard record-changing unit.

"You can adjust the volume to what you are accustomed to, but the loud passages will be reproduced far more realistically and in their true proportion without the faintest sign of distortion." J.S.-T.

AMPLIFIER DETAILS



The diagram above shows the top of the amplifier chassis, from which it will be seen that no inter-component connections are made above this chassis. The three wet electrolytic condensers are mounted on an aluminium plate to ensure good contact with the chassis. To the right is the wiring diagram of the underneath of the amplifier.



Great Range

This is complete in itself, the motor chassis being screwed down to a wooden motor board which is cut out to accommodate it.

The pick-up and tone-arm are part and parcel of the unit, but a volume control potentiometer is not required as the volume control already in the receiver will work for either radio or gramophone, a radiogram switch being provided on the panel (the right-hand lower knob).

Practically all the components are connected by S.W.G. 20 bare tinned copper wire inside varnished sleeving. Soldering is almost universally employed, as it is felt that an outfit of this magnitude should have permanent wiring. Incidentally; the cost of the components is thereby lessened.

The Shielded Leads

A number of the wires in the receiver are screened, a copper sheath surrounding the wires. It is very important to see that the capacity of the screened wire is not excessive. Messrs. Peto-Scott have been given samples of the actual screened wire used. The use of screened wire of excessive capacity would, amongst other things, cause trouble with the ganging of the condenser.

The screened wires are: Control grid of the pentode section of the triode-pentode (i.e. the top terminal) to the variable condenser; the anode of the first variable-mu pentode to coil assembly; second section of variable condenser to the coil assembly; anode lead of the pentode of the A.C./T.P. (runs under the baseboard to primary of first I.F. transformer); twin lead between tone control resistance and

—No Second Channel Trouble

the tone control condenser; lead to the grid of double-diode-triode second detector from volume control moving contact.

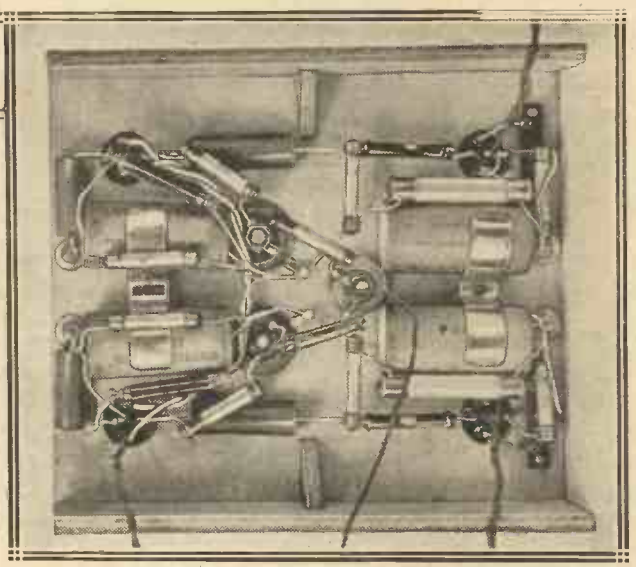
Iron-Covered Wires

There is an iron-covered double-screened lead used in the following cases; output lead from the radio chassis to the amplifier; the iron sheath being earthed to both chassis; there is also an iron sheath around the two leads from the pick-up terminals on the gramophone base-plate to the radio chassis, the sheath being earthed to the motor chassis, and also to the radio chassis.

MISCELLANEOUS NOTES. On the radio chassis the valve holders are of the chassis type and it is desirable to clear the metallising one-eighth of an inch around the holes made in the "Metaplex" through which the valve holders pass; this can be done by slightly countersinking the holes by means of a round file. The object is to avoid any accidental contact between a valve socket and the "Metaplex."

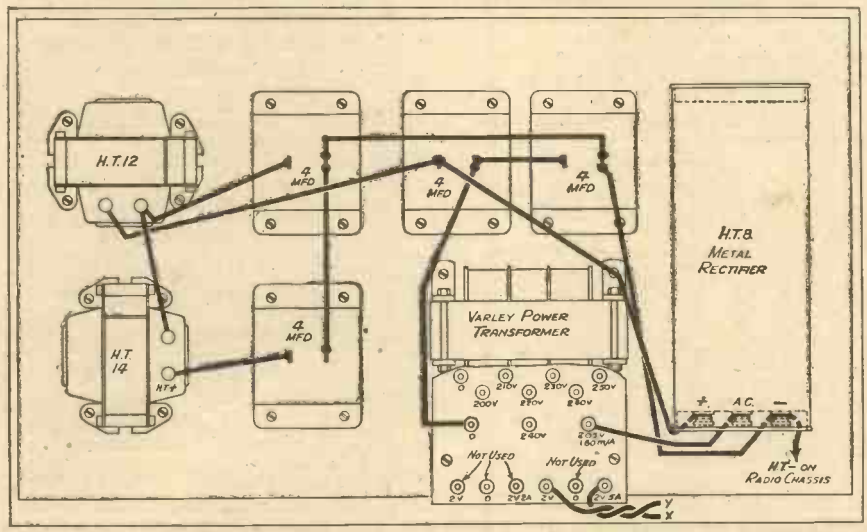
Important Constructional Details

On the radio chassis one heater socket on each valve holder is earthed by a wire connecting it to a soldering tag held down on to the metallising of the "Metaplex" by a fixing bolt which passes through the fixing hole nearest the heater pins; each valve holder is, in addition, held down by three ordinary wood screws.



Comparison of this photo of the underside of the amplifier chassis with the wiring diagram on the opposite page will prove helpful when wiring up this important section of the set. Note the clamps that hold the electrolytic condensers.

A SIMPLE SECTION OF THE CONSTRUCTION



This is the wiring diagram of the radio mains unit, which is quite a straightforward piece of apparatus. A metal rectifier is employed for this unit in contrast to the valve rectifier used in the case of the amplifier's mains unit. The leads "x" and "y" are connected to the heaters of the valves in the radio section.

When starting to construct the radio chassis, place the coil assembly in position and mark the baseboard in readiness for drilling the holes through which the wires will pass through the "Metaplex" chassis. The holes along the variable condenser side of the coil assembly should be countersunk top and bottom to keep the "Metaplex" metallising clear of the wire. The coil assembly is fixed by two wood screws and two bolts which pass through the chassis and hold two soldering tags. The coil chassis should be cleaned just under the heads of these bolts.

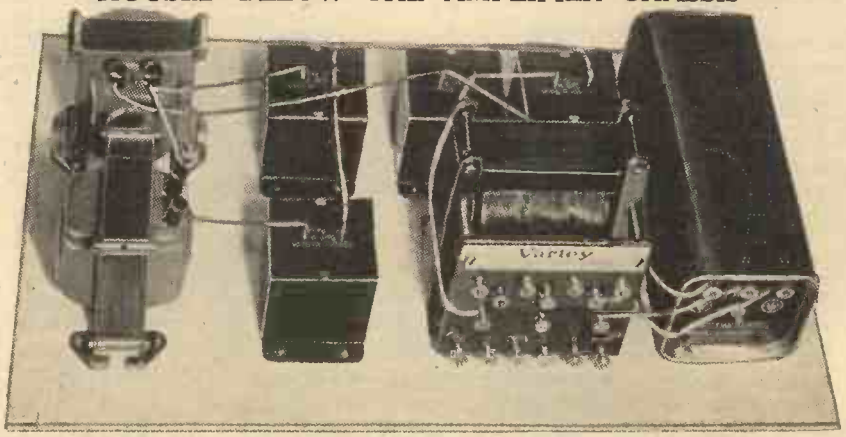
Grouping the Parts

The gang condenser is held down by fixing bolts.

The drive should not be fixed at this stage.

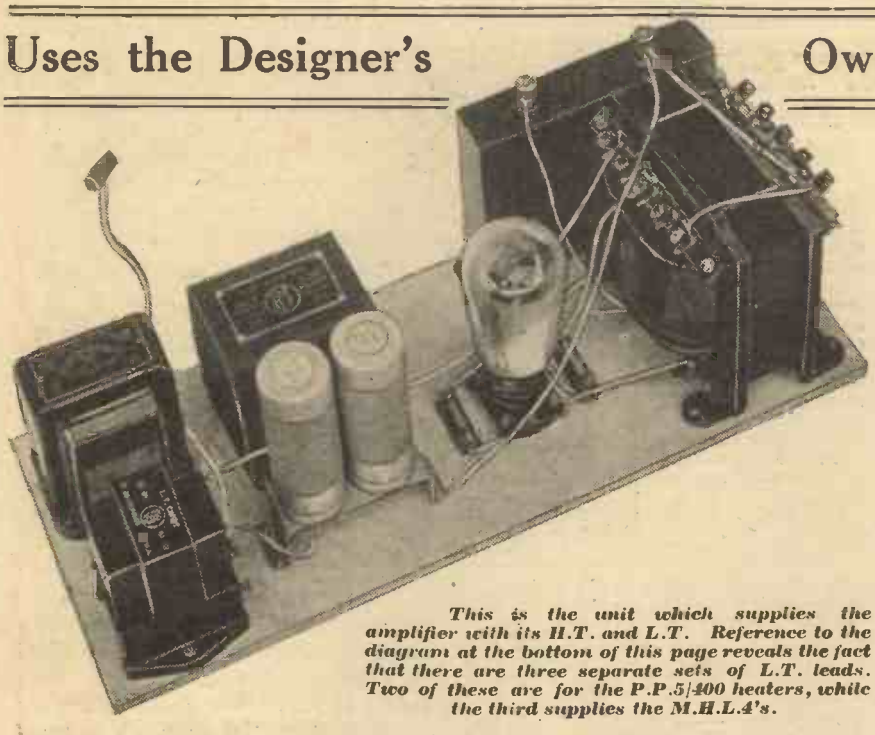
A large group of resistors and condensers is mounted on a sheet of bakelite or presspahn, or similar composition material. All the components in the group are held in position on this panel (see diagram).

HOUSED BELOW THE AMPLIFIER CHASSIS



The mains unit for the radio section, illustrated here, is accommodated in the bottom of the right-hand section of the Super-Gram's cabinet, beneath the amplifier whose mains pack is in the centre section.

Uses the Designer's Own A.V.C. System



This is the unit which supplies the amplifier with its H.T. and L.T. Reference to the diagram at the bottom of this page reveals the fact that there are three separate sets of L.T. leads. Two of these are for the P.P.5/400 heaters, while the third supplies the M.H.L.4's.

In mounting the 50-mfd. dry electrolytic condenser, make sure that you have the plus and minus the right way round; a mistake is easily made, and will naturally upset the working.

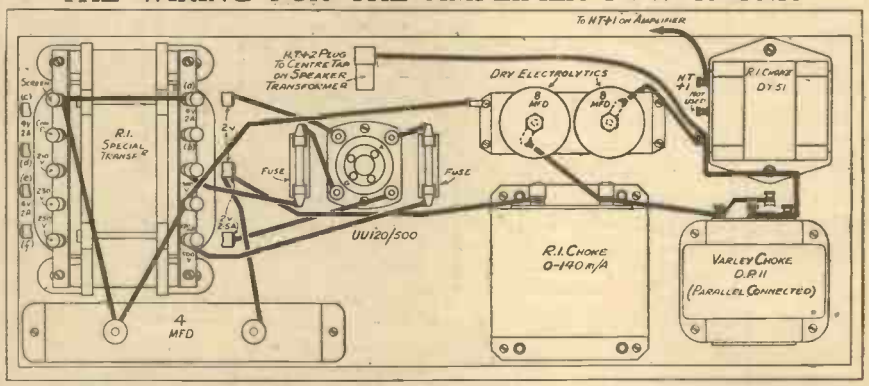
The Extension Rods

It will be noticed that I have used two brass rods, one to operate the radiogram switch and the other the standing bias control. These are ¼-in. brass rods and suitable couplings and bushes are provided by Bulgin.

The sheaths of all the screened wires should be finished off carefully and should be clear of the end of the tubes which they surround; winding with thread is recommended.

Any strain on the heater leads which go from the radio chassis to the radio mains chassis is taken by a thick binding of insulating tape on the pilot lamps leads which pass through the chassis.

THE WIRING FOR THE AMPLIFIER POWER UNIT



The amplifier mains unit chassis is a plain baseboard, a small bracket of aluminium sheet being used to mount the two electrolytic condensers. Earth connection is made to the bracket via one of its fixing screws.

It is to be noted that the H.T. minus lead on the radio chassis is not earthed to this chassis because it is a few volts negative relative to the chassis.

As regards the amplifier chassis, the valveholder holes should be drilled so that the metallising is kept clear by countersinking, as has been explained in connection with the radio chassis.

See that the four 50-mfd. dry electrolytic condensers are connected the right way round.

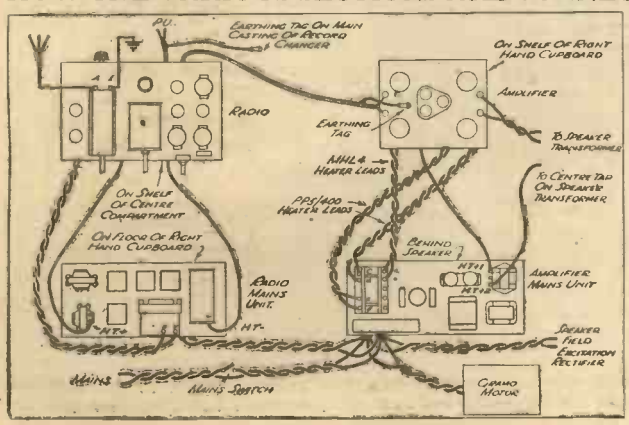
Ensuring a Good Earth

A triangular sheet of aluminium with holes corresponding to the fixing holes of the three wet electrolytic condensers is held down on to the metallised "Metaplex" chassis by these condensers. The object of this sheet is to form a sound earth connection.

The radio mains unit calls for no comment. A metal rectifier is used and all the wiring is on top of the plain wood baseboard.

The amplifier mains unit chassis is also a plain baseboard. A small bracket of aluminium sheet is used to mount the two high-surge-voltage dry electrolytic condensers. Earth connection is made to soldering tags held down on to the bracket by one of its fixing screws. Make sure that the earthed M.H.L.4's heater lead is joined to that terminal on the mains transformer which is also connected to earth.

HOW THE VARIOUS SECTIONS ARE CONNECTED TOGETHER



How the various units are connected together to form the complete radiogram. Note the two screened leads which are earthed. One of these marked P.U. goes from the pick-up to the radiogram switch and the other connects the output of the radio section to the input of the amplifier.

Simple Switching System

The radiogram switching is very simple, the volume control being switched over either to the load resistance of the main diodes or to the pick-up. A resistance of 50,000 ohms may be connected across the pick-up terminals for the purpose of reducing "needle scratch." The radiogram switch also breaks the cathode lead between cathode and earth of the I.F.

(*Please turn to page* 244.)

The RADIO EXHIBITION

Without a doubt, Olympia, 1934, is the most ambitious and certainly the most revolutionary Show that has ever been held under the auspices of the Radio Manufacturers' Association. Cheaper and better components, accessories and sets are the order of the day, and in this specially illustrated exhibition section of the "Wireless Constructor" will be found news of developments destined to have far-reaching effects on the future of broadcast reception.

OLYMPIA, 1934, will do more to consolidate the position of radio as a national pastime than any other show in the history of broadcasting.

Cheaper and Better Sets

Rationalisation of manufacturing ideas and a wholesale adoption of skilful mass production methods have combined to provide the listening public with cheaper and better components and sets, and the results are strikingly in evidence in the show which is now running at Olympia.

It is to the credit of the Industry as a whole that hand in hand with this amazing but welcome downwards price tendency, has been a year of development without parallel. Not only are modern sets and components cheaper, they are infinitely better!

One's impression of this year's exhibition, based on a knowledge of market conditions, is that only by a miracle can prices ever be appreciably lower than they are to-day.

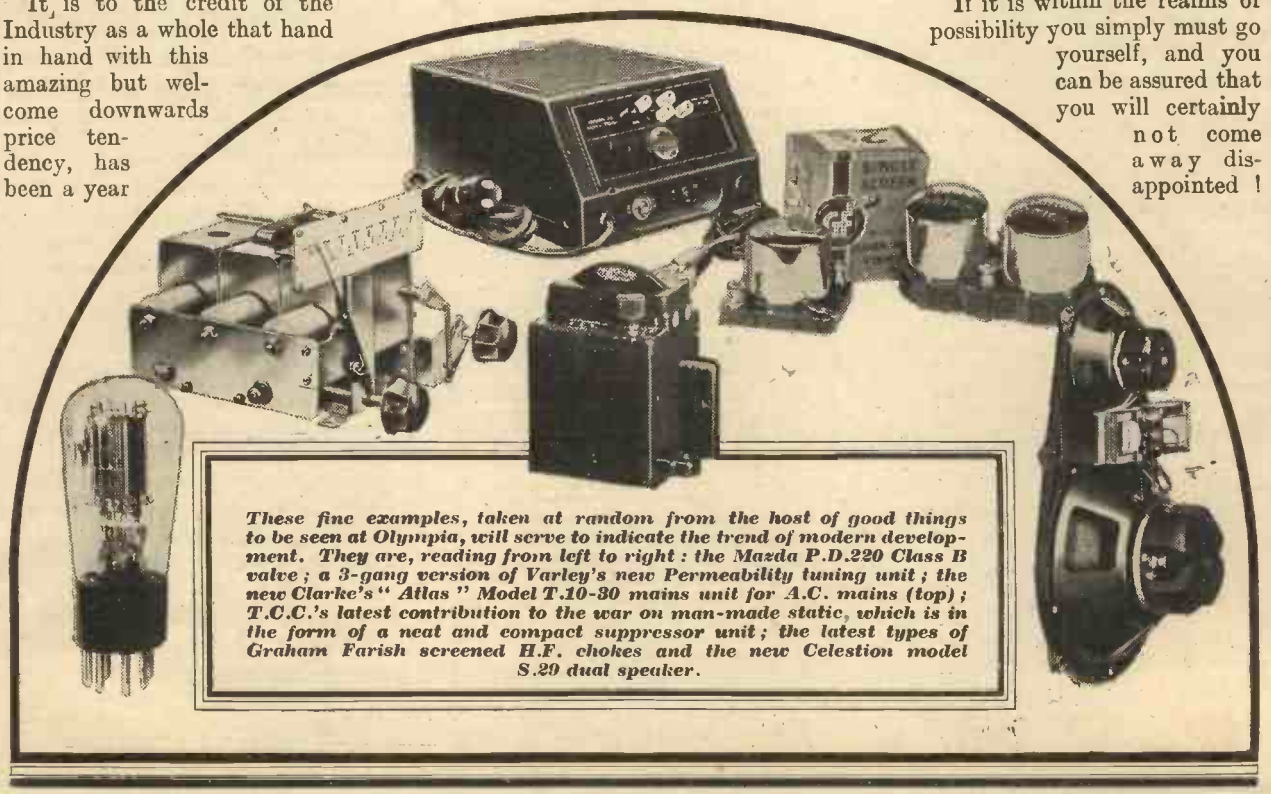
Now, then, is the time to buy. Now is the time to decide upon your first set or your new set. The "tide" in the affairs of listeners is undoubtedly at its crest in the exhibition which is there for you to see.

You Must Go

That we should be eulogistic over such an exhibition will be obvious from the moment you enter Olympia. On all sides you will see evidence of the Industry's determination not only to maintain but actually to strengthen its lead in the radio affairs of the world.

If it is within the realms of possibility you simply must go yourself, and you can be assured that you will certainly not come away disappointed!

ON OTHER PAGES.



These fine examples, taken at random from the host of good things to be seen at Olympia, will serve to indicate the trend of modern development. They are, reading from left to right: the Mazda P.D.220 Class B valve; a 3-gang version of Varley's new Permeability tuning unit; the new Clarke's "Atlas" Model T.10-30 mains unit for A.C. mains (top); T.C.C.'s latest contribution to the war on man-made static, which is in the form of a neat and compact suppressor unit; the latest types of Graham Farish screened H.F. chokes and the new Celestion model S.29 dual speaker.

ALL ROADS LEAD TO OLYMPIA!

YOUR SIMPLEST WAY TO GET THERE

TO OLYMPIA
FROM THE CITY AND WEST END.

VICTORIA
UNDERGROUND : District Line to Addison Road, (change at Earls Court), Barons Court or West Kensington Station.
BUS : Route 52 to Knightsbridge, change to route 9, 33, 73, 173 or 273.

WATERLOO
UNDERGROUND : Bakerloo or Edgware-Morden Line to Charing Cross Station, thence District Line to Addison Road, (change at Earls Court) Barons Court or West Kensington Station.
BUS : Route 33 (direct).

LONDON BRIDGE
UNDERGROUND : Edgware-Morden Line to Bank Station, change via escalator to Monument Station, thence District Line to Addison Road, (change at Earls Court) Barons Court or West Kensington Station.
BUS : Route 13 or 13a to Charing Cross Station, change to route 9 or 33.

HOLBORN VIADUCT
UNDERGROUND : Central London Line from Post Office Station (a short walk) to Shepherds Bush Station, thence Bus 49 or 526 ; Metropolitan Line from Farringdon and High Holborn Station (two minutes' walk) to Addison Road Station, change at Edgware Road Station.
BUS : Route 184, 185 or 188 to Bond Street, change to route 73, 173 or 273.

CHARING CROSS
UNDERGROUND : District Line to Addison Road, (change at Earls Court) Barons Court or West Kensington Station.
BUS : Route 9 or 33 (direct).

PADDINGTON
UNDERGROUND : Metropolitan Line to Addison Road Station.
BUS : 27 or 127 (direct).

EUSTON
UNDERGROUND : Edgware-Morden Line to Charing Cross, change to District Line, thence District Line to Addison Road, (change at Earls Court) Barons Court or West Kensington Station. Metropolitan Line from Euston Square Station (three minutes' walk) to Addison Road, change at Edgware Road Station.
BUS : 73, 173 or 273 (direct).

ST. PANCRAS
UNDERGROUND : Metropolitan Line from Kings Cross and St. Pancras Station (2 minutes' walk) to Addison Road Station, change at Edgware Road Station ; Piccadilly Line to Barons Court Station.
BUS : Route 73, 173 or 273 (direct).

These comprehensive instructions, specially compiled for "Wireless Constructor" readers by the London Passenger Transport Board, will prove invaluable when your turn comes to visit Olympia.

KINGS CROSS
UNDERGROUND : Metropolitan Line from Kings Cross and St. Pancras Station (subway connection) to Addison Road Station, change at Edgware Road Station ; Piccadilly Line to Barons Court Station.
BUS : Route 73, 173 or 273 (direct).

MARYLEBONE
UNDERGROUND : Metropolitan Line from Edgware Road Station (three minutes' walk) to Addison Road Station.
BUS : 27 or 127 (direct).

LIVERPOOL STREET
UNDERGROUND : Metropolitan Line to Addison Road Station, change at Edgware Road ; Central London Line to Shepherds Bush Station, thence bus route 49 or 526.
BUS : Route 9 (direct).

FENCHURCH STREET
UNDERGROUND : District Line from Mark Lane Station (a short walk) to Addison Road, (change at Earls Court) Barons Court or West Kensington Station. Metropolitan Line from Aldgate Station (a short walk) to Addison Road Station, change at Edgware Road Station.
BUS : Route 15, 23, 25, 26, 96, 123, 125 or 126 to Bank Station, change to route 9.

BANK
UNDERGROUND : Central London Line from Bank Station to Holborn (Kingsway) Station, change to Piccadilly Line to Barons Court Station.
BUS : Route 9 (direct).

OXFORD CIRCUS
UNDERGROUND : Central London Line to Shepherds Bush Station, thence bus route 49 or 526 ; Bakerloo Line to Piccadilly Station, change to Piccadilly Line for Barons Court Station.
BUS : Route 73 or 173 (direct).

TOTTENHAM COURT ROAD
(Oxford Street)
UNDERGROUND : Central London Line to Shepherds Bush Station, thence bus route 49 or 526 ; Edgware-Morden Line to Leicester Square Station, change to Piccadilly Line for Barons Court Station.
BUS : Route 73 or 173 (direct).

MARBLE ARCH
UNDERGROUND ; Central London Line to Shepherds Bush Station, thence bus route 49 or 526.
BUS : Route 73 or 173 (direct).

HYDE PARK CORNER
UNDERGROUND : Piccadilly Line to Barons Court Station.
BUS : Route 9, 33, 73, 173 or 273 (direct).

PICCADILLY CIRCUS
UNDERGROUND : Piccadilly Line to Barons Court Station.
BUS : Route 9 (direct).

NOTE : **WEST KENSINGTON STATION** is within easy walking distance of Olympia, but bus route 28 or 526 is available.
BARONS COURT STATION is a few minutes walk from Olympia.
ADDISON ROAD STATION adjoins Olympia, and there is a specially augmented service of L.M.S. trains from Earls Court Station, and Metropolitan trains from Edgware Road Station during the run of the Exhibition.

THE OFFICIAL LIST OF EXHIBITORS AND STAND NUMBERS

NAME OF FIRM	STAND No.
Acrialite, Ltd.	253
Acrodyne Radio, Ltd.	68
Amalgamated Press, Ltd.	12
Automatic Coil Winder and Elec. Equip. Co., Ltd.	2
Belling & Lee, Ltd.	41
Benjamin Electric, Ltd.	42
Block Batteries, Ltd.	31
British Blue Spot Co., Ltd.	90
British Rola Co.	48
British Radiophone, Ltd.	97
British Pix Co.	237
Bulgin & Co., Ltd., A. F.	121
Burndept, Ltd.	81
Celestion, Ltd.	28
Central Equipment, Ltd.	4
City Accumulator Co., Ltd.	89
Clarke & Co., Ltd., (M/c) H.	85
Chloride Electrical Storage Co., Ltd.	254
Cole, Ltd., E. K.	72
Colvern, Ltd.	38
Cossor, Ltd., A. C.	73
Dubilier Condenser Co (1925), Ltd.	96
Eastick & Sons, J. J.	T.23
Edge Radio, Ltd.	91
Edison Swan Electric Co., Ltd.	18 & 58
Eric Resistor, Ltd.	14
Ever Ready Co. (G. B.), Ltd.	83
Ferranti, Ltd.	70
Fuller Accumulator Co. (1926), Ltd.	124
Garrard Eng. & M'g. Co., Ltd.	54
General Electric Co., Ltd.	34, 66, 225
Gilbert & Co., Ltd., C.	T.9
Graham Farish, Ltd.	59
Gramophone Co. Ltd.,	33 & 61
Grosvenor Electric Batteries, Ltd.	104
Goodmans (Clerkenwell), Ltd.	125
Halcyon Radio, Ltd.	36
Heayberd & Co., F. C.	24
Hellesens, Ltd.	78
Henleys Telegraph Works, Ltd.	109
High Vacuum Valve Co., Ltd.	27
Jackson Bros. (London), Ltd.	114
Kolster-Brandes, Ltd.	84
Lectro Linx, Ltd.	218
Mains Power Radio, Ltd.	230
Marconiphone Co., Ltd.	76
Milnes Radio Co., Ltd.	249
Multitone Electric, Ltd.	51
National Accumulator Co., Ltd.	226
National Radio Service, Ltd.	215
New London Electron Works	39
Ormond Eng. Co., Ltd.	100
Philips Lamps, Ltd.	62
Plew Television, Ltd.	11
"Popular Wireless"	12
Portadyne Radio	71
Provincial Incandescent Fittings Co., Ltd.	111
Pye Radio, Ltd.	69
Radio Gramophone Dev. Co., Ltd.	74
Radio Instruments, Ltd.	92
Regentone, Ltd.	99
Reproducers & Amplifiers, Ltd.	53
Siemens Electric Lamps & Supplies, Ltd.	77
Sound Sales, Ltd.	203
Smith & Sons (M/A), Ltd., S.	47
Stratton & Co., Ltd.	30
Tannoy Products	95
The 362 Radio Valve Co., Ltd.	244
Telegraph Condenser Co., Ltd.	37
Telegraph Construction & Maintenance Co., Ltd.	112
Telephone Mfg. Co., Ltd.	105
Telsen Electric Co., Ltd.	75 & 101
Vandervell, Ltd., C. A.	234
Varley	103
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Wright & Weaire, Ltd.	1

BRING YOUR PROBLEMS TO STAND No. 12

THE WIRELESS CONSTRUCTOR ANSWERS THEM FREE!

ETHER PROBLEMS AND THE 1934 SHOW

There have been more upheavals in Europe's ether affairs during the last year than at any time almost since broadcasting commenced. Hats off to our British coil and condenser manufacturers for the enterprising way in which they have taken up the challenge! Modern H.F. components reach standards of performance hitherto undreamed of, and they form a ready answer to the problem of a crowded ether.

OF all the problems of radio to-day, probably the most difficult of solution are those concerned with the crowding of the ether. And these are not merely matters concerning wavelength plans and the transmitting stations, they also effect set design.

As a matter of fact the question of selectivity has to be kept most prominently in mind if a receiver is to be capable of holding its own under present conditions. But it is not merely a question of the circuit design, for to obtain selectivity at the cost of quality or sensitivity is to foredoom a receiver before it is built or used by anyone. No, the components themselves must be specially designed to cope with the demand for really high selectivity.

Selectivity Improvement

The keen visitor to the Show this year will find many improvements in component design, all destined to assist in coping with the ever increasing need for great selectivity. Of course, the components concerned will mostly be those connected with the tuning

"...An efficient aerial system is an excellent start off for a selective receiver ..." Why not use Electron "Superial"?

of the receiver; even so, one must not overlook the fact that an efficient aerial system is an excellent start off for a selective receiver.

An ideal wire for the aerial which has proved itself over and over again, and which is made by specialists in wire manufacture, is the Electron "Superial." Another firm which specialises in aerials is Aerialite Ltd., who, it is interesting to record, are showing a number of new car aerials, an exhibit that will attract the motoring visitor.

To turn now to tuning coils. At one time efficiency in this line necessitated large components, but luckily that day is now passed. As a matter of fact since Colvern Limited introduced iron-cored coils into this country, one has been surprised at the small sizes of inductance obtainable with high efficiency. Incidentally this firm are showing new and improved models of their Ferrocart coils.

Accurate matching is a feature of all British Radiophone ganged condensers.

R.I. Ltd., are another firm who have been very successful with iron-cored coils, and their Micrion series are being continued and are shown on their stand. But it must not be thought that iron-cored coils have completely ousted inductances of the air-cored types.

Whether one uses cores of iron or of air is largely a matter of personal preference, and those who desire the latter will find the Telsen range particularly attractive. Another good range of coils is the Nucleon, both Junior and Senior models, which are being shown by Messrs. Wright and Weaire, a firm who are specialising in the popular market with low-priced tuning coils.

While on the subject of coils, it is interesting to record that Messrs. Graham Farish are re-entering this market with a range of iron-cored inductances. They are also introducing at the Show a series of tuning condensers, both single and ganged types.

Visual tuning is likely to become all the rage during the coming season, and this new Cossor Neon Tuning Indicator makes it a practical proposition for constructors.

Tuning condensers it must be conceded, are every bit as important as the coil units where the obtaining of efficient selectivity is concerned. And as an excellent example of this being achieved we cannot do better than mention the range of that old-established condenser firm, Messrs. Wingrove & Rogers, Ltd.

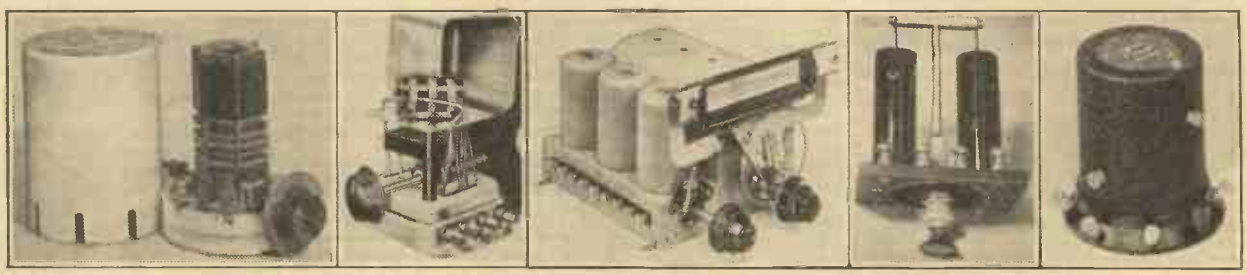
Two, three and even four gang condensers are common components these days, and the British Radiophone models are a good example of the mechanical precision that is necessary in such components.

Construction Simplification

Incidentally, the trickiness of turning out an efficient and well trimmed single-knob-tuning receiver is considerably simplified for the constructor by the J.B. Linacore unit. This is an assembly of gang condenser and matched coils.

In connection with the subject of complete tuning units, it is interesting to note that new methods are not being neglected. The best example being the Varley Permeability Tuner, which entirely does away with the necessity for a tuning condenser.

SOME OF THE COILS THAT WILL DOMINATE 1934 DESIGN



A few of the many modern coils which you will see at Olympia. Left to right: Telsen's famous screened air-core coil; a coil in the popular Wearite "Nucleon" range; the J.B. "Linacore," which is a complete tuning unit; the Varley "Bifocal" focusing coil and the R.I. Micrion coil.

RECTIFICATION,— *à la mode!*

The importance of the detector circuit is often underrated. An efficient and distortionless rectifier is as essential to perfect reception as any other stage in the set.

THE detector valve or rectifier in a receiver acts like a liaison officer between the high-frequency and low-frequency stages. It puts the output of the H.F. valves into a form that can be comprehended by the L.F. valves.

This go-between job is very important, for high H.F. amplification and good-quality L.F. magnification will be completely wasted unless efficient detection is present. And of all the items concerning the detector, quality is the most important, though it naturally has to be coupled with sensitivity as far as is practicable.

Graham Farish fixed condensers are ideal for leaky-grid detection.

Straight-line rectification is at present considered to be the ideal, and many circuit schemes and components have been introduced with this object in view. But no matter what method is utilised, it cannot result in quality unless good-class components are used in its practical conception.

The Westinghouse "Westector" H.F. metal rectifier.

For instance, it is easy to assume that because the grid-leak and grid-condenser are two tiny little components which do not look important, any old thing will do for them. But do not be misled by such an assumption. They are most important parts and should be provided from such reliable and established makes as Dubilier, T.C.C., etc., who have their usual extensive ranges on show.

Grid-leak clips are supplied with certain capacities of T.C.C. type S fixed condensers.

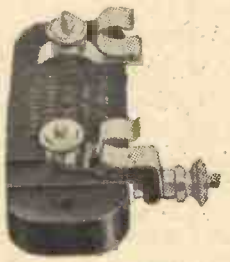
But the grid-leak and condenser are not the only important components where detection is concerned, the resistors used for voltage dropping to the detector, decoupling and automatic bias when this is necessary, are every bit as deserving of some reliable make. Erie, Ferranti and

Reliable resistances for voltage dropping and for decoupling in detector circuits are produced by Erie.

Graham Farish resistances are to be found in hundreds of sets, a fact which makes the exhibits featuring these components of great interest.

Then there are the large fixed condensers which go with decoupling and bias resistances. T.M.C. Dubilier and T.C.C. are showing extensive ranges of fixed condensers for all purposes.

Diode rectification, both for detection and for the provision of A.V.C. has become quite usual in many receivers of late. In a large number of cases valves are employed to carry out the duties of diode, but in many other instances the small Westinghouse rectifiers known as Westectors are utilised, and an article on detection would not have been complete without some reference to this amazingly efficient component.



An old favourite—the Dubilier type 610 fixed condenser.

PROGRESS IN MAINS APPARATUS

This Ferranti full-wave rectifier gives an output of 120 m.a. at 280 volts.

BETTER receivers demand better power supplies, and the design of the apparatus for supplying H.T. and L.T. from the mains does not lag behind that of the sets it supplies. This is true both of the individual components incorporated in complete mains receivers and also of the mains units for running what are normally battery receivers, or receivers requiring a separate mains pack.

So far as rectifying valves are concerned there is a very wide choice of makes, among which can be mentioned those firms of reputo who make Cossor, Mazda, Ferranti, Osram, Hivac, Marconi, Philips and Mullard valves. An interesting feature of the 1935 rectifiers is the marked tendency to concentrate on valves of the indirectly-heated type.

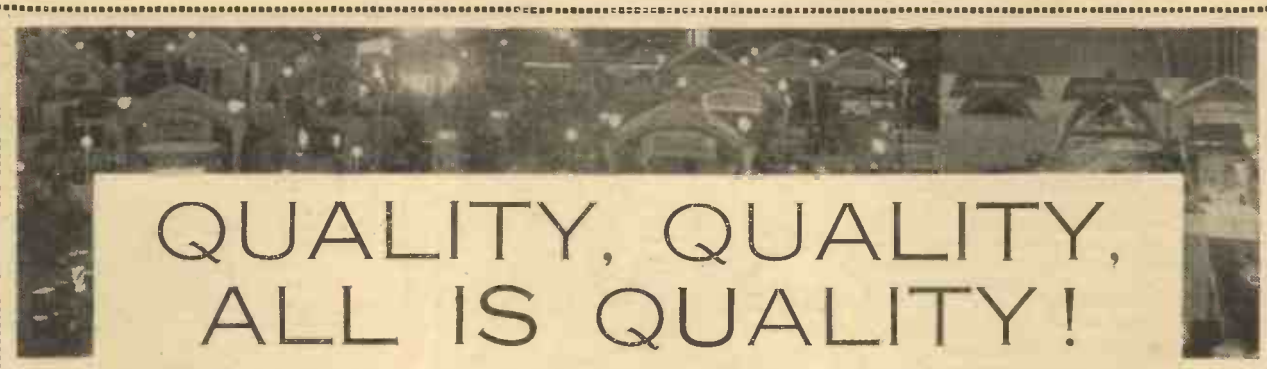
Quite apart from added robustness, the indirectly-heated rectifier valve confers other advantages. For instance, due to the slight delay in the warming up of the cathode, and therefore in the electron emission, the H.T. voltage is gradually applied to the various components and thus avoids undue strain on the di-electric of condensers because by the time the rectifier is going full-out the valves in the receiver have also warmed up and are imposing a load on the H.T. supply.

The Osram U.10, a general purpose full-wave rectifier.

For those who prefer it, there is, of course, the Westinghouse metal rectifier. These metal rectifiers are used in nearly all the separate mains units.

An outstanding point about many of the 1935 mains units, is the special attention that has been given to voltage regulation. Such units are to be found in the Ekco, Atlas and Heayberd ranges. All three of these firms are also exhibiting new models on their stands —models that speak well for a "smooth" season so far as H.T. is concerned.

A WELCOME AWAITS YOU AT STAND No. 12.



QUALITY, QUALITY, ALL IS QUALITY!

That the manufacturers have concentrated even more upon the "quality and cost" aspect of broadcast reception is abundantly obvious from the exhibition now running at Olympia. Some idea of the amazing developments that have taken place will be obtained from this survey of the present position.

FROM a survey of the last twelve months of research and manufacturing activity, it is obvious that the Industry's "rolling-stone of progress" has certainly gathered no moss! This time last year standards of performance generally—and particularly with regard to quality of reproduction—had reached such high levels that few of us could conceive developments of anything but minor importance in the ensuing months.

Whether or not it was for that very reason that the Industry set about the various problems connected with broadcast reception with even greater determination, we do not know. But, disregarding the motives, there is not the slightest shadow of doubt that the standards of to-day completely eclipse those of this time last year!

But it is not sufficient just to urge you to go to Olympia to prove it for yourself, for taking into consideration only the question of quality of reproduction in so far as it affects the ear, it is ten to one that you would come away disappointed! "Why," you might argue, "my reproduction at home is every bit as good as that given by the latest models at Olympia." And, considered only from that point of view, you would probably be right!

Still Further Advances

And yet we maintain that the standards of to-day completely eclipse those of this time last year. They do. But in a much more subtle, even perhaps a much more vital way than is conveyed to you by your ear.

It isn't this year a question simply of quality of reproduction, for in this respect alone, it may truthfully be said that it would be practically impossible appreciably to improve upon the high standards of last year. After all, if, last year, the general standards of quality of reproduction were almost akin to the real thing, as they most certainly were, then, short of stereophonic reception, the impossibility of further progress will be obvious.

But where the progress, which, if you look for it, is so very marked in this year's exhibition is (*a*) in connection with your pocket, and (*b*) in the developments which have taken place for the elimination of man-made static.

Twelve months ago a new era was started in the standards of battery-set reception, and as a result of Class B, Q.P.P. and other "mains output from battery set" developments, it became possible to obtain first-class quality and adequate output without mains. It was a tremendous step forward, but with some at least of the schemes available, the frequency with which the hand had to be dipped into the pocket for battery replacements was positively alarming.

That was due, not so much to the question of milliamp. consumption as to the fact that for absolutely distortionless reception it was desirable—one might almost say necessary—to discard the battery at a very much higher voltage than is ordinarily considered to indicate the end of its useful life.

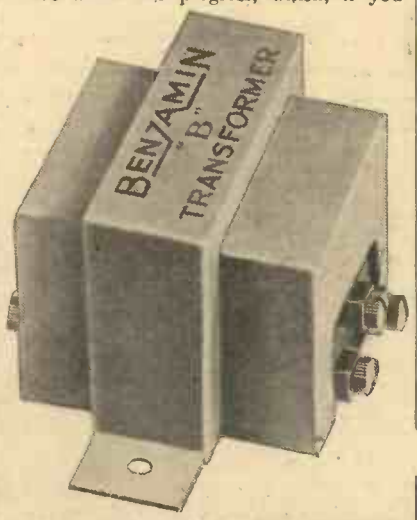
A new lease of life is given to Q.P.P. output by the advent of the latest "two-in-one" pentode output valves. The Hivac version, which is designated the "Q.P.240," is the valve on the left, while on the right is the Marconi "Q.P.21," a valve similar to which is also available in the Osram range.

Close co-operation between the valve, battery and component manufacturers has this year largely obviated that state of affairs, and moreover, prices of batteries alone have in many cases been substantially reduced.

There have been, too, some noteworthy advances in circuit technique as a result of developments in the valve world. The Osram and Marconi Q.P.21, the advent of which removed practically all the known "snags" with Q.P.P., is a typical example. In this valve, the two pentodes are built into the one envelope, and as a result of the internal arrangements and connections of the electrodes, most of the initial difficulties of Q.P.P. adjustment are overcome. Hivac are also exhibiting a two-in-one Q.P.P. valve which is worthy of special mention.

The Special Components

The advent of this valve has, of course, called for special components to go with it, particularly in regard to the Q.P.P. transformer, but the component manufacturers have not been lacking in enterprise. On the Wearite stand you will see a transformer specially designed for the new valve, and



This Class B transformer by Benjamin is ideal for modern battery-set output circuits.

FOR TONE CONTROL

Tone flexibility is a desirable feature of any modern design. This is the Multitone tone control equipment.

A WELL-TESTED LINE

Reliable resistances, such as Graham Farish "Ohmites," are vitally important to the attainment of good quality.

QUALITY, QUALITY, ALL IS QUALITY!

(*Continued from previous page*)

similarly on the stands of Bulgin, Varley, Benjamin, R.I., Multitone, and Sound Sales.

There is every indication that this method will come back into favour during the coming season, for despite the fact that Q.P.P. definitely took a back seat when class B became all the rage, the new method has a lot to commend it.

Better Parts Everywhere.

But it should not be assumed from that that there is likely to be a decline in the use of class B during the coming season. Again, far from having stood still, there have also been amazing advances in this particular method, thanks, principally, to the resourcefulness of the valve manufacturers. The new valves for class B are too numerous to mention in the course of the present article, but in your tour of Olympia you will find that almost all of the valve manufacturers are giving special prominence to their Class B products.

One of Cossor's contributions to Class B valve technique, the "220B."

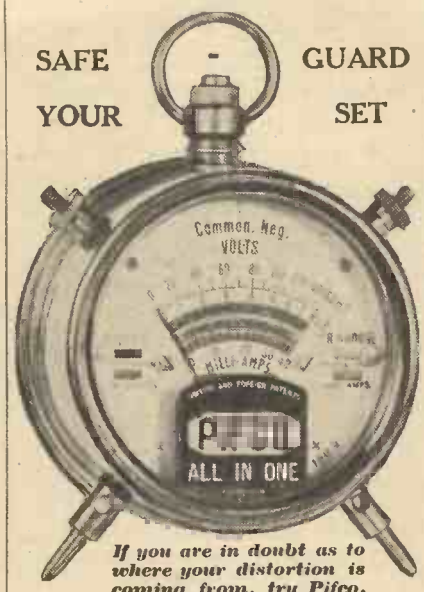
So, also, are the various Class B transformer manufacturers, for it is obvious that they, too, have not been standing still during the last few months. Many new transformers are on exhibition, and in many cases the new and improved models are available at lower prices. The leaders in Class B component technique whose stands certainly warrant a visit are Varley, Multitone, Bulgin, R.I., Wearite, Telsen, Benjamin and Sound Sales.

So far we have been concerned with developments in output schemes, but it will be obvious that the last stage, important though it is, is not by any means the be-all and end-all of perfect quality. And as this is definitely a "quality" exhibition in all its aspects, it is appropriate that we should refer also to the various other questions connected with the attainment of real fidelity of reproduction.

Be sure of your high voltage condensers. T.M.C.-Hydra have a reputation for reliability.

The importance of the intervalve coupling link in the chain of perfect quality is not always realised, and with L.F. transformers especially, the "old-stagers" more often than not live on from set to set simply because externally there is little to indicate anything by way of an improvement in the latest models. Never judge a book by its cover! Buy a new one and try it, and you will be amazed at the improvement that has taken place in low-frequency technique.

Modern low-frequency transformers are as different from their prototypes as the proverbial chalk is from cheese, and all the recognised specialists in low-frequency amplification such as Ferranti, Varley, Wearite, Radio Instruments, Benjamin, Sound Sales, Telsen, Bulgin, Multitone, etc., to mention a few of them, will provide you with conclusive evidence if you visit their stands.



If you are in doubt as to where your distortion is coming from, try Pifco. You will soon know.

Almost everywhere you turn in the present exhibition you will find testimony to the activities which have taken place during the last twelve months in the interests not perhaps so much of quality as of "cheaper quality." The activities of Graham Farish and their subsidiary company Formo are worthy of particular note, and a visit to their stand will be time well spent.

The Bulgin Q.P.P. transformer for use with the new 2-in-1 pentode output valves.

The title of this article was inspired following a survey of the Exhibition from the angle of quality. Whether you are a battery or mains set user, if your reproduction does not compare favourably with that which you will hear on all sides at Olympia, you can consider yourself behind the times! Ways and means—and ways and means, moreover, that are within the reach of all, are there for you to see, and if you do not take advantage of them, well, you will be missing a golden opportunity to say the very least of it!

Real Fidelity For All.

And remember one important thing. The designer of loudspeakers generally has advanced so very rapidly during the last few months that today there is no excuse for anybody putting up with anything but real fidelity of reproduction.

But a good loudspeaker cannot make a bad set good! To do justice to the excellence of modern speakers you simply must look to your amplifier and output systems. Olympia, 1934, shows the way: the rest is up to you!

MILLIAMP "MONEY-SAVERS"

Reduce your costs and lengthen the life of your H.T. battery.

How much do you "starve" *your* set? Perhaps you were not aware that you did? Perhaps you don't! But isn't it funny how reluctant the average Englishman (to say nothing of his friends over the border) is to throw away an H.T. battery that *looks* as new as on the day when it was bought!

Poor quality and inadequate H.T. is an old, old story, and whereas our sympathies are entirely with the listener, it does seem a pity that more people do not take advantage of the schemes which are now available for substantially reducing H.T. costs.

In this connection battery set users who intend paying a visit to Olympia this year should make a special point of looking out for the ingenious battery economy units which are exhibited. Theoretically, and taking the ideal case, it is said that a battery economy unit can practically double the useful life of your H.T. battery.

Substantial Reduction.

We prefer to remain guarded as to the actual saving that is effected by the use of one of these units, but it can be said in all fairness that they certainly do bring about a very substantial reduction in H.T. consumption, and for that reason we have nothing but praise for them.

Moreover, they have the advantage that they can be fitted with little trouble to almost any type of battery-operated receiver, with the exception of sets employing Class B or Q.P.P. output, where, of course, the need does not arise. But for all battery sets employing an ordinary output valve, a battery economy unit will pay for itself over and over again, and it does help to ensure decent quality from one battery for a much greater length of time. Does not that fact alone make them very well worth while?

The battery economy units which are on show at Olympia are available in two different types. On the stands of Graham Farish and Benjamin you will find models in which the Westinghouse rectifier, which is an essential part of the unit, is omitted, but which are provided with clips on the side for the rectifier to be fitted by the user. On the Varley stand you will find a model in which the rectifier is built in.

The Benjamin "Auto-controla" is a money-saver for all battery-set users.

It makes little difference which you choose, for both technically and financially, it amounts to the same thing. In the case of the units without rectifier the price is 7s. 6d., to which must be added the cost of the rectifier, which is another 7s. 6d., and the price of the Varley unit with rectifier built in is 15s.

Easily Fitted.

As we have previously indicated, these units are very easy to fit to your set, and they make not the slightest difference to operating procedure. The units are quite small, not appreciably larger than an average size L.F. transformer, and the best place to fit one, if there is room, is on your existing set baseboard.

Any of the manufacturers to which we have referred will be pleased to provide you with circuit-connections and full instructions for fitting, and if you decide to buy one, you will find in practice that it represents one of the best fifteen-shillingsworth that you have ever had.

"GLOWING TRIBUTES" TO 1934 PROGRESS

The progress in valve design during the last few months is one of the Industry's most striking indications of unprecedented activity in the cause of better radio. The valve exhibits at Olympia this year constitute a real eye-opener.

Many and varied are the new Osram valves that you will see at the Show.

The "Kings of the Air" this year include types for all modern circuit requirements.

TWELVE months ago, at the Radio Show last year, there was every indication that the valve was entering upon a new phase of intensive development. That facts have followed indications is well borne out by the magnificent range of valves that are to be seen on all the stands of the valve manufacturers.

Numerous New Types

Many of the new types are only just beginning to get used in more than just a few isolated designs. At the same time the more ordinary types have been still further improved.

It is quite natural that the general use of entirely new types of valves should lag slightly behind their introduction. Valves may be truly said to lead the way to a very large extent for new receiver designs. And they have certainly set a brilliant lead that is being followed no less brilliantly by British set manufacturers. A single "glance" at the Show is all the proof anyone needs of this!

Probably the most outstanding feature in valve design to be noted at this year's Show is the large number of valves that are more or less two individual valves in one envelope, although in many cases special advantages are conferred by this single housing.

The best illustration of this is the Heptode valve, first made available by Ferranti as a contribution to the revival of the superheterodyne. This valve is a combination of oscillator and first detector, or mixer, in one.

The oscillator is of triode pattern, while the mixer is a screen-grid valve. Instead of the local oscillations being applied to the mixer by coupled circuits, the mixing is actually done by means of the electron stream inside the valve.

A Double Base

Naturally a valve with so many electrodes cannot be accommodated by the ordinary five-pin base, and is provided with the new 7-pin base with which most of us are now familiar. Although this base seems more complicated than the ordinary one, it must be remembered that it takes the place of two bases and that, therefore, there are really no extra connections. Some of the multi-valves use the Continental type of 7-pin base which has the pins arranged in a different manner.

A representative selection of the valves with which the new season will be ushered in. Valve technique generally has seen some radical changes during the last few months.

Universal receivers which will work on either A.C. or D.C. mains have quietly but steadily increased in popularity during the past year, and this has brought with it a greater demand for universal valves. It is thus quite natural that more firms should be found at the Show this year exhibiting a range of such valves.

Of particular interest are the Marconi and Osram range of valves for universal receivers. These have a heater voltage rating of 13 and a current consumption of ·3 amp.

For Car Radio

The advantage of the 13-volt rating is that the valves are also ideal for use in car radio. The 12-volt battery as used on most cars generally has a voltage over the 12 because it is normally fully charged.

So far we have been considering mains valves only, but not, let it be added, because battery designs have in any way been neglected. These, as a matter of fact, have entirely kept place with their mains counterparts.

An interesting exhibit in the valve line is that of Hivac, whose latest products are being shown at Olympia. These are mains valves, and the interest largely lies in the fact that they are the first complete range of mains valves made available in this popular make.

Other valve ranges which have always held a place of great esteem with all constructors include those made by Cossor, Mullard and Ediswan. The latter may be better known to some, however, by their trade name of Mazda, to say more than which is quite superfluous.

LOUDSPEAKERS THAT SPEAK LOUDER!

Greater sensitivity, vastly improved response, and lower prices than ever are the features of this year's exhibition loudspeaker display.

The "Stentorian Senior" is the name given by W.B. to this new super-sensitive speaker. It is one of the sensations of the show.

THE last link in the radio chain is the loudspeaker, but it's as important a link as any. The speaker is just as capable of marring results as any other component, so that the need for something really good, and sensitive, can be immediately appreciated.

The Magnetic Material

Moving-coil speakers are practically universal these days, and for all normal purposes they are of the permanent-magnet type. And the results of this type, particularly where sensitivity is concerned, are almost entirely reliant on the quality of the magnetic material employed.

In view of this, the exhibits on the W.B. stand call for especial note. The Whiteley Electrical Radio Company are showing an entirely new range of speakers embodying revolutionary features.

Their design has been made possible by the discovery of a new magnetic alloy which gives nearly double the magnetic strength of any previously known material at the same cost.

Better Reproduction

This new material, which is claimed to give a reproduction power far beyond anything previously available from a commercial instrument, is being confined exclusively to W.B. speakers. As a matter of fact, the Whiteley company took a very large part in its development.

The powerful magnetic system on the "Stentorian" speakers, as the new models are to be known, enables a large gap to be used round the speech coil. This permits special design of the coil so that it gives a remarkable improvement in natural bass response.

And, finally, you *don't* have to pay more for this speaker. You pay less if anything, for the most expensive model is priced at only two guineas, while there is a baby model at 22s. 6d.

Another feature of the loudspeaker exhibits this year is the attention that is being paid to the question of matching up to the set's output impedance. There is hardly a model without some form of tapped transformer.

A remote control device, costing only 10s. 6d., is available from Blue Spot for use with their new "Star" range of speakers.

As an instance take the Blue Spot "Star" range of loudspeakers. These are so designed that they may be matched to any output stage or connected in parallel with any other type of loudspeaker, matching being effected by inserting a plug in the correct socket on the panel provided at the back of the speaker.

(*Please turn to page* 244.)

Grosvenor batteries are popular favourites among battery-set users.

BETTER BATTERIES THAT MEAN BETTER RADIO

BATTERY improvements and new introductions are to be seen on all the stands of battery manufacturers at the Exhibition, a sure indication that battery reception is as wide and popular as ever.

Television Types

To cope with the new types of battery receiver design, there is a new power type in the Britannia range. It is known as the Blue Carton type and will give 10 to 12 milliamps economically despite the fact that it is priced but little higher than the ordinary standard size battery.

The popular indicating type of L.T. accumulator is represented in the Exide range by their models incorporating an actual dial indicator. The Ever Ready accumulators, on the other hand, have indicators of the float type.

What is probably the most interesting of the new batteries is to be found on the Siemens stand. This is a special high-voltage type turned out for use with cathode-ray tubes which are almost a common component among television enthusiasts these days.

They have a voltage of 300 and cost thirty shillings each. Normally three of these batteries would be employed.

During the last year there have been many new battery receivers introduced, and quite a large number of firms are turning out H.T. batteries especially to suit these new receivers. Owners of them will therefore have a wide choice of makes.

Among those firms specialising in this way is the old-established one of Hellesen. They are also showing their usual range of high-class batteries.

Of the other firms who have outstanding battery exhibits we must not omit a mention of that enterprising concern, The Grosvenor Electric Battery Co., Ltd. Many and varied are their types on show.

Improved L.T. Cells

Finally there are improvements to those popular low-tension accumulators made by Block Batteries. The chief of these is concerned with the special lid and the terminals, which project out at one side. The top of the accumulator, which so often gets damp with acid, is thus shut off and cannot cause any harm to battery leads, and will not collect dust.

THE COMMERCIAL SET BUYER AT OLYMPIA

"Just a little bit louder? Certainly!" For it's an easy matter with the "His Master's Voice" Superhet Five-Four-Two Autoradiogram to adjust the volume to almost any level. This fine set retails at 27 guineas.

IF the present broadcast licence figures do not show a very substantial increase during the coming season, it will certainly not be the fault of the commercial set manufacturers.

Never before in the history of broadcasting have such first-class instruments been offered at such amazingly low prices, and it is impossible to think that prices will ever be lower than they are to-day.

We openly admit that we said the same thing last year, for based on our knowledge of manufacturing costs and overhead charges, it seemed impossible even then that prices could ever be appreciably lower without a corresponding decline in the quality of the article. But we were wrong. We were wrong because nobody—not even in the most optimistic frame of mind—could possibly foresee that the demand created by the new "low-level" prices would be so great as to necessitate the introduction of entirely new and more speedy manufacturing methods to keep pace with it. And yet that was what happened.

Sets were sold in their thousands. The demand became greater than it had ever been, and it is only now that we are beginning to feel the benefit of these increased manufacturing facilities by an all-round reduction in prices. But once bitten, twice shy! The manufacturers are now prepared and equipped to meet almost any demand, and we cannot therefore look to a repetition of last year's eventualities to bring about still further reductions by this time next year. A study of market conditions and raw material prices tends to indicate that if anything the reverse will be the case, and that by this time next year we shall be commencing our survey of commercial receivers in a very different strain.

Cheaper and better sets for all!—That is Olympia, 1934. There is no doubt now that the British set manufacturers lead the world!

This is not a "scare" article, but there can be no sounder advice other than that if you intend to buy, you should certainly buy *now*.

The Marconiphone Model "286" radiogram is deservedly popular at 20 guineas.

ALL-ROUND VALUE!

Ekco has a reputation for originality! This new universal superhet model 65 of theirs is striking both in appearance and performance.

And, as a matter of fact, there are reasons other than that of price, to convince you that now is the best time to buy.

Benefits of New Developments

This time last year we were able to record that never before in a single season had so many new developments taken place. It has taken time for those new developments to find their way into commercial receivers, and to undergo the usual "teething" processes, and it is only now that the full benefits are available in commercial form.

Without a doubt, this year's standards easily surpass anything that we have known before. And not only do the designs on show reflect tremendous advances technically, but there is also abundant evidence to show that the questions of cabinet work and general appearance have been given due consideration.

Many and varied are the new styles exhibited of which, perhaps, the most radical departure from orthodox lines is to be found on the Ekco stand. The extent of their enterprise and determination to set the fashion is ably demonstrated by their new Model 65 which, in our opinion, is one of the most distinctive designs in the whole of the show.

Last year they created a tremendous sensation in the radio world by the introduction of the first black and chromium cabinet, with interchangeable fret. Exactly as was anticipated, it was in tremendous demand. This year they have gone one better by the introduction of the first completely circular cabinet which is also available in black and chromium.

Their new Model 65, which is a six-stage superhet of the universal type, i.e., can be used on either A.C. or D.C. mains without adjustment, is available at the amazingly low price of 10½ guineas, and without a doubt it is a remarkable proposition worthy of your serious consideration. We were privileged to hear it demonstrated during a recent visit to the Ekco works at Southend, and its station getting abilities and general performance are no less remarkable than its lowness of price.

An Eight-Stage Superhet

Another new Ekco production which, indeed, does them credit is their new Model 85. It is an eight-stage superhet, with a new and ingenious device known as a station pre-selector and noise suppressor and, in our opinion, it is a tremendous step forward towards the ideal of interference-free radio. No less remarkable is its price of only 12½ guineas, which applies for the A.C. and battery versions.

Cossors have recently made elaborate plans still further to increase their manufacturing facilities by the erection of another huge factory—the fifth one to be built—at Highbury. The first fruits of their enterprise are to be found in the attractive range of sets which they are exhibiting at Olympia. It is a stand that nobody should miss.

Of particular interest to battery users is their new Model 435B, a de-luxe table console which, complete with valves and a permanent magnet speaker of advanced design, sells for £8 15s. The

THE POPULAR PYE P/B

One of the best-known battery portables at the exhibition, the famous Pye "P/B."

THE COMMERCIAL SET BUYER AT OLYMPIA

(*Continued from previous page*)

set is a four-valver with variable-mu screened grid H.F. stage, H.F. pentode detector and class B output. It is particularly selective, just the thing, in fact, for modern conditions, and the single knob dual-pointer tuning with horizontal full-vision scale calibrated in wavelengths ensures great ease of operation.

The Cossor "Super-Ferrodyne," a magnificent all-electric radiogram, and this year's version of their famous "Melody Maker" are also things that you should not miss seeing.

Tuning by vision is a predominating feature of the H.M.V. display this year, and one can have nothing but praise for the firm who was

"FLUID-LIGHT" TUNING

The "His Master's Voice" mains portable employs the new "Fluid-light" tuning scheme.

responsible for this great innovation. "Fluid Light" tuning, as it is appropriately called, provides a visual indication of the correct tuning point for any given station.

Take, for instance, the case of their "Superhet Fluid Light Five" (Model 442). On the front, in a receding panel, is a small glass tube rather like a test tube in appearance but only about an eighth of an inch wide. When you tune the set in to a particular transmission, a green column of light slowly climbs up the tube until the station is accurately in tune. The moment you overshoot the mark, the column of light begins to fall again.

With this ingenious scheme, it is possible to tell in an instant—and even without hearing the speaker—when a station is correctly in tune, and because of this tell-tale column of light the

Pentode output is employed in the Cossor Model "353"—a three-valve battery-operated receiver.

chances of distortion due to the set being incorrectly tuned are completely removed. Perfect quality and ease of operation are ensured for all who decide upon the "442." It is one of many fine receivers and radiograms to be seen on the stand of H.M.V. Their automatic record-changing radiogram—the Model 5-4-2—is another fine instrument to which readers' attention is called.

H. Clarke & Co (Manchester) Ltd., have this year concentrated upon the production of one instrument only, which is available in table and console cabinet. If the model so produced is an example of what can be done by putting all one's eggs into one basket, then it is a pity that certain other firms do not follow suit. The "Atlas Five" 7-5-8—seven tuned circuits, five valves, eight separate functions—is a remarkable instrument. It is a superhet arrangement with an entirely new innovation known as "spectrum tuning with a tilting dial," and it is one of those schemes which is almost bound to catch on.

Other Outstanding Designs.

Marconiphone are demonstrating their confidence in the future of visual tuning schemes by the exhibition of two fine models, in which this latest idea is to be found. The one to which we would particularly call your attention is the six-valve mains superhet—an ideal solution to the problem of radio in every room.

In this particular instrument, the point of correct tune is ingeniously indicated by two "light" arrows which come together as you tune on to the carrier-wave and which separate again when you tune beyond it. This Marconiphone portable is one of the show's outstanding designs, and one can, with confidence, predict a great future for it. You will find it, together with many other fine receiver and radiogramophone designs on the stand of Marconiphone.

Superficially, Ferranti designs this year are distinguished by the unique illuminated dial and electric tuning indicator, which are fitted to almost all of the new models. From the "Lancastria" at 12 guineas to the "Arcadiagram" at 30 guineas, the whole range of Ferranti sets is second to none.

One has grown to expect that state of affairs from Ferranti's, and there is little doubt this year that they have excelled themselves. Both technically and from the point of view of appearance there isn't a single one of their sets that doesn't fall into the category of being equalled by few and excelled by none.

The adoption by Telsens, early this year, of an entirely new policy led us to expect great things from them at show time. We have certainly not been disappointed, for their stand at Olympia pays tribute to the fearless nature of their policy. The new Telsen range of receivers is the talk of the show, and at the prices at which they are offered, they look like doing very big business indeed during the coming months. We strongly recommend you to make a point of examining it when you visit Olympia.

"SPECTRUM" TUNING

The dial on the new "Atlas Five 7-5-8" receiver swivels to facilitate easy tuning.

Battery set users have cause for great rejoicing over one of the sets to be seen on the G.E.C. stand. It is known as the G.E.C. Battery Compact Three, and it must surely be one of the best value-for-money lines in the whole show.

Frankly, but for the fact that it is the product of such a world-famous organisation, we should have had our gravest doubts about it, for it seems wellnigh impossible to believe that such an attractive set could be offered complete with valves, batteries and an improved type of permanent magnet speaker for only £5 17s. 6d.!

As you may well imagine, there are many other outstanding sets to be seen under the roof of Olympia this year, and although considerations of space preclude a refereuce to all of them, we do strongly recommend you to try to find time to visit the stands of Kolster-Brandes, Aerodyne, Bush Radio, C.A.C., Edge Radio, Regentone, Portadyne and, of course, Pye.

WORTHWHILE GADGETS TO SEE AT THE SHOW

INEXPENSIVE gadgets to serve a variety of useful radio purposes are to be found on almost every other stand at Olympia this year. And doesn't the average listener just love something "gadgety"? He will go to no end of trouble to obtain a switch that will operate his receiver from another room, or a pretty light that will tell him whether his set is on or off!

And why not? If a gadget serves a useful purpose, it doesn't matter in what connection it functions, it is a worthwhile article. And several of those to be seen at the exhibition are very useful gadgets indeed.

Alas, were we to attempt to refer to all of them, the whole of this exhibition section of the WIRELESS CONSTRUCTOR would have to be devoted to gadgets alone, and then we should not properly cover the ground. Anyway, here are one or two suggestions which are worthy of your special attention when your turn comes to visit Olympia.

BE SURE TO VISIT US AT STAND No. 12

Radio in every room is an ideal that is entertained by most of us. With the aid of Bulgin's natty little wall Jacks and plugs, it is a very simple matter indeed to arrange it. The wiring is simple, the price is right, and full directions are contained in the Bulgin catalogue. Why not?

Decorative Signal Lamps.

As a matter of fact, Bulgin are responsible for a number of useful gadgets, and you will spend a very interesting quarter-of-an-hour if you pay their stand a visit. While you are there have a look at their range of decorative signal lamps. As well as being particularly ornamental, they serve a very useful purpose indeed.

The Graham Farish "Gard" lightning arrester and "Filt" earthing device can hardly be considered as gadgets. These days they have come to be regarded almost as necessities. All the same, gadgets or otherwise, if you have not yet seen them you should make a special point of doing so at the exhibition.

Electrical Interference.

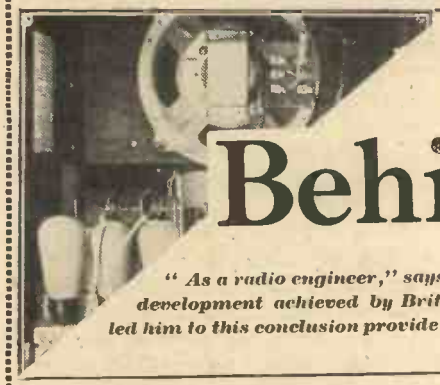
"Man-made static" and ways and means of eliminating it are the talk of the day. It constitutes a serious menace to the enjoyment of radio programmes, and the trouble of it is that it isn't always possible to eliminate it. But if you are troubled with any sort of interference from an electrical source, you can get it down to negligible proportions even if you cannot completely eliminate it, by means of one of the many units now available.

These small units, which you will be able to examine on the stands of T.C.C. and Belling & Lee, and Dubilier, to mention three of them, are very simple to fit, and moreover, they are inexpensive. They are certainly worthy of serious considerations if "man-made static" mars your programmes.

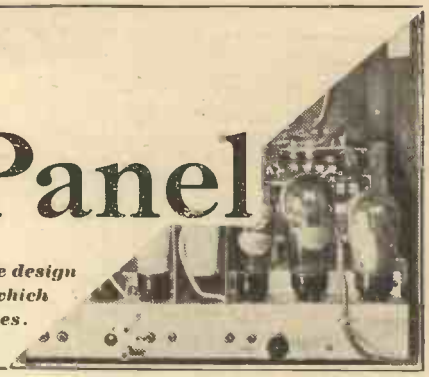
Improving Selectivity.

Gadgets for improving selectivity in existing sets are numerous, but so many spurious articles have appeared in this connection that the need for caution when buying cannot be too strongly emphasised. You need not worry, however, concerning the selectivity devices shown at Olympia, particularly if they are the products of reliable firms.

Perhaps the best-known selectivity device of the lot which, incidentally, has stood the test of time, is the Pix. It is easily fitted in your aerial circuit, and there are very few cases in which it is not effective.



VICTOR KING TAKES YOU Behind the Panel



"As a radio engineer," says Victor King, "I am simply amazed at the design development achieved by British radio factories." The circumstances which led him to this conclusion provide a useful insight into modern circuit tendencies.

THIS time last year most of us were thinking, if not saying, that radio reception had advanced pretty well as far as it could or need go. And that all we could expect from the future were minor refinements and so on and so on.

Do you remember those opening months of 1933? First Q.P.P. and then Class B, a whole spate of new valves and better and better iron-cored coils.

It was rather a surfeit of good things, and the end of the year left us with the giant task of assessing the real value of a hundred and one innovations. And now we are reaping the benefit of it all.

Magnificent Achievements

The sets on show at Olympia this year are really magnificent technical achievements miles in advance of their predecessors. Considerable ridicule has been directed at the multi-electrode valves from some quarters. It has been said that they are merely portmanteaus of standard types. That the functions of a double-diode-triode for example, could be duplicated by suitable standard triodes.

Without arguing this point in detail, my answer to that is where in pre-multi-electrode days can you find sets incorporating the technical features of this year's designs? They just did not exist.

As a radio engineer I am simply amazed at the design development achieved by British radio factories. You can now obtain mass-produced outfits embodying every up-to-the-minute feature, and not travesties of these features at that. No longer can it be said that radio sets for the people include nothing but shadows of the triumphs achieved by research laboratories.

This Cossor Frequency Changer—designated the "41 M.P.G."—is in great demand for modern superhet circuits.

The valve acts both as "mixer" and oscillator, the whole mixing process being carried out in the electron stream of the valve.

For prices within the reach of all, instruments representing the last word in reception technique can be purchased.

Take, for example—and I make my first choice at random—the Marconi range. One of the special features of the particular set due to Marconiphone which I have in mind embodies "fluid-light" tuning. This I consider to be an exceptionally valuable development.

Tuned by Sight

A year or two ago there was no such thing, and it is no reflection on the value of the innovation when I say that no one perceived the necessity of it, but rather an indication as to the amount of distortion that was tolerated on the average superhet or, alternatively, the quality achieved with modern instruments.

With fluid-light tuning the listener can at once see when his tuning is dead accurate, and this is an essential condition if the response is to be preserved unimpaired.

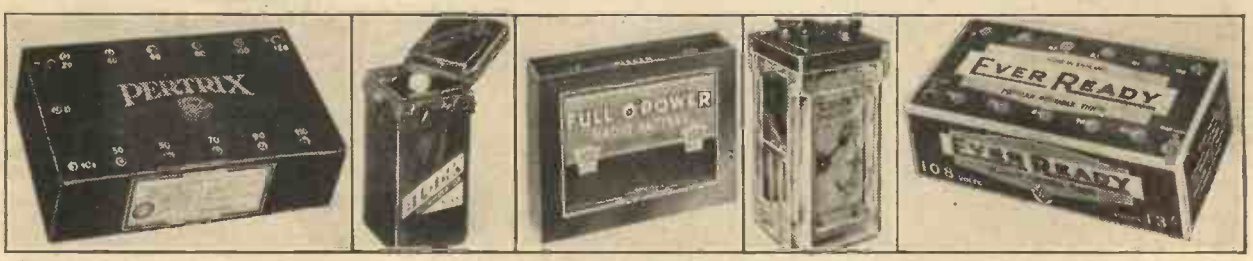
At this year's show another great advance is to be seen in the perfection of the universal mains set, which can be used with equal success on either D.C. or A.C. mains.

Over Twenty Electrodes

Ferranti have a very interesting instrument of this nature. It is a "super" in which there are four valves and a rectifier. Only four valves, mark you, but what valves! There is first of all a heptode which functions as a combined mixer and oscillator.

This is followed by a variable-mu H. F. pentode. Then comes a double-diode-triode second detector and finally

OLYMPIA'S MODERN POWER UNITS FOR MODERN SETS



Modern circuits demand reliable sources of current supply. Reliability is the keynote of all the examples shown here which, from left to right, are the Pertrix 120-volt super-capacity battery; the latest "Block" accumulator; a 300-volt "Full O'-Power" unit for television; the Exide "indicator" accumulator; and the Ever Ready 108-volt "Popular Portable Three."

VICTOR KING TAKES YOU BEHIND THE PANEL

(*Continued from previous page*)

a 2½-watt output pentode. You can amuse yourself for a few minutes trying to work out how many electrodes figure in this team of valves. As something of a guide I can tell you that there are more than twenty!

By the way, it is interesting to note that the new Ferranti Gloria is equipped with a twenty-four hour clock.

"Getting Things Done"

Automatic volume control is still a novelty, though when one considers the Ekco A.C.85 super one could quite well believe that it possessed a long, technical history. But I suppose it does in measurements of experiment and research, if not in calendar time, for this is a radio age of getting things done. As much progress is made in a year now as used to be accomplished in a decade, in so far as the perfecting of things is concerned.

This is probably due to the fact that our theory is well and truly hammered out and marches hand in hand with, if not in advance of, practice.

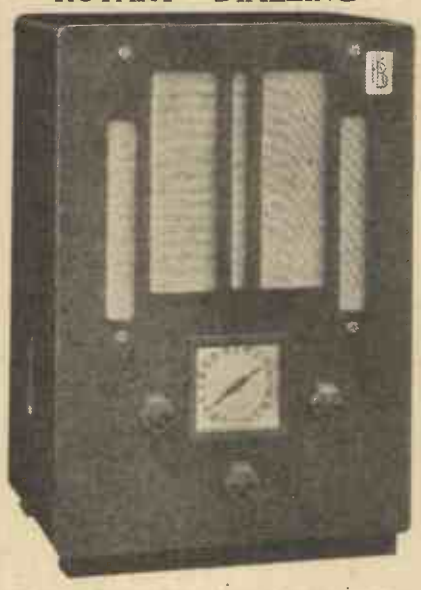
Wide Range of Control

In this fine Ekco set the A.V.C. is "amplified" and thus produces a wide-range control. It can get to grips with any condition. It is "delayed" so that the weak transmissions are not reduced in strength, and it is "quiet," enabling noiseless programme changes to be made. If you could have thought of anything more that A.V.C. ought to be or do than that, then your imagination is greater than mine!

As a matter of fact, Ekco do not leave their A.V.C. there. They take advantage of its characteristics and carry it forward into a quite novel station pre-selection scheme in which reception conditions are pre-arranged for groups of programmes.

One of the outstanding events of this 1934 National Radio Exhibition is the inception of the Telsen superheterodyne receiver. It marks the complete emancipation of the supersonic principle.

ROTARY "DIALLING"



The new K.B. "362" in which the tuning-dial takes the form of a "clock-face."

Curious what a chequered career it has had. Many listeners may think that the superheterodyne idea is a quite new one. But it isn't. It enjoyed something of a burst of popularity about ten years ago and then dropped out of the limelight mainly owing to the bad quality of response that it then gave.

There was a half-hearted revival about five years later, but again its advantages were outweighed by the same fault.

But at long last the drawback was overcome by designers and with its greatly improved quality, great power and extreme selectivity the "super" has at last swung right back and even bids fair to assume a complete leadership in commercial set design.

Economical Battery Sets

What of Class B amplification? I suppose every constructor knows what it is and what it does, but I don't think the ordinary listener yet fully appreciates it. Class B is another thing which is still comparatively new. It came to us from America last year.

Its purpose is to provide amplification (using batteries) that can compare most favourably with mains valve results and yet not consume a disastrous quantity of H.T.—which is an expensive commodity when supplied by dry batteries.

Actually, the H.T. current consumption of a Class B stage of amplification varies in strict proportion to the volume that is delivered by the loudspeaker. Quiet passages of music or programme pauses—very little current; loud passages—an increased current.

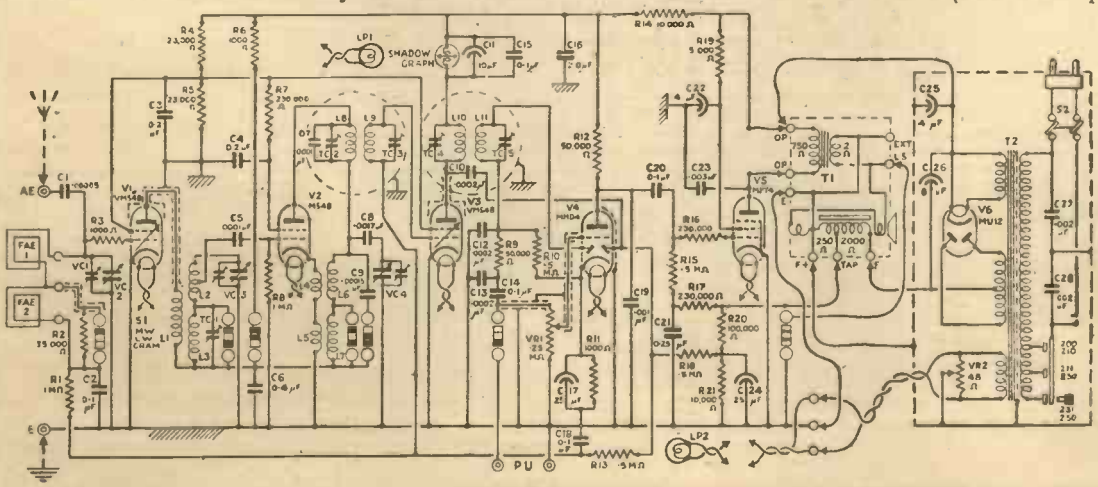
The General Electric Co. have a battery set embodying Class B amplification and capable of a fine performance. There is also a number of first-class G.E.C. mains sets being exhibited at the show.

Special Super Valve

And talking about supers and high-power outputs reminds me of the Cossor All-Electric Super which employs a High Slope Pentode output. This interesting production also includes a Pentagrid Frequency Changer. The Pentagrid is one of the new valves.

Like many of these modern valves it

(*Please turn to page 244.*)



The circuit of the "His Master's Voice" Superhet Portable Fluid-Light Six exemplifies the progress that has been made generally in circuit technique during the last few months.

Organ Noise Leakage

B.B.C. Publications

The New "5XX"

Television Advertising

Mr. Whitley's Recovery

THE RT. HON. J. H. WHITLEY, Chairman of the B.B.C., has now recovered from the illness that laid him low just before his arrival in South America last spring. Mr. Whitley has resumed his various activities, paying particular attention to Empire Broadcasting. He will not, however, be able to be present at the September opening of the Droitwich Transmitter.

More Studio Troubles

The leakage of noise from the organ to studios above and below the floor on which it is situated has become so chronic that its use is severely limited. There was certainly a serious miscalculation in connection with the organ at Broadcasting House. Other studio troubles are gradually being overcome; but the congestion remains acute despite the taking over of at least four new properties nearby in Portland Place. It is certain that the B.B.C. must begin to plan a new building operation on a big scale if it wishes to avoid being scattered all over London as it was towards the end of Savoy Hill.

"Welsh and Western"

Sir John Reith has decided to make an important concession to Welsh feeling by changing the name of the West Region to the Welsh and Western Region. This gives official approval to the predominance of the Welsh influence in the Western organisation of the B.B.C. While no doubt people in the Principality will be pleased, there may be some discontent in Somerset, Devon, and Cornwall.

Autumn Programme Difficulties

There is disappointment among the programme builders of the B.B.C. because of the miscarriage of some of their plans for programme development next autumn. These plans were the result of much careful thought. When formulated, they promised a general enrichment of the service. But, of course, they required extra facilities, including a new orchestra.

The Administrative Division at Broadcasting House "hung up" the schemes, and the latest report is that there will be little or no development. If this is the result, then the accusations which have been made against the dual organisation of the B.B.C. will have been more than justified. Mr. Cleghorn Thomson, former Scottish Regional Director, continues his campaign.

THEY SERVED THE PURPOSE

Now our radio chimes come once again from Big Ben, we have almost forgotten the bells of St. Paul's, which became world famous for a time. Here we see B.B.C. engineers removing the microphone used to pick up the strokes of the big bell of St. Paul's.

A New Publishing Policy

There are signs of a change of attitude by the B.B.C. towards publications. Until now, every effort has been made to secure the maximum amount of profit from publications. This policy has involved unfair competition with the publishing industry and a good deal of friction has resulted. In several directions B.B.C. publishing promises to be less aggressive. The signs are that a more liberal attitude on the part of the Treasury is making it possible for the B.B.C. to conduct its operations with less emphasis on profits from publications.

Transmissions from Droitwich

Engineering tests with full modulation have been transmitted from Droitwich for the past three weeks for three hours nightly beginning at midnight. These will be changed over to the slide-in "service" transmissions during September, the complete change-over occurring in October. Owing to the anxieties of the wireless trade, the Regional "nationals" will not be closed down for some months. It is believed that London will provide a difficult problem of reception, and a good deal of adjustment may be necessary.

Eliminating Electrical Interference

The battle against electrical interference with broadcasting transmission was carried a stage further by the recent meeting in Paris which put the problem for the first time into the arena of international affairs. For Great Britain there was a strong delegation, representing the Post Office the I.E.E., the B.B.C., and a few other bodies concerned.

It was decided to aim at the solution of two difficulties preliminary to effective international action. The first was the specification of a permissable practical level down to which

The Dropping of the B.B.C.'s Peace Motto

interference can be suppressed. The second was to secure a common standard of measurement. Progress was made in both, and experiments were to continue in Berlin.

A Broadcasting Union "Incident"

The aftermath of the Assembly Meetings in London of the International Broadcasting Union has contained at least one "incident." When it was announced that Vice-Admiral Sir Charles Carpendale had been reappointed Chairman for yet another year, it was intimated at the same time that M. Pellenc of France had been invited to fill a vacant Vice-Presidency, the impression being created that the way was being prepared for M. Pellenc to succeed Admiral Carpendale next year.

Statements to this effect received wide currency both in England and on the Continent, where they caused heartburning. There are at least three Vice-Presidents substantially senior to M. Pellenc, and neither they nor their countries fancied seeing their chances dismissed so lightly.

The result is that there will be preparations soon for a bitter struggle in the Union for the presidency. I would not be surprised if the solution will be to ask Sir Charles to stand for a twelfth year. Perhaps he could do this even if he ceased to be the Controller of B.B.C. Administration, because it is unlikely that he will carry on in that capacity beyond 1935.

MAKING HIS IDEAL RECORD

After 24 rehearsals with the London Philharmonic Orchestra, Sir Thomas Beecham recently made what he considers to be the ideal record. The item was Bizet's Suite, "Fair Maid of Perth," and the recording was deferred from 1932 to ensure that the musicians should play it to perfection.

The Television Committee

The Postmaster-General's Committee on Television, presided over by Lord Selsdon, has continued its meetings throughout July and early August. Evidence has been accepted from widely varying sources. For example, the Newspaper Proprietors Association sent a strong deputation. They were concerned chiefly about urging against the admission of advertising as a way to support television programmes.

Then the Radio Manufacturers Association had a good deal to say about the importance of the right kind of control and encouragement of the new industry. But so far there is no one on the Committee itself who would venture a forecast of its recommendations. There is known to be marked difference of opinion, but special precautions have been taken to ensure no "leakage" of information or views.

All Over a Few Words

The dropping of the "Nation Shall Speak Peace Unto Nation" motto from the B.B.C. note-heading and printed matter continues to cause controversy and wonderment. Broadcasting House has received a large number of letters on the subject. Peace societies up and down the country have passed resolutions. Members of Parliament have been pressed to raise the issue in the House.

Some blame Colonel Dawnay, others Admiral Carpendale. I understand the truth is that Sir John Reith himself, supported by Mr. Whitley, the Chairman, put the idea through. The international peace motto dated from the old Board of Governors, and Lady Snowden had a good deal to do with it. It is believed that Sir John had never been enamoured of the motto, and there are lots of occasions on which that motto would be embarrassing.

THE STAR OF THE MONTH

THERE may be a large number of listeners who enjoy the nightly poetry readings which the B.B.C. provides by way of a National night-cap. But I cannot believe that there are more than a very few who appreciate poetry lugubriously read in a sombre monotone.

That is how we used to get it, and I believe the result to be the exact opposite to the popularisation of poetry which, I presume, was the B.B.C.'s purpose in these broadcasts.

Lately however, we have had Felix Aylmer more often to deliver the five-minute poetry snippets. And last month listeners were given a special treat. He read the whole of the "Ancient Mariner" by way of a centenary celebration of the death of Coleridge, its author.

It was a magnificent performance, and because of it I have no hesitation in selecting Felix Aylmer as the star of the month.

Felix Aylmer is, of course, a great actor. And he is great because he puts real feeling into his art. Without in any way overacting he makes his lines live and, in my opinion, he is one of the few personalities who have completely conquered the technique of the microphone.

His first microphone appearance will be remembered by all who heard his grand delivery of Lord Grey's speech announcing Britain's entry into the World War.

Since then he has appeared in many radio plays with conspicuous success. There are few stage actors in the whole history of broadcasting who have been able to adapt themselves so readily and so well to the microphone.

Perhaps some day we shall hear Felix Aylmer repeat "The Ancient Mariner" on the air; I hope so, it would make much more pleasurable listening than the bulk of the repeated B.B.C. material.

V. G.

WIRELESS IN THE GREAT WAR

THE EXPLOITS OF THE EMDEN, BY "RADIAT"

"EAST of Suez" is the home of romance and adventure. The deep blue of the Indian Ocean reflecting the sapphire of the sky, the white superstructure of the great ships, cool-looking even in the burning sun, famous Eastern coastal cities, Bombay, Calcutta, Rangoon, Madras, and Godavari glistening like toy palaces when seen from the horizon.

The Modern Touch

And the nights, stars like diamonds studding the deep purple dusk of the heavens; the blaze of lights from the liners lighting up the darkness of the sea. Even the old tramps homeward, or foreign bound up the Bay, cast a halo of romance.

What more suitable setting for deeds of daring could be found? And, indeed, the story of the German raider *Emden* does read more like some old-time sea yarn than an incident in modern warfare, that is, except for the fact that wireless played a very important part in her activities and the "grand finale."

At the outbreak of the great war between England and Germany the German cruiser *Emden* was in Japanese waters, and thus when Japan decided to join the Allies, shortly afterwards, the *Emden's* position naturally became rather precarious.

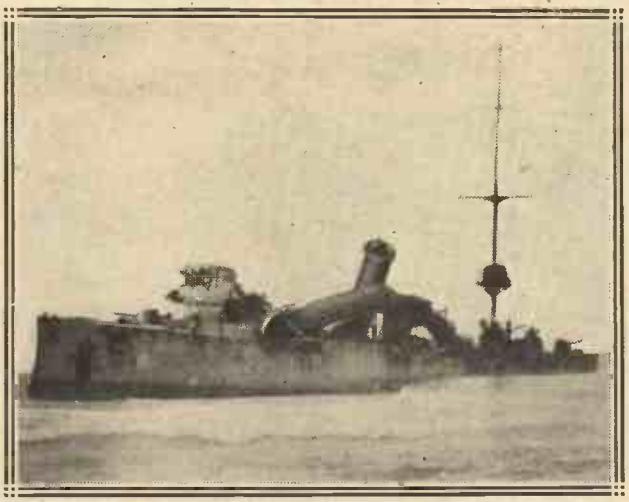
An Unsuccessful Search

Owing to the *Emden's* wireless the Japanese knew that she was in the vicinity, and following this wireless "scent," they searched for her very thoroughly, but without success.

It is true that one of the Japanese warships sighted a foreign cruiser, but upon close investigation this was seen to have four funnels and was flying the white ensign of the British navy (the *Emden* had only three funnels). Any further doubt was set at rest by the crew of the strange vessel lining up on the rails and giving the Japs three hearty British cheers in quite the correct Nelson style, as they went by.

It took some time for the Japanese commander to appreciate the joke and realise that the hearty British cheers came from German throats, but by that time the *Emden*—for she it was, of course—was far away. The fourth funnel was a dummy.

HER LAST BATTLE FOUGHT



The German Light Cruiser Emden after her destruction at the Cocos Islands. Her amazing exploits, largely rendered possible by radio, make one of the most romantic stories of the Great War.

Everyone then began to realise that much might be expected of a commander capable of such daring and possessed of such a sense of humour.

The next we hear of the *Emden* is an urgent wireless signal from the S.S. *City of Rangoon*, reporting that the German raider is operating off the mouth of the Hoogli, and that she, the *City of Rangoon*, had narrowly escaped capture by the *Emden*, and was therefore returning promptly to Calcutta.

Apparently the *City of Rangoon*, when only a few hours out from Calcutta, was signalled by the Italian steamer *Loredano*. The latter reported that she had been held up by the *Emden*, but on proving herself to be a neutral vessel (Italy had not then entered the war), she was allowed to proceed on her journey. The *Loredano's* skipper also reported that the *Emden* had several prizes accompanying her.

The *City of Rangoon* was a new and valuable ship carrying about £70,000 worth of cargo, and fortunately had been equipped with wireless. She was, therefore, able to warn all shipping.

The surprise and consternation of this wireless message was thorough, for the authorities had imagined the *Emden* to be thousands of miles away in the Pacific, and it seemed hardly possible that a lone enemy would dare to appear in the well-protected Bay of Bengal. But there she was, and having the time of her life capturing and sinking merchantmen at the rate of two or three a day.

Altogether she sank 70,000 tons of shipping, and had it not been for the wireless warnings which were radiated all over the Indian Ocean, she would probably have sunk double that amount.

Enemy Stations

All efforts to capture the daring raider failed; she seemed to bear a charmed life. So lucky was she, in fact, that her good fortune was thought to be due to information which she received from secret enemy wireless stations dotted around the Indian coast and on the outlying islands.

That there were secret German

A Dummy Funnel and a Foreign Flag

wireless stations there is no doubt, but the naval authorities believed that her freedom from capture was largely due to the skill of her commander, Captain Karl von Muller, and also the great use which he made of his own wireless for picking up information.

No D.F. Radio

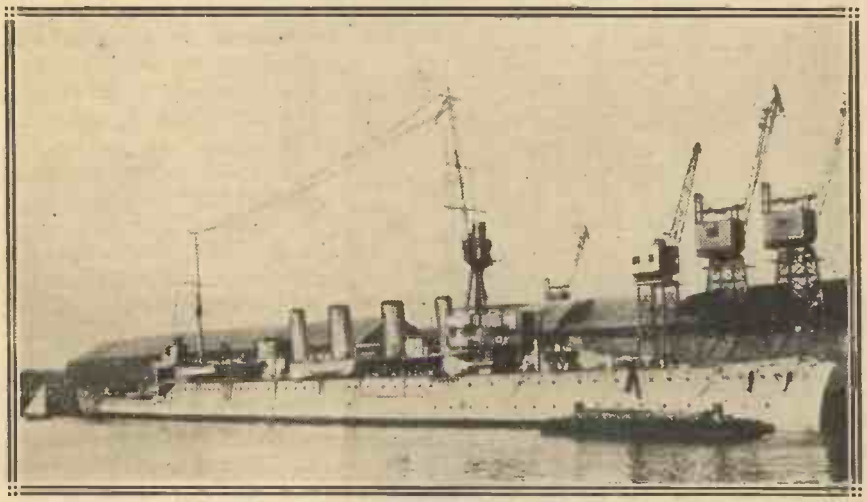
The *Emden* had no wireless direction-finding apparatus, but even without this apparatus it was quite possible for her wireless operator to guess with a fair degree of accuracy the approximate distance of another vessel solely by the signals emanating from the vessel. If the signals become louder over a period of time then the two vessels were approaching, and vice versa. On more than one occasion the *Emden's* wireless operator was able to tell of the presence of British warships, and thus enable his vessel to escape in time.

The tension caused by the continual escapes and success of the *Emden* in the Bay can well be imagined. The wireless cabin on every merchant vessel fitted with radio was the nerve-centre around which all were vitally interested. "Any news of the *Emden?*" was the continual question.

From time to time all and sundry would find their way up to the wireless room, seeking news. The chief engineer from the engine-room, the purser, with inquiries from anxious passengers; the second officer, off watch, would drop in for a smoke and follow eagerly the pencil of the operator as he jotted down the various incoming messages in the log. Anxiety, excitement, the very air vibrating with the fatal word *Emden*; sleep was out of the question on most ships steaming through the Bay on those hot autumn nights of 1914.

The adventure of the *Emden* and her narrow escapes would, and indeed

H.M.A.S. SYDNEY WHICH DESTROYED THE EMDEN



In answer to a call from the operator of the land station, H.M.A.S. Sydney proceeded to the Cocos Islands, where a landing party from the Emden was destroying the station. A fight ensued, after which the commander of the German ship was taken prisoner.

As the one link with the outside world the operator occupied an extremely interesting and precarious position; he was strictly forbidden to use his transmitter without the express command of his captain, at the same time he must be ready to use it at a moment's notice should the necessity arise for jamming a distress signal from a victim which might give him away.

All messages received had to be studied closely to see if they could be used either as means of hunting down the prey or else escaping from the jaws of the British lion.

have, filled volumes. Her commander's favourite ruse was to rig the now famous dummy funnel and fly a foreign flag. Doubling on his tracks was also constantly resorted to

Doubling on Her Tracks

One evening, for example, having bombarded the oil tanks at Madras and destroyed half a million gallons of kerosene, the *Emden* made off to the northward, but when out of sight of land turned about and made due South, and this, of course, led to much confusion as to her whereabouts.

Technically, the *Emden* was a pirate, for while flying a flag other than her own she would often approach and sink an Allied merchantman, an action which by international law is a piratical offence. Her commander, however, was nothing if not chivalrous, for he never on any occasion sank a vessel without first removing all the passengers and crew to safety. Moreover, his treatment of the captured passengers and crew was always courteous and considerate.

The Cocos Station

The *Emden's* activities were greatly hampered by the British wireless, and more than once Captain Muller had to cut and run because of the wireless signals radiated from the vessel which he was about to capture. These distress signals would be picked up by the Allied land stations and passed on to British warships.

One station he regarded as a particular thorn in his flesh, namely, that of Cocos Islands, for this station invariably appeared to smell out his presence and spoiled his little game on more than one occasion.

For this reason Muller decided to destroy the station at the earliest convenient moment.

At about 6.30 a.m. on November 9th the operator on duty at Cocos observed a warship approaching the harbour, but as it had four funnels he at first took it to be H.M.S. *Minotaur*, which vessel was expected in the vicinity.

Suddenly, however, the operator noticed that the fourth funnel seemed to be a little shaky, and his suspicions were immediately aroused, there could be little doubt it was the dreaded *Emden*. (As a matter of fact, the dummy fourth funnel had on this occasion been rather carelessly rigged.)

Jamming the SOS

The Cocos transmitter was started up and the distress signal radiated. But the operator on the *Emden*, ready for such emergency, immediately commenced to jam the Cocos' S O S.

Three cables also radiated from Cocos to Perth, Batavia and Rodrigues, and before the first boatload of Germans arrived at the station the superintendent had managed to get a message through by cable to the nearest British admiral and even to London.

By this time the first German party were in the room. On pain of death,

(*Continued on page 242.*)

From the world's news this month S.T. has gleaned a wide variety of items on which he comments in his trenchant and witty manner. Thus in his notes we range from a dissertation on the history of amateur radio to the electrical diagnosis of the physical condition of a defunct cod. The nomenclature of the receiving valve, too, is discussed during a report of "interviews" with "well-known valve manufacturers."

You have heard, no doubt, of the old custom which forbids hostile action against one whose salt one has eaten, or who has eaten one's salt—I forget which way round it works.

It has always struck me that a five-shilling lunch is the cheapest investment is the world if it buys off for ever the potential enmity of another.

I see that the Sultan of Sokoto and the Emir of Gwandu were recently entertained in London by the United Africa Company, Ltd. The chairman, Lieut.-Col. E. H. L. Beddington, welcomed them, and silver bowls containing kola nuts covered with brocades, were presented to the rulers as a symbolic act of friendly greeting.

The acceptance of these, so my newspaper tells me, indicates that no harsh word should pass between the giver and receiver.

This gives me an idea. I propose to silence all my critics by presenting to them bowls of raspberries sprinkled with powdered brickbats.

Celebrating its "Twenty-First"

I see the Radio Society of Great Britain celebrates its 21st birthday. Starting as the Wireless Society of London, in 1913, it has gone through what seems inevitable in radio—stages of Americanisation.

To-day the R.S.G.B. is essentially a society of "old men," Q.S.L. cards and world-bridgers. Probably in this field the amateur has definitely pointed the way to the professional.

To my mind the years before broadcasting commenced were the most important ones from the amateur point of view. We were given wavelengths which nobody else wanted—until astonishing results were obtained with them.

The Fight with the P.O.

I sometimes wonder whether the post-1920 amateur transmitter realises how much he owes to some of us who bore the brunt of the fight with the Post Office folk who were determined to make it as hard as possible to obtain licences.

The constructor was also anathema to St. Martin's le Grand, and the Post Office in those days was not only defied by the gallant Mr. Ford, but was on the point of receiving a treasonable manifesto from the Radio Society.

I myself offered the R.S.G.B. five hundred pounds to fight the P.M.G., an offer which was accepted; but the Post Office relaxed its attitude, and hostilities were unnecessary.

How peaceful is my life these days! I find no one to quarrel with, nobody to rile, few to make jealous. Is it because I am older and more mellow? Or is it because I am an independent writer instead of an editor?

Probably neither. The industry we founded has grown so great and stable, that it is far greater than any of us. I read that 80,000 men are engaged in the radio industry.

The B.B.C. once had a bit of card with their initials written in ink on it. A drawing-pin affixed this notice to the offices in Savoy Hill. To-day they are like sardines in Broadcasting House—some say they are a tinful of sardines dragooned by an admiral.

But the fact remains that the B.B.C. is now beyond criticism. Even ridicule bounces from the stone edifice, and it is said that the office walls are lined with crocodile hide.

Sir John, himself, a great fighter, must feel how dull things are. Thank goodness they are so. Pioneering is exciting, but it is better to look around and see the widespread art and industry which have been built up.

Where the R.S.G.B. Failed

These senile thoughts are prompted by the fact that the R.S.G.B. has almost entirely gone over to transmission simply because it failed to hold the receiving experimenter.

The "live wires" were the transmitters. If fifteen "ordinary" members went to a meeting it was a

A Peculiar Epidemic—Is Hogson's Cycle to Blame?

surprise. If twenty went, it was a miracle.

Suburban societies were drawing audiences ten times as large. I "drew" three hundred at Ilford myself. Keen transmitters grew tired of the R.S.G.B. and formed a new society. I told them — in print — that they were wrong. I said they should reform the R.S.G.B. from within.

My attacks grew in strength, and Capt. Ian Fraser (he was knighted in June this year, and a more popular honour could hardly be imagined) came to my Fleet Street office to argue his case.

I urged him to use his brilliant organising ability and his keen henchmen to capture the R.S.G.B. instead of breaking up the amateur transmitter movement and weakening its influence at the Post Office. He decided to act on these lines.

A National Society

I still think there ought to be a very strong national experimental society composed of people who read the technical journals. The Institution of Electrical Engineers is, of course, a professional body, and its formal meetings often deal with matters remote from broadcasting.

For president I would suggest the editor of any of the wireless papers. He would crowd the meetings, because he would know what would interest the public.

* * *

Talking of societies, I regret the name of the Institution of Radio Engineers. It is almost the same as that of the Institute of Radio Engineers, the famous American organisation which has a hundred times the prestige. I should like to see the membership standard of both bodies at a higher level.

I am one of those who think that professional diplomas should be very difficult to obtain. It is not a very simple matter to become a chartered electrical engineer, with the result that the prestige of the Institution of Electrical Engineers is likely to be much higher than that of any purely radio organisation.

* * *

"If you want to know if your fish is fresh—take its voltage," is the advice of the Gloucester (Massachusetts) station of the Bureau of Fisheries.

The Old Methods Obsolete

This, of course, will revolutionise the diagnosis of cod's corpses by fish-fanciers' better-halves. The old methods of looking straight into its eyes, smacking its back, counting its spots, and noting the colour, pulling down the lower eye-lid, etc., will now be jettisoned.

Smelling the fish would be a breach of good taste, opening its jaws an act of vandalism.

You now simply measure its voltage with a D.C. meter and, if dissatisfied, tell the fishmonger that the voltage of the fish—and therefore the fish itself—is too high.

* * *

A proposal of mine that there should be a National Sanctuary for Radio Designers is bearing fruit. The proposed site is on the slopes of Mount Snowdon. Five square miles is regarded as sufficient and a high railing will be erected to keep off the public.

Throwing bricks at the designers will be strictly prohibited, and no one will be allowed to throw sticks at, poke at, feed or otherwise annoy any designer browsing in the compounds.

May Become Extinct

A special pit is planned for some of the wilder designers, who have recently shown signs of thinking for themselves and consequently have been much attacked and pestered.

It is feared that unless special steps are taken to protect radio designers, the species will become extinct. They have already suffered greatly from the drought.

* * *

A report from Luton recently stated that dozens of iron-core transformers are losing their inductance. News now comes of very similar troubles at Newcastle, Bramhall (Cheshire), Aston (Birmingham), and South Shields. It was at first thought to be due to a revival of an epidemic of inductance weevils.

Prophesied by Eddy

A far more likely cause, in my opinion, is the onset of Hogson's Cycle. Every fifty years there is a plague of the lamination louse. This, of course, is the first occasion on which this virulent pest has had wireless apparatus to attack.

Hogson's Cycle was prophesied by Eddy—the Father of Lamination. The Life Story of Eddy has presented great difficulties of research, but a few more facts can be revealed.

After Dr. Eddy's visit to England, the famous electrician returned to

"ON THE AIR" ABOUT "IN THE AIR"

Mr. Filson Young of the B.B.C. getting into an aeroplane at Heston for his first lesson in flying. He is describing his experiences week by week, on Thursday evenings, in the series entitled "Growing Wings." In these talks he is hoping to indicate to other middle-aged people just what flying can hold for them in the way of thrills, and as a pastime.

S.T. SUPER-GRAM de LUXE

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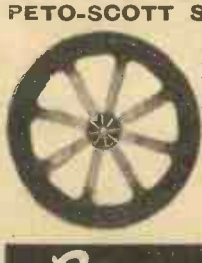

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The Sensational Result of the Egg-Whisk Experiment

Amsterdam and startled the scientific world by his famous Egg-whisk Experiment, which proved once and for all that it didn't matter a quantum which way round the egg-whisk was whisked.

The Eddy Bath Problem

It is said that this sensational experiment resulted in the suicide of the Professor of Natural Philosophy at the University of Freiburg, who had shown mathematically that the whisk would only whisk if whisked clockwise.

The professor's traducers whispered, however, that his death was due not to whisks but to whisky.

Within a year, Eddy, in an examination paper, had set the fundamental problem generally known as the Bath Problem or the Tank Question. It has attained tremendous popularity down the years and goes as follows:

A 600-gallon tank is provided with a waste-pipe capable of emptying the tank in 3 hours 40 minutes. A hot-water tap is capable of filling the tank in 1 hour 50 minutes, and a cold-water tap in 2 hours 20 minutes. How long will it take for the tank to fill? And how hot will the water be?

Few students realise that they have to curse Professor Eddy for having started the snowball rolling, or rather for first turning on the taps.

The "Three Chains Patent"

The following year, the Professor of Electro-Philosophy at Leyden cast a cloud over Eddy's life by inventing the Three Chained Jar.

It will be remembered that Eddy himself had gained a Ph.D.(Leyden) by making contact with the tinfoil inside a Leyden jar by the aid of two metal chains instead of the previous one chain.

The invention of the third chain embittered Eddy to the day of his death. He would write to all the technical papers every year to point out that he was the inventor of the Leyden jar, which he wasn't,* and that the three chains had been declared by the United States Court of Appeals to be an infringement of his two-chain patent.

Everybody got heartily sick of this insistence, and if Dr. Eddy had had any friends they would have urged him not to spoil his case by overstating it.

* Professor Leyden, of course, was the real inventor.

Had Dr. Eddy married his Gridda—the beautiful goose-girl of his native Black Forest—the "three chains patent," as it was called, would never have worried Eddy. Gridda would have kept him worried over a thousand and one other matters.

Every month during his visit to England she wrote to him: "When are you coming back to your liebling goose-girl? I often play with the gold-plated Edelweis Pile that you sent me, but the frog's legs no longer jump. Can it be that the Aitch-Tee has run down?"

Those Human Touches

Beyond a brusque suggestion to recharge the Pile with buttermilk, Eddy ignored these pathetic letters. But to his mother—the beautiful daughter of the Thuringian watchmaker—Eddy wrote every day.

He once told an audience of schoolboys at the Royal Institution: "If all the letters I wrote to my dear mother—may her dear soul rest in peace—were put end to end and sandwiched by discs of carbon and zinc, they would, if soaked in copper sulphate, produce a battery of ten thousand volts."

It was human touches like this that endeared Eddy to the masses.

* * *

I see that an American society has been formed for the reformation of the nomenclature of flowers. For too long have such robust names as Stinking Dogswort held sway.

Rustics who delight in calling that charming pink-tipped flower Beggar's Bloodweed are to be taught to call it Royal Rosefern. Even medicinal herbs are to be reformed, and the purgative Dog's Slobber will be known as Heaven-foam.

Why Not Radio Terms, Too?

Some may call this mealy-mouthed Bowdlerism. These people will say that Aromatic Meadow-scent would smell as sweet under its time-honoured rural designation of Hog's-stenchweed. I disagree.

There is no reason why radio terms should not also be refined. Clumsy, unromantic words clutter up the technological terminology of the handmaid of the arts.

Let us bring the grace and fragrance of an old-world country cottage into the musty laboratories of this machine-ridden age.

I mentioned the matter to the chief of Cozda's, the valve people. He said: "We ourselves have already done something on these lines. Our triple-diode-pentodes are known here as Grandmother's Blessings, but we have hesitated to alter our catalogues.

"We also call the blue-glow which indicates a dud valve St. Cozda's

(*Please turn to page* 243.)

"THE GANG" OPEN THEIR FAN MAIL

Hughie Green, the Boy Producer and broadcaster, assisted by the members of "The Gang" opens a big pile of "fan" mail. Judging by the expressions of delight, listeners were particularly pleased with the broadcast in question.

SHORT-WAVE NOTES

Our short-wave expert reviews the increasing importance of the five metre band, and explains its peculiar advantages over other wavebands.

THIS summer the ultra-short waves have been occupying the time and thoughts of many of us, thanks to the enthusiasm of the amateur transmitters, who have thoughtfully provided something on 5 metres for us to listen to!

There must be many readers of these notes who have never taken any interest in these latest recruits to the radio spectrum, but they are rapidly assuming an air of importance, not only with the amateurs, but in the eyes of commercial concerns.

The Reflected Ray

Think of the characteristics of our "ordinary" short waves, by which we mean anything between 15 and 100 metres. "Reception from incredible distances, when conditions are right for it" is the first thought that strikes one.

This is entirely due to the "reflected ray." Broadcast stations on the medium and long wavebands make use of the direct ray, and their service area is, therefore, limited. Short-wave stations, on the other hand, even if used only for short-distance communication, find that they are being heard at the four corners of the earth, thanks to the reflected ray. (There is no need to enter here into a discussion on the Heaviside Layer!)

The point is that this is not *always* an advantage. Two amateur transmitters, working across London on the 20-metre waveband, may be causing interference in the U.S.A. or even Australia!

Strange though it seems, one of the crying needs of radio at the moment is a reliable wavelength for *short-distance* communication; preferably one on which interference is not too bad, and certainly one on which one is not a servant of "conditions."

What could serve this purpose better than the ultra-short waves?

AN ARMY PORTABLE

A light car equipped with transmitting and receiving apparatus used during Army manœuvres.

Take the behaviour of 5 metres as an example. With transmitters using powers as low as 2 watts, communication with 100 per cent. reliability is possible up to five miles, even in a crowded city. There are no "conditions," no reflected ray being involved.

The gear is extremely simple to construct and operate. There is an enormous "kilocyclage" available—room for over 1,000 stations with "B.B.C. separation" between 5 and 6 metres!—and the interference bugbear has been almost eliminated.

The last of all is natural, because we can have 100 transmitters working in one town and perhaps another hundred in another town 50 miles away, and the two towns will probably never hear each other!

Remarkably Compact

Who can foretell the uses to which the ultra-short waves will be put in the next few years? Television probably has need of them; they are already being used as "links" in telephone services. There is one in action across the Bristol Channel.

Some of the amateurs' efforts have set a new standard of "portability." Several of them have complete transmitters and receivers, *with power supplies*, in portable gramophone cases. These can be carried about, complete with aerial (a 4 ft. copper rod) for field-day work without the slightest discomfort.

W. L. S.

A NEW TEN K.W. S.W. STATION

THE establishment of a short-wave transmitter in a tropical climate, calls for special precautions to ensure undistorted reception. For this reason the Philips Company carried out special tests before finally building the new 10-kilowatt station of Tandjong Priok in the Dutch East Indies.

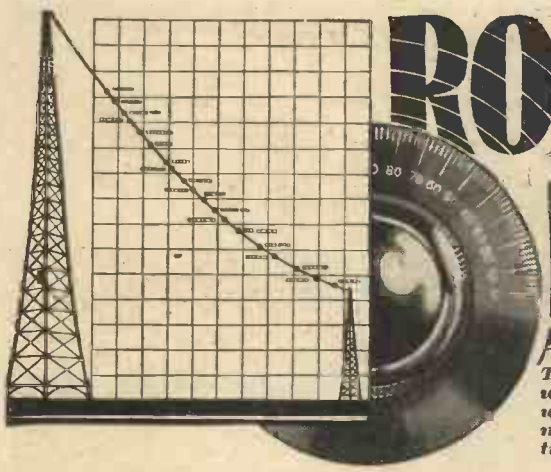
A 1-kw. transmitter was installed and operated for 6 months, and during that time reports from over 23,000 listeners were received. When compared with notes of the adjustments at the transmitter, these reports provided very valuable information.

An Interesting Feature

The new transmitter, which is being shipped this month, is crystal controlled and destined to work on a wavelength between 40 and 80 metres.

An interesting feature is the special voltage regulating system. This has been installed because of the varying mains voltage in the Dutch East Indies, and it is designed so that a voltage variation of 10 volts up or down, is reduced to 1 volt inside two seconds.

A. S. C.



ROUND the DIALS

The new "Daventry" is on the air with its preliminary tests, and is well worth listening for. So are many of the Continentals mentioned below, and who are coming over exceedingly well.

FAR more listening is done upon medium wavelengths than on those above 1,000 metres, in the ordinary course of events. But the coming of Britain's new high-power transmitter which is to supplant Daventry 5 X X upon 1,500 metres, has recently caused more listeners to switch over to long waves than at any time in the B.B.C.'s history.

Exceeded in strength only by Moscow, and with Luxembourg as the only long-waver of equal power, this new station at Droitwich at last provides Britain with a worthy representative on the long waveband.

* * *

Apart from the fact that the power rating was to be 150 kilowatts, and the quality was to be the best obtainable, little has been said officially about the station, which has been erected on a site at Wychbold. (About three miles north-east of Droitwich, on the Birmingham-Droitwich road).

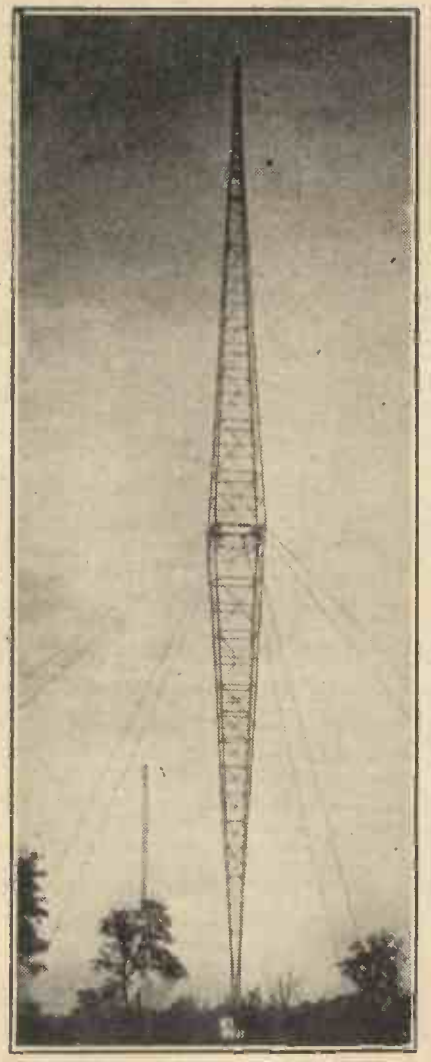
A New Standard

But unofficially it has been said that the engineers have been greatly pleased with the new equipment, and confident that it will set a new standard of quality on long waves.

At the time of writing the tests have not advanced sufficiently to judge, but within the next few weeks the public will be able to make up its mind whether the high hopes entertained of the newcomer have been justified.

* * *

On the medium wavelengths reception has been very interesting, especially when it is remembered that the midsummer season is so often considered of little use for long-distance listening.



As a matter of fact the foreigners have been coming over very well indeed, Trieste and Frankfurt being particularly notable near the bottom of the dial. But between 250 and 350 metres—roughly the extremes covered by London National and London Regional—there has not been very much from abroad worth tuning to.

* * *

The upper half of the medium waves, however, has been lively. Leipzig, on 382·2 metres, has been an interesting station to watch for; while Munich, Rome and Sottens, all below the North Regional, have also been scoring good marks.

The Best Section

And probably the best section of the whole tuning range has been that between North Regional and the top of the dial.

* * *

If we ignore Cologne and Lyons la Doua as being too close to the North Regional to be comfortable for many listeners, we still leave a galaxy of entertainers, including Prague, Brussels No. 1, Florence, Vienna, Stuttgart, Athlone, Beromunster and Budapest, in the order of ascending wavelengths.

And most of these stations have been coming over excellently, five or six nights out of the seven.

* * *

It is true that atmospherics have been distinctly troublesome during the period under review, but considering the season these have interfered less than might have been expected. In previous years we could never rely upon so many promising alternative programmes in mid-summer as the above-named stations alone have provided—and these do not exhaust the list.

Greater Reliability

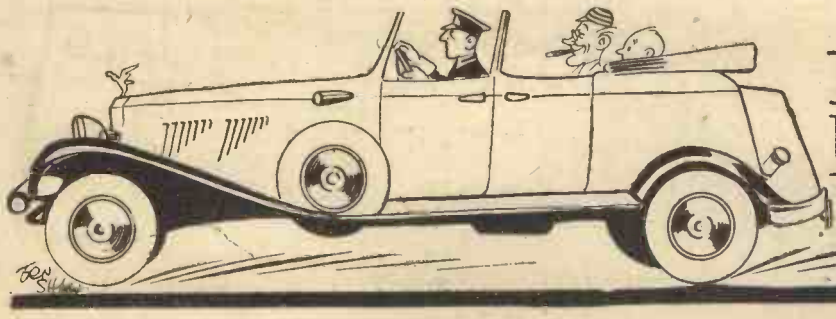
That is one of the advantages of Europe's race for higher power—it provides a much higher margin of reliability during the summer months.

Those listeners who know foreign languages have had an incomparable opportunity to acquire first-hand political information about the unrest in Europe.

THE BUDAPEST MAST—

—OVER 1,000 FT. HIGH

An interesting feature of the Budapest aerial mast, which is illustrated above and which is claimed to be the highest in the world, is that it is of the "guyed" type as distinct from the "tower" type such as the Eiffel Tower. The reason for its being wider in the middle is partly because this is where the greatest strain is centred, and partly to give the mast greater rigidity as a whole. It will be noted that there are no stays above half-way up, the section between there and the top being to all intents and purposes an ordinary mast of the self-supporting variety. The Budapest station works on 549·5 metres and has a power of 120 kilowatts.



IN LIGHTER VEIN

By Wayfarer

COMPLETE EXHIBITION REPORT

By PROFESSOR GOOP AND WIRELESS WAYFARER

So far as the doings of our radio friends are concerned this report is certainly complete, but when it comes to radio—well, read for yourself.

HALF-PAST nine to-morrow morning, then," I called cheerily to the Professor as I left the "Microfarads." "Or rather I should say—should I not?—nought nine hours thirty?"

"What on earth are you talking about?" queried Professor Goop.

"You've apparently forgotten," I retorted, "that to-morrow's the opening day of the Wireless Exhibition and that I've written to the authorities for Distinguished Visitors' free passes, which should be here by the first post in the morning."

The Letter Duly Arrives

"Tut, tut," said the Professor. "I had indeed forgotten. I knew that there was something on in London, but I quite thought that it was a Test Match or the tennis finals at Wimbledon, or something of the kind. Yes, yes, my dear fellow, come for me by all means at nought nine hours thirty.

And sure enough there was a letter bearing the theme-design, so to speak, of the Exhibition on my plate at breakfast time. I stuffed it into my pocket so that I couldn't possibly forget the tickets. After a light, satisfying breakfast I strolled along to the "Microfarads."

The Professor himself answered my ring at the door. He was garbed in a

"AN ADVERTISING STUNT"

"You can't possibly go in that get up. They'd take you for an advertising stunt, or something."

tall hat, a frock coat and the etceteras appertaining to these, whilst over his shoulder was slung a pair of field-glasses in a case.

"Jolly day for Goodwood, isn't it?" he remarked with a smile. I feel like spotting all the winners."

"But, my good man," I cried, "we're not going racing. To-day is the Wireless Exhibition. W for Wilno, I for Istanbul, R for Radio-Paris, E for Eskilstuna, L for Langenberg, E for the Eiffel Tower, S for Sverdlovsk, S for Strasbourg, E for Eketchuna, X . . . for atmospherics, H for Hamar, I for Innsbruck, B for Bratislava, I for . . . 'Ilversum, T for Tartu, I for Idaho Falls, O for Oslo, N for Novosibirsk."

"Lorks," cried the Professor, "so it is! Well, anyhow, here I am ready."

Not Quite Suitable

"But you can't possibly go in that get up."

"Why ever not?"

"Why, they'd take you for an advertising stunt for Oxhide Batteries or Bossor Valves, or something. Off you go and change, and be quick about it."

The Professor dashed upstairs, whilst I settled down with the morning paper. Presently, as time was getting on, I went upstairs to his bedroom to see what was happening. Tapping on the door I walked in and found him snugly tucked up in bed.

The only thing seemed to be to stand over him until he was equipped, and this I did. Perhaps he might have done rather better than white flannel trousers, a morning coat and a cricket cap, but time was too precious to be wasted over mere details.

A Friend in Need

We left the house with just three minutes in which to catch the train. We might, I think, have done so, but for a little contre-temps at the booking-office.

"Your turn to pay for the railway tickets this year," I panted. "I stood them in 1933."

The Professor's face fell.

"I haven't a bean," he grunted. "I was relying on *you*."

Sadly we started to retrace our steps. Just outside the station yard we met Sir K. N. Pepper's Rolls-Royce in charge of his chauffeur. I held up my hand. The car drew into the kerb.

"Were you about to call for Sir K.N.?" I asked the driver.

He told me that he was. He had just taken Lady Pepper into the town for shopping purposes and he was on his way back to drive her lord and master to the Exhibition.

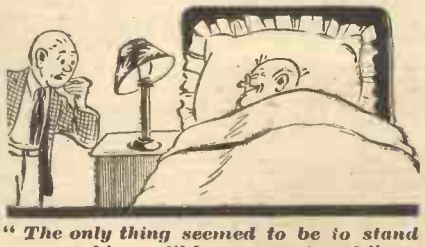
We Arrive at Olympia

"Lucky we met you," I said. "Sir K. N. decided at the last moment to take a lift in Mr. Tootle's car. He wants you to drive the Professor and me to Olympia and then to park the car and to wait until we are ready to go back this evening."

The chauffeur held open the door. The Professor and I clambered in. We had a delightful drive to Olympia.

At the turnstiles I produced the envelope that had arrived by that

SNUGLY TUCKED UP



"The only thing seemed to be to stand over him until he was equipped."

morning's post and handed it haughtily to the commissionaire.

"What's this?"

"Distinguished Visitors' free passes," I smiled.

He opened the envelope and examined the contents.

Snack, Lunch, Tea, Dinner—A Busy Day

"Next entrance," he remarked, jerking his thumb to the left. He handed me the letter which had come from the envelope. There were no tickets, and of *all* the insults—well, I won't labour the point.

"My friend and I prefer to pay our way into your measly exhibition," I remarked haughtily.

"But how?" whispered the Professor.

"Dear Lady Pepper must be rather missing her handbag at the moment," I replied. "She was foolish enough to leave it on the seat of the car."

I had some difficulty in obtaining change for the £5 note that I tendered, but eventually it was forthcoming.

A Little Sustenance

"Before we examine the stands in order to report upon them fully for WIRELESS CONSTRUCTOR readers," I said to the Professor, "I think that it might be as well to fortify the inner man a little. We shall be so busy that we are sure to have a very late lunch. What about a snack to be going on with?"

Though it was but half-past eleven, the Professor agreed that he was as hungry as I was. We therefore repaired to the restaurant, where I ordered the lightest of light snacks—two soles, two Porterhouse steaks and a ration apiece of suet pudding with treacle.

We felt distinctly better some little time later as we sat back, drinking our coffee and puffing our cigars.

"What about a stroll round?" I asked.

The Professor expressed his complete agreement.

Lunch-Time Arrives

On leaving our snack place two things struck us simultaneously. The first was that just across the way there was another restaurant billed as catering specially for epicures; the second was that the hands of the clock pointed to one o'clock, or thirteen hours, if you prefer it so.

"That restaurant looks jolly attractive," burbled the Professor.

"And it's just lunch time," I said. "How about it? I'm sure that we are both feeling a little faint since we have had nothing but that tiny snack since breakfast time."

Our two minds with but a single thought, we entered the inviting portal arm in arm.

I always think that a good lunch is essential to a thorough appreciation of any exhibition. Thanks to Lady Pepper's thoughtfulness—or should I say forgetfulness?—we were able to do ourselves really well. Both Professor Goop and I like light meals, so we partook of nothing more than hors d'œuvres, soup, salmon mayonnaise, a roast grouse and something or other on

"WHAT'S THIS?"

"'Next entrance,' he remarked, handing me the letter that had come from the envelope."

toast, the whole washed down by a quite excellent bottle of champagne.

When we had again reached the coffee and cigar stage the Professor suggested that we might now make a tour of the Exhibition itself.

Paying the bill with a second £5 note from that admirable handbag I sallied forth with him.

The Tea Interval

Curiously enough, two things once more brought themselves simultaneously to our notice. The first was yet another restaurant advertising dainty teas; the second, the clock, whose hands were now pointing to 16 hours 30.

AN EXTENDED MEAL

"Very sorry to disturb you, gentlemen, but I am afraid that we must get the tables ready for dinner."

"I am always at my best after tea," I said. "What about you?"

The Professor agreed that he was just the same. I must say that the tea place that we struck was absolutely topping. So good in fact was the tea that we lingered over it quite a while.

Presently the head waiter began to hover round our table like a bee round some choice blossom.

"And what," I inquired at length, "is biting you, my good man?"

"Very sorry to disturb you, gentlemen," he replied, "but I am afraid that we must get the tables ready for dinner."

No Need to Move

"Dinner!" exclaimed the Professor. "That is indeed an excellent suggestion. There's no need, I take it, for us to move whilst you are laying the table. Bring the menu."

It was a splendid meal and when it was over we decided that we must now view the Exhibition in order to prepare that comprehensive report that readers of the WIRELESS CONSTRUCTOR expect annually from us.

A Rapid Exit

No sooner had we emerged into the great hall when I clutched the Professor's arm.

"This way quick," I hissed. "Sir K. N. Pepper's just over there!"

We beat it for all we were worth through the exit door and strolled round to the car park where we had told the Rolls-Royce to wait.

GLASS-TOPPED BOXES

A Reader's Suggestion.

Dear Sir,—On looking back over my WIRELESS CONSTRUCTORS, I notice in the "Practical Suggestions" for April, 1934, a reader's query, i.e. glass-topped boxes for small parts.

I recently received a catalogue of watchmaker's tools, etc., from Morris Cohen & Co., 34, New York Street, Leeds, and they supply this article in six sizes from $\frac{7}{8}$ in. diam. by $\frac{5}{8}$ in. deep to $3\frac{1}{4}$ in. diam. by $\frac{7}{8}$ in. deep.

If your reader, R. W. H., and anyone else requiring this type of box, will write to the above firm, he will receive full particulars.

In conclusion, I would like to say that I find the CONSTRUCTOR, and particularly "S. T.", very interesting and instructive reading.

Hoping that the information will be useful.

I am, yours faithfully,
W. S. MORGAN.

8, Anson Street,
Barrow-in-Furness, Lancs.

QUESTIONS I AM ASKED by JOHN SCOTT-TAGGART

Q. 95. I have been reading an article in which the author keeps referring to volt-ampères. I always thought that volts-times-ampères were watts. Why call them volt-ampères when he means watts?

A. He doesn't. Volts multiplied by ampères are only watts when the power factor is unity.

Q. 96. What is meant by "second harmonic distortion"?

A. The characteristic curve of a valve is not absolutely straight. If a pure sine wave A.C. E.M.F. is applied to the grid of a triode, the anode current will not take the form of a sine wave if the characteristic is curved. If the grid swing exceeds a safe amount we encroach on the bottom bend, for example, and this will result in a complicated output wave-form which, when analysed, will be found to contain a percentage of second harmonic, i.e., currents having twice the frequency of the original desired currents. Five per cent second harmonic distortion is regarded as the maximum permissible in commercial sets.

Q. 97. What is "shot effect"?

A. The pattering of electrons on the anode of a valve gives rise to an unsteady anode current which results in a noise which limits the amount of amplification obtainable, since for weak signals the background noise becomes predominant. This is not, however, the only cause of hiss, etc.

Q. 98. Can you tell me whether you are going to maintain your policy of enabling us to use our old components in new designs?

A. This has never been my policy. It has "happened" that readers have been fortunate in being able to convert the S.T.300 into S.T.400 at slight expense. But it is impossible to go on doing this indefinitely. The S.T.600 is likely to break away from my previous practice, and this, I'm afraid, will mean that new components etc., will be required.

But I should not expect readers to follow my lead unless I had something radically better to offer them than the S.T.400 and S.T.500. The easy road to a success would be to make some conversion of the S.T.400, but it simply cannot be done if I am to get the vastly improved performance of the S.T.600.

Q. 99. We get a good deal of fading at Bournemouth. Why do you not incorporate automatic volume control on your sets?

A. A great deal of misapprehension arises out of A.V.C. It is treated as a magical refinement which will cure the whole problem of fading. Actually there are two merits of A.V.C., and both of the merits are not always obtained.

Readers who write to Mr. John Scott-Taggart ask the most amazingly varied questions, and in this feature our popular contributor deals with some of those of specially wide appeal to constructors.
By following this page month by month it is possible to obtain a good insight to the technicalities of radio practice.

In the first place, it cures "blasting" i.e. overloading of the set through excessively strong signals. By the use of A.V.C. (automatic volume or "gain" control) as applied in modern sets the amplification of signals (and often the conversion conductance in super-hets) is reduced when the signals are too strong to be comfortable. The result is that an even level of signal strength is obtained from the loud-speaker.

This is a luxury which the constructor does not appreciate very much. Except in the case of a very sensitive and powerful receiver, the cost, adjustment, and risk of failure are out of proportion to the benefits to be received. After all, if a signal is too loud you can, on most sets, "turn down the wick."

Delayed A.V.C. is best carried out with a diode biased negatively and such an arrangement calls for a fairly strong signal to operate it. A.V.C. is not much use on a three-valve set, say.

When A.V.C is Desirable

Then, again, there will be a few cases on the average small straight set when a foreigner would come in as loud as a local B.B.C. station. The anti-blasting qualities of A.V.C. would therefore not be needed.

On a very sensitive and powerful superhet (e.g. the one I have designed for the exhibition) the position is different, as dozens of stations are capable of causing an overpowering output from the speaker and A.V.C. becomes worth while.

The greatest misunderstanding about A.V.C., however, is that fading can always be cured by it. Now fading can be (*a*) quick, (*b*) slow, (*c*) distorted, (*d*) slight or complete. If the fading is accompanied by severe distortion, A.V.C. can do very little; it certainly cannot affect the distortion, but only the loudness of the distorted signals. Its ability to remedy quick fading depends on the time constant of the system employed.

Signals That Nearly Disappear

Slight fading is the most easily remedied. But if the signal nearly disappears you are "in the soup" unless the set is extremely sensitive, and even then you will get considerable background noise during fading periods, as the background-to-signal ratio is high.

You cannot possibly cure severe fading unless the signals at their weakest moment can be brought up to

(*Please turn to page* 242.)

How to obtain BETTER RADIO

Accuracy in trimming is essential if a single-knob-controlled multi-stage receiver is to operate properly. This month a simple method of assisting the task is described.

By FREDERICK LEWIS

ONE of the worst troubles that besets the constructor of a newly made set and can prove a most deadly enemy, is that of ganging. It is not such a bad job, perhaps, to get a two-stage ganged tuning receiver fairly well matched up, but when it comes to three or more trimmers to be adjusted the matter becomes anything but a joke.

Especially is this so when the circuits that have to be trimmed are band-pass in arrangement. To tell by ear when a bandpass tuner is properly in trim is not an easy matter, and I may go as far as to say that probably 80 per cent of the bandpass circuits used in conjunction with a three- or four-stage ganged condenser in home-constructed sets are not really trimmed.

What Ganging Is

A nasty accusation against the skill of the home constructor? Not really, for he may well be excused having failed in many cases to get the condensers properly trimmed.

If we analyse ganging we find that it is merely a method of enabling more than one circuit to be individually tuned with the use of only one control knob.

If you tuned three tuned circuits with three separate tuning condensers I warrant you would probably get them pretty accurately in tune. But the task would be tedious, and when one station had been tuned in you would be loth to pass on to another and begin the whole performance again.

The Art

A two-stage tuned set is not much bother to tune with separate condensers, but when more than two stages have to be tuned we always prefer a ganged tuning control.

The art of trimming is to get the circuits set so that each takes the same amount of rotation in the appropriate section of the ganged condenser to tune it to a required wavelength.

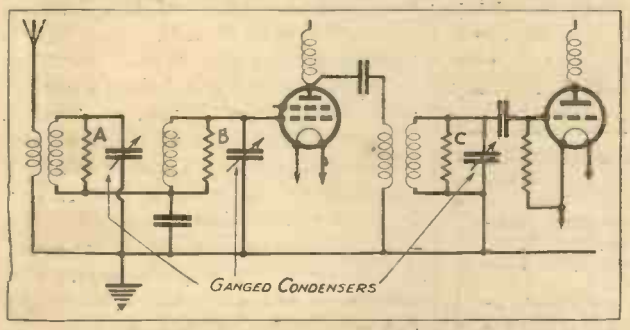
So we set the tuning at one point, where a station can be heard, and we adjust the trimmers on the gang condenser so that we get maximun strength. With these adjusted we have loaded each circuit so that it starts on a par with its neighbours as regards its capacity, so to speak.

In bandpass circuits the arrival at this state of affairs is often difficult to judge, and we are liable to get the circuits slightly out of trim with bad results on the tuning curve of the set, and on the reproduction.

When we tune the aerial coil circuit by means of the trimmer we are liable to misjudge the peak setting owing to the presence of selectivity due to the other circuits, and so on at each stage. Each tuned coil is offset in its selectivity peak by the others.

If we could avoid this we might be able to get the tuning more accurate. But how can it be avoided? Obviously by flattening the tuning of the stages not being trimmed, so that the tuning point of the non-flattened circuit shall be as sharp as possible.

A SIMPLE BAND-PASS CIRCUIT



By placing resistances, as shown, any two of the circuits can be "flattened" while trimming is carried out on the third.

Flattening Tuning

The diagram shows how this is done—by the simple (and oft-used expedient by those in the know) of placing resistances across the coils not being trimmed.

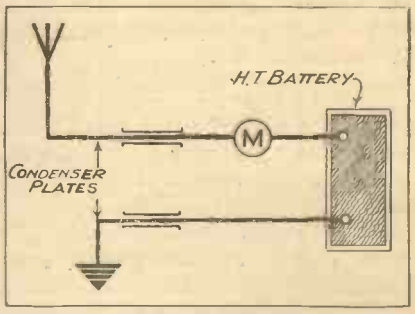
The resistances should be of about 5,000 ohms in value, and while circuit A is being trimmed resistances across B and C should be used to flatten the tuning, and render these circuits out of the question as aids to selectivity.

* * *

And now a word about your aerial and earth. This dry weather is apt to play havoc with the earth, which should be watered frequently (drought regulations permitting) if a hygroscopic earth device is not used. The aerial, too, should have an overhaul at this season ready for the winter.

And apart from a visual overhaul, try the insulation of the aerial and earth system by means of an H.T. battery and a voltmeter—you may be surprised.

AN AERIAL CHECK



A simple check of the resistance of your aerial-earth installation.

The aerial and earth form two plates in a condenser, and if the condenser is good (no leakage to earth from the aerial) it will allow no voltage to be read on the meter when placed in circuit as shown. If the condenser is faulty a voltage will show, especially if the voltage applied is high.

Ideas about current practice culled from actual experience.

THE falling off of results due to summer conditions, to which reference was made in our "Reminders" last month, often leads to the owners of old battery receivers trying to ginger up their set's performance a little. And quite frequently new valves are purchased.

Instead of resulting in an improvement, the effect is sometimes to produce instability. This is due to the greater efficiency of the later type valves, and if it is overcome will lead to reception considerably better than that previously enjoyed.

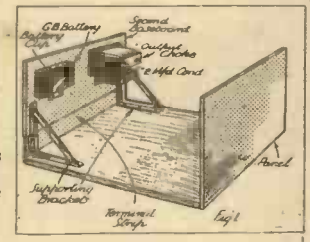
Adding the Components

The most likely way to cure the trouble is to decouple the detector's H.T. lead. If such decoupling is already in the set, you are up against a bigger problem, and probably the best thing to do would be to obtain less efficient valves or make another design.

The two components can be added externally to the set and are wired as

MORE ROOM FOR PARTS

A novel idea fully described in the text.



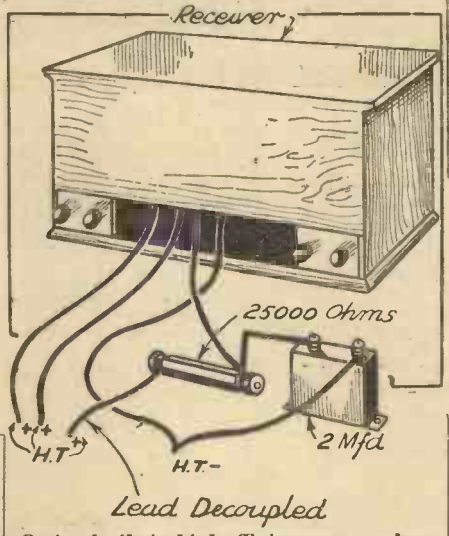
is clearly shown in the centre diagram on this page. By using other condensers and resistances the remaining H.T. tappings can be decoupled, but the improvement in these cases is not likely to be so great.

I mention that the extra components can be used externally to the receiver, but if you like to keep your set neat you will naturally prefer to have them inside. This is quite plain sailing so long as there is room on the baseboard for them.

If there is not, I would suggest that you adopt the little scheme illustrated on this page. I do not claim it as original, but feel it is well worth passing on to those who have not met it before.

It consists of fixing an auxiliary baseboard to the back of the set above the terminal strip by means of panel brackets. This is also useful for the accommodation of output filter components and for the grid-bias battery.

WHEN USING NEW VALVES



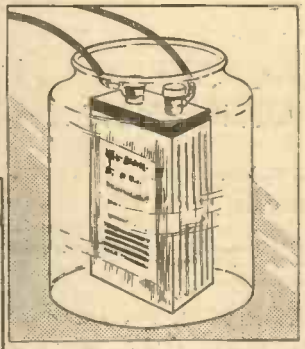
Owing to their high efficiency new valves may make an old set unstable. But decoupling will often smooth things out again.

Of course, the extra components *could* be attached to the back of the cabinet, but this has the great drawback that whenever you wish to remove the set from the cabinet for any adjustments, you have to undo quite a number of leads. With the scheme I am recommending the set may be removed as a complete unit.

A Battery Tip

There is another tip, suggested by a reader, which I should like to pass on while writing about old type battery receivers. With such sets it is most unusual to find the batteries accommodated inside the cabinet, the accumulator usually standing on the floor beneath the receiver.

This may cause anxiety to the female section of the household, particularly if the room is carpeted. And quite rightly too, for the modicum of acid can work havoc with all sorts of things.



SAVES HOLES DUE TO ACID

A simple but effective precaution that will save trouble.

The third sketch tells you what to do. Just find a large glass jar and stand the accumulator in that.

Glass being easily washed, the jar can be kept free from acid on the outside. Of course, it won't do for large accumulators, but then, nothing is completely universal; and many L.T. batteries *are* small.

Some of the large glazed earthenware jars will take two or even three two-volt cells, passed inside one at a time, if greater voltage or capacity than is available from one cell is desired.

A. S. C.

REMINDERS FOR MAINS USERS

When installing a new set, find out the *exact* voltage of the mains. It is not always good enough to have the mains input connected to terminals on the mains transformer which are only roughly right.

* * *

Never touch any of the terminals on the components inside the set, or make wiring adjustments, without switching off the mains.

High-voltage-test condensers are desirable in both the earth *and* aerial leads of a set run from D.C. mains.

* * *

Electrolytic condensers are not normally suitable for D.C. sets, as they can be damaged if the mains are joined up the wrong way round.

AS WE FIND THEM NEW APPARATUS TESTED

Interesting reviews of the latest apparatus submitted by radio manufacturers and traders for examination and test in "The Wireless Constructor" laboratories.

"Clix" Connectors

CERTAIN of the new valves have thimble caps instead of terminals on top. Among these may be mentioned the Marconi and Osram variable-mu S.G. two-volt types.

These thimble caps consist of a small metal cylinder with a slightly domed top and in order to ensure

FOR S.G. VALVES

These neat connectors are a recent addition to the "Clix" range. They are designed for S.G. valves with thimble caps.

good contact it is desirable—in fact essential—to have a suitable connector. Messrs. Lectrolinx, Ltd., 79a, Rochester Row, London, S.W.1, have recently produced a very effective little gadget especially for this purpose. Two of these connectors are shown in the photograph, and as can be seen, the design is quite simple.

One advantage of these "Clix" connectors is the ease with which they can be slipped on and off. Yet for all this, the electrical connection is as perfect as anyone can wish for.

The Benjamin Transfeeda

The "Transfeeda" unit, made by the Benjamin Electric, Ltd., of Brantwood Works, Tottenham, London, N.17, comprises a parallel-feed L.F. transformer, together with its associated anode resistance and coupling condenser.

Parallel-feed amplification, as many readers will know, is a very efficient method of L.F. coupling, giving, as it does, a remarkably even response over a wide range of musical frequencies. The H.T. current to the valve is diverted from the transformer primary, and passes to the anode of the valve through the anode resistance.

The coupling condenser between the valve anode and the transformer primary acts as a barrier to the H.T. current but, of course, permits the L.F. impulses to pass and become amplified by the transformer in the usual way.

The latest Benjamin "Transfeeda" has been improved in several ways. For instance, the coupling condenser is of the high-voltage type enabling the unit to be used in mains circuits. This is an important point. In addition, the method of winding the transformer bobbin has been altered, and improved so as to permit of a higher step-up ratio. This is now 1–3·5, and although it provides greater amplification there is no loss of bass.

SELF CONTAINED

This is the latest Benjamin "Transfeeda." It is a complete parallel-feed L.F. coupling unit.

In performance the "Transfeeda" reaches a high standard, and at 11s. 6d. it must be regarded as excellent value.

Hydra Condensers

Three additions to the popular range of T.M.C.-Hydra condensers have recently passed through our hands.

The first of these is a block in which four condensers are embodied in the one unit.

Grouping of this nature has several advantages among which may be mentioned compactness, economy, and ease of wiring.

In the block we tested there were three ·1-mfd. and one 1-mfd. condensers. The connecting tags are conveniently arranged, and the common connection stands apart from the others. Each value is clearly marked on the bakelised top of the unit.

This condenser block retails at 5s., and is designed for a working voltage of 400 D.C.

The second addition is a range of Hydra condensers with terminals instead of soldering tags. These are a real boon to those who cannot solder. Moreover, there are many experimenters who like to be in a position to change components and values quickly, and who therefore look upon a soldered joint as being somewhat of a nuisance. Terminals are truly a blessing in these cases.

Needless to say the extra cost of these terminal models is very slight.

New Tubular Types

Apart from the types already mentioned there is also a range of tubular condensers with wire ends. These are available in capacities from ·0001 mfd. to ·1 mfd., and the values are claimed to be accurate within fifteen per cent. The samples we tested came well within this margin.

These tubular types are all tested

SAVES SPACE

A Hydra condenser block comprising no less than three ·1 mfd. and one 1-mfd. condensers.

at 2,000 volts and have a maximum working voltage of 600 D.C. Moreover, they all carry the T.M.C.-Hydra twelve months' guarantee.

T.M.C.-Hydra condensers are made in England by the Telephone Manufacturing Co., Ltd., and distributed by T.M.C.-Harwell (Sales), Ltd., of Britannia House, Shaftesbury Avenue, London, W.C.

THE PENTODE IN COURT

All about the recent interesting patent action.

By Our Special Correspondent.

LAWYERS have good reason to look upon the valve with affection—more money has probably been spent upon it in litigation than on any other invention of modern times.

The first spot of trouble occurred between Sir Ambrose Fleming and Professor Lee de Forest, both of whom claimed to be entitled to draw patent royalties on the original valve when used as a detector or amplifier.

Another Big Battle

Before that issue could be settled in favour of Fleming, another big battle had started over the use of reaction. This occupied the attention of the American Courts for many years, the final decision—dated only a short while ago—being in favour of Lee de Forest as against Armstrong.

One of the longest and most expensive patent actions ever brought before the British Courts concerned the so-called French valve. This was fought to a finish between the Marconi Co. and Mullards, victory finally going to the latter. Quite recently the famous reaction patent again came before the High Court—probably for the last time—in an action for infringement taken by the Marconi Co. against Messrs. Philips. Here, too, the decision went against the Marconi Co.

The latest chapter in this long story of legal conflict is the action recently taken by the Mullard Radio Valve Co. against the Philco Co. and certain others, claiming damages for infringement of their well-known Pentode valve. The hearing lasted for eight days, judgment being delivered on July 3rd by Mr. Justice Farwell.

A Curious Defect

If one reads the Pentode Patent specification (No. 287958) one finds that a curious defect is pointed out in the working of the ordinary three-electrode valve.

As the voltage on the grid is made more positive, two things occur. First, the anode current naturally increases, since the internal resistance of the valve is now less than it was before. Secondly, the larger current flowing through the valve circuit as a whole, produces a definite voltage-drop on the plate of the valve.

This fall in plate voltage naturally tends to cut down the current passing through the valve, and so acts, to a certain extent, in opposition to the rise in grid voltage. The two are, in fact, "out of phase" with each other, and for this reason some of the full amplifying action of the valve is lost.

The specification goes on to say that the use of a screening grid, maintained at a comparatively high voltage, is not in itself a satisfactory remedy, because for large signal inputs (such as those used in a power-amplifier) the plate voltage may actually fall below that of the screen, and so cause a "reverse" current to set in from plate to screening grid.

If, however, a second screening grid is interposed between the first screen and the plate, and is kept at a low voltage (say by connecting it directly to the filament), the danger of any "reverse flow" or secondary emission from the plate is avoided, and the valve can then be used to handle heavy signals without distortion.

The actual inventors of the Pentode are the N.V. Philips Co. of Eindhoven, in Holland, but the patent rights for this country are now held by the Mullard Co.

At the hearing of the action Mr. Moritz, for the plaintiffs, said that his clients' valve had proved an instantaneous success, and was being sold by the million. He claimed that the defendants had infringed the Pentode patent, by manufacturing and selling certain specified high and low frequency amplifiers.

An L.F. Application

Mr. Whitehead, for the defence, argued that there had been no infringement of the monopoly claimed by the inventor. The Pentode patent described certain valves having a number of electrodes, including suppressor grids, and then left it to the Court to select which of these fell within the claims. So far as he could see, the inventor had only considered the application of the valve to low-frequency amplification.

In giving judgment in favour of the Philco Co., Mr. Justice Farwell said that the problem of preventing secondary emission from the anode of an amplifying valve was a very real one, and so far as he could see, the solution of this problem by inserting a low-potential "suppressor grid" between the anode and the high-potential screening grid, was a new and valuable invention, provided it was used in the manner set out in the patentees' first claim. This, however, limited its use to the last stage of a series of amplifiers connected in cascade.

"Very Wide Claim"

He thought the patentees went too far in claiming, as part of their invention, any valve having more than four electrodes in which the electrode nearest to the anode was directly connected to the cathode. They apparently wanted to cover this construction of a valve, quite apart from its application.

"That appears to me," said his Lordship, "to be a very wide claim." He added that valves provided with this number of electrodes were well-known prior to the date of the patent, and that being so, he could not hold there was any invention in merely connecting a particular electrode to the cathode.

He accordingly dismissed the Mullard Co.'s claim for infringement.

It is understood that an appeal has been entered by the Mullard Co. against this decision. Meanwhile the case is of special interest to all those interested in wireless.

THE OLD AND THE NEW

Taken in the Tungsram valve factory in Budapest, this photograph shows an operator clad in the picturesque working garb of the Hungarian peasant. It is a type of dress worn by quite a number of the workers in this modern valve factory.

FOR CONSTRUCTORS

Details of an inexpensive and attractive radiogram cabinet available for home-built receivers.

SHAKESPEARE'S seven ages of man are singularly appropriate as applied to most home-constructors. There may not be quite seven of them in the life of the ordinary radio enthusiast, and yet how often do you find a keen constructor who is content to stick to one outfit for any length of time? Not often.

And in the various transitionary stages from the humblest of valve sets (a common jumping-off point) to the elaborate radiogramophone, there invariably comes a time when the ordinary table-model type of instrument is forsaken in favour of the more ambitious radiogram.

The problem of finding a cabinet in which to house the radiogram—and a cabinet, moreover, to compare in appearance with those of commercial receivers, is not always an easy one, at least, it is not always an easy one if price is to be considered.

Peto-Scott was one of the firms who realised that, and when, last year, they stepped into the breach with their famous "adaptagram" cabinet, it was patently obvious that the demand for it would be phenomenal. It was. The "Adaptagram" sold like the proverbial hot cakes.

But we are not concerned with past history. Much more to the point is the fact that this famous cabinet in a new and improved form is being continued throughout the coming season.

Beauty and Utility

The 1935 Peto-Scott "Adaptagram" is a wonderful example of cabinet craftsmanship, combining beauty of appearance with genuine utility. A tasteful two-tone finish is imparted by the skilful contrasting of inlaid walnut veneer panels, and a pleasingly modern effect is obtained by the use of an effective chromium fret-surround.

The cabinet takes the set, the speaker, the power equipment and a gramophone turntable. It is supplied with ready-fitted motor-board, and is obtainable either with plain front or vignetted to take any panel up to 18 in. × 8 in. Peto-Scott undertake to drill it for you from your own dimensioned sketch for a slight extra cost.

The Adaptagram Cabinet Model "A" costs 3 guineas. Model "B," which is supplied with double-spring motor, B.R.G. tone-arm with pick-up and volume control costs 6 guineas.

The same equipment, but with an induction electric motor in place of the spring motor is available at an extra charge of 1 guinea, i.e. 7 guineas complete.

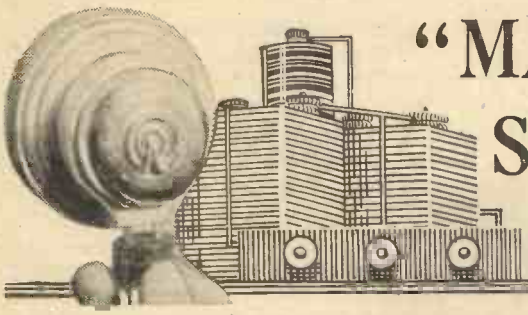
For those who are interested in automatic record-changing mechanism it is of interest to note that an Adaptagram cabinet, complete with Garrard automatic record changer, pick-up, and volume control can be supplied for 14 guineas.

Each of these models is available in Walnut, Mahogany, or Oak, to choice, at no extra cost.

THE "AVOMINOR" COMPETITION

Readers will be interested to learn that the closing date for the ingenious competition organised by the makers of the famous "AvoMinor" testing instrument has been extended to September 15th.

Full details of this competition, in which there are valuable prizes, can be obtained from The Automatic Coil Winder & Electrical Equipment Co., Ltd., Winder House, Douglas Street, London, S.W.1.



"MAN-MADE STATIC"

By L. H. THOMAS.

The author, who is owner-operator of station G6QB gives some really practical advice to those whose reception is marred by electrical interference.

MOST of the interference from which broadcast and short-wave listeners suffer may be grouped under the following broad headings:

(1) Interfering transmitting stations:
  (a) On a near-by wavelength.
  (b) Remote in wavelength, but very close to the receiver.
(2) Electrical apparatus:
  (a) Tramcars and trolley buses.
  (b) Small electric motors.
  (c) Making and breaking of contacts.
  (d) High-frequency apparatus.

How It Is Caused

To the average listener, "1a" indicates a broadcasting station that is either heterodyning with or "spreading over" the station he is listening to; "1b" would probably be either an amateur transmitter on short waves or a Government or R.A.F. station situated unpleasantly close.

"2a" is self-explanatory, while "2b" includes vacuum cleaners, electric fans, electric sewing machines, etc. "2c" includes dirty switch contacts inside the house or in a neighbouring house, together with flashing signs, refrigerators, electric warming pans and the like.

"2d"—probably the most troublesome, although one of the most rare, of the whole lot—embraces X-ray apparatus, ultra-violet apparatus (artificial sunlight), diathermy and various other medical appliances.

Your First Steps

Obviously, the first thing that one has to do in any case of interference is to attempt to find the source. Common sense, fortunately, is a great help in these matters. For instance, a noise that occurs on hot summer evenings is more likely to be an electric fan than a bed warmer! Similarly, in a country district one is not likely to suffer from ultra-violet or X-ray apparatus, which is probably worse in the neighbourhood of Harley Street than anywhere else!

A persistent whirring sound, resolving itself into a continuous rushing noise when the receiver is oscillating, can nearly always be put down to an electric motor. If the interference is severe the chances are that it is very close, and that it will easily be tracked down by approaching one's immediate neighbours in a friendly way.

An elusive case can only be traced by walking or driving about with a portable receiver. Readers who do not feel that they can tackle this are probably best advised to approach the G.P.O. on the subject.

Naturally, trolley buses and tramcars are rather beyond the reach of the people who suffer from them. In most cases, however, they have either been fitted with "suppressors" of some kind or work is actually being done on those lines at the moment.

A Standard Cure

It has always been my experience that an organised complaint by a large body of listeners who really do suffer from serious interference is promptly and courteously dealt with.

The most common form of "man-made static"—electric motors—can be dealt with at the source quite easily. The standard "cure" is the fitting of two 1-mfd. or 2-mfd. condensers in series across the brushes of the motor, the centre-point being connected to the frame, as in Fig. 1.

Needless to say, no risks must be taken. The condensers must be capable of standing at least 250 volts A.C. (each) if they are to be used with safety, in series, across 220-volt mains. And if you don't feel that you know enough about the mechanics of electric motors to do the job yourself, get the local radio and electrical man to do it for you.

You would be surprised at the number of vacuum cleaners in my own neighbourhood that carry two 1-mfd. condensers strapped on in some inconspicuous place!

Easy Earthing

Connection of the centre-point of the filter to the "frame" is usually sufficient. In cases of modern wiring, where three-pin mains plugs are used, the third pin providing a direct earth for the metal frame of whatever object is plugged in, this is even more efficient. If an external earth is connected a ·01-mfd. mica condenser should be wired in series with the earth lead, as shown in Fig. 1.

In the case of a fixed electric motor a direct earth may possibly be arranged near by and the frame connected

SILENCING MOTORS

The simple scheme shown below is very effective in quietening vacuum cleaners and similar apparatus.

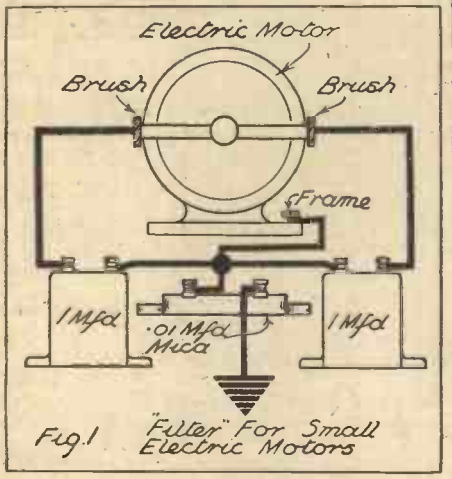


Fig. 1. "Filter" For Small Electric Motors

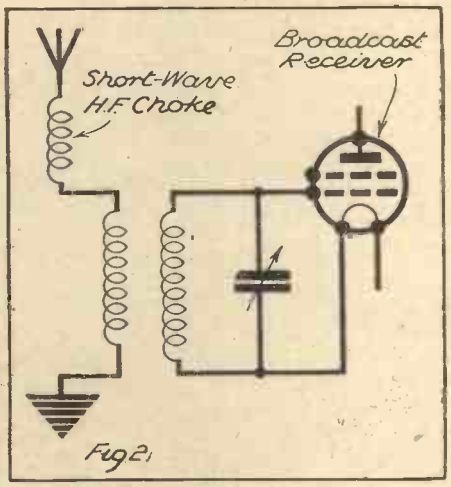


Fig. 2.

THAT NEAR-BY STATION

A short-wave choke in the aerial, as shown, is recommended for those whose reception is "wiped-out" by transmissions from a neighbouring amateur station.

"MAN-MADE STATIC"

(Continued from previous page)

thereto. The whole object of the condensers is to isolate the high-frequency energy caused by sparking to a small, compact circuit.

Where it can drain away to earth via a few feet of wire there will not be much trouble. Without the condensers it has to travel along the mains for an indefinite distance, to the detriment of the nerves of other mains users.

Miniature Transmitters

In short, any electric motor or other appliance that sparks is a radio transmitter; but when it is equipped with a perfectly good aerial, in the shape of the mains wiring, it becomes ten times more of a nuisance than it need be.

"Clonking" noises, caused by dirty switch contacts, are best dealt with by fitting the modern type of "quick-break" switch. One sharp click may be heard on making or breaking the circuit, but that is nothing compared with the actual arc that one hears with the old type of switch.

I do not propose to deal with "1a" here. Heterodyning or "swamping" interference is dealt with effectively only by installing a 1933 receiver; 1927 receivers are not much use nowadays in such cases.

"1b," however, is worthy of mention, particularly where the interference comes from a near-by amateur transmitter. If it takes the form of violent "key clicks" the chances are that the transmitter is partly to blame. In this case, from what I know of the fraternity, the offender will be only too pleased to go into matters with you.

"Wipe-Out" Effects

On the other hand, if you are affected by "wipe-out"—the disappearance of the programme you are listening to every time he switches on his transmitter—it is probably your receiver.

One of the most certain cures in these cases is the fitting of a short-wave H.F. choke between your aerial lead-in and the set. Most amateur transmitters have fixed these in neighbours' broadcast receivers before now, and know what size they should be. One hint, however: don't approach your local amateur as if he is a criminal! The chances are that he is perfectly within his rights and quite unaware that any interference is being caused.

LICENCE FIGURES

A letter from the B.B.C.

The Editor, WIRELESS CONSTRUCTOR.

Dear Sir,—You publish a paragraph under the heading "The Editor's Chat" in your August issue referring to wireless licence figures for May last. I would like to suggest that if your comparison had been extended, a different complexion would have been placed upon the matter. The increase in April (the last complete month following what you call "anti-broadcasting" propaganda) over March, 1934, was 56,281. The increase in April, over March, 1933, was 37,433.

Again, the increase in June, 1934, over May, 1934, was 34,033, while in June, 1933, the increase over May, 1933, was 21,561.

A six months' comparison would more accurately determine progress:

Total increase in licences between December 31st, 1933, and June 30th, 1934, 399,855.

Total increase in licences between December 31st, 1932, and June 30th, 1933, 335,024.

Yours faithfully,

B. B. CHAPMAN. (*Press Representative*).

WIRELESS IN THE GREAT WAR

—continued from page 218

everyone was ordered to leave their instruments. A second German landing-party then commenced to blow up the wireless masts and cut the cables. As it happened, there were a number of pieces of odd cable lying about for repair purposes, and this confused the Germans, who only succeeded in cutting the cable to Perth.

Dynamos Broken Up

All the instruments, and even the clocks, were then smashed and finally the dynamos were broken to pieces by means of slogging hammers.

But retribution was at hand. A shrill whistle was heard from the *Emden* urgently recalling the landing-parties to the ship. The reason was obvious, a black cloud of smoke on the horizon was growing larger. It was the answer to that first S O S from Cocos; the jamming by the German operator had, this time, been too late.

With all speed the *Emden* made for the open sea and prepared for action. The black smoke presently proved itself to be his Majesty's Australian Ship *Sydney*. But nothing daunted, the *Emden* prepared to put up a fierce fight, and her first salvo struck the *Sydney*, killing and wounding some seamen.

The *Sydney's* superior speed and gunnery, however, began to tell very shortly. The *Emden's* foremost funnel was the first thing to go, the foremast followed almost at once (thus ending her wireless career). The afterpart of the ship then caught fire, and the second and third funnels were quickly blown away. The terrific British lyddite soon turned the decks into a shambles.

No Signal-Books Left

The *Emden* seemed helpless, not a gun could answer, and she had drifted aground. The captain of the *Sydney* signalled to her to surrender.

"No signal books left, what does your signal mean?" came the reply from the *Emden*.

The British signal was repeated in Morse.

Came the reply: "Our captain refuses to surrender."

With this the *Sydney* was forced to open fire again, but a few minutes later a German sailor was seen to be climbing up the remaining mast with a white flag in his grasp.

Thus ended what was surely one of the most romantic adventures in the history of the Great War. Never again was the setting so romantic or the old-time chivalry of the sea so exemplified. When the Admiralty in London learned of the destruction of the *Emden* and the capture of her commander so great was their appreciation of his daring and courtesy that they forthwith gave instructions that he was to retain his sword and be treated with the dignity and honour worthy of so brave a foe.

QUESTIONS I AM ASKED

—continued from page 231

full loudspeaker results by increasing the sensitivity of the set.

In other words, you need a set which is far more sensitive than is ordinarily necessary. When the patch of fading is over the receiver automatically becomes very inefficient owing to the A.V.C. action.

We can afford to do this on a very sensitive set such as a mains super-heterodyne of good type.

If you have, say, a S.T.300 and Fécamp fades, no A.V.C. circuit would be of the slightest use unless under normal circumstances you need deliberately to reduce the sensitivity of the set. If with the set sensitive your Fécamp signal becomes weak there is no method of boosting it up by A.V.C.

Delayed A.V.C. would nevertheless prevent excessive volume on the "local." But this advantage is not very important.

To fit A.V.C. to any battery set I have designed would be a fraud on the reader. A badly fading signal would usually be a comparatively weak station—certainly not to be compared with a nearby "local"—and so there would not be those necessarily great reserves of sensitivity. When most wanted, A.V.C. would be of no avail.

To give a simple set an apparent air of modernity by introducing A.V.C. may be a temptation, but I have not fallen.

S.T.600

(In preparation)

I desire to thank all those who have offered their aerials. Far more letters are required from those near (the nearer the better) the B.B.C. stations. Most of the letters are from readers who are delighted with their S.T. receiver. I also want letters from those who get disappointing results from their sets; it does not matter which sets they are. Please write immediately if you want to hear the S.T.600 in your own home. State present set and general results obtained. Appointments will be made with readers.

J. S.-T.

FROM MY ARMCHAIR

—continued from page 222.

Light. A happy thought, don't you think?" I did think.

Mulram's—also the best valve-makers in the industry—were no less enthusiastic. The works manager said: "Microphonic rattle is a term unknown here. All the staff call it 'Sphere-music,' and concerts are often held to checr the test staff. Our new fifty-point suspension screened H.F. pentode, with its mutual of 50 milliamps per volt, is favoured by most soloists."

"Moth's-Wing Effect"

A famous firm of transformes manufacturers whose transformers sing and talk, and, by their cunning disposition of windings, are able to claim that a loudspeaker is unnecessary, said that lamination-flutter would in future be called "Moth's-wing effect."

I ought perhaps to mention that while at Cozda's I learnt that the workpeople were having difficulty in the accurate assembly of the duo-diode - triode - pentode - heptode frequency changer valves.

Having thought of "Designer's Balsam" as a better name for this very useful valve, I approached a harassed works foreman, and said kindly: "What do you people—you real workers—call the duo-diode-triode-pentode-heptodes?"

He turned his head aside. Then, slowly, he raised his face to mine and said: "I can't say the word."

"Just try," I urged.

He lowered his face again, and I saw his moustache quiver.

"Is it 'Heaven's Comfort'?" I asked gently.

He Wrote it Down

He shook his head and his nostrils twitched with distress.

"Is it worse?" I asked.

"Much worse," the foreman replied.

"Does it imply disapproval of the valve?"

"Grave disapproval," he answered.

"A term of abuse?" I hinted.

"A term of grave abuse."

"Tell me."

His head hung again.

"I cannot say the word. I am a family man."

"You must really tell me," I said. "WIRELESS CONSTRUCTOR readers will want to know it. They may want to use it when writing to me. Take a deep breath."

He took one, but it came out as a deep sigh. He drew his hand across his moustache, then flung his head back and said defiantly: "I'll write it."

He wrote a simple duosyllable of very ancient Saxon origin. Alfred the Great used it to describe the marauding Danes. Alfred the Great himself was called one by the lady whose cakes he burnt.

I left Cozda's works, crying softly.

J. S.-T.

POINTS FOR PURCHASERS

Jottings concerning the latest trade tendencies.

As the Radio Exhibition Number of THE WIRELESS CONSTRUCTOR is filled with good points for purchasers. I do not propose to particularise here the various new lines, etc., available.

* * *

Fortunately this is not to be one of those "mad" years, when everybody goes "moving-coil mad," or "super-het mad" or "Class B mad," or whatever the fashion of the moment may be.

* * *

Contrary to what has often been stated, there is a special liveliness about the new components this year, so those who had half believed that the made-up sets would get it all their own way should keep a watchful eye on what the component firms are offering as counter-attractions.

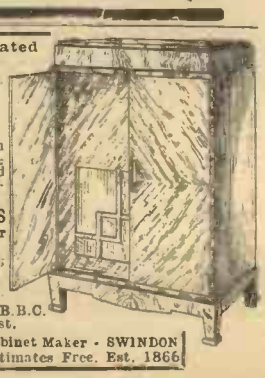
* * *

In some instances components are so improved that a whole new range will be available from one firm—I believe that Telsen's, for example, have made radical changes of this kind in their new season's productions. And when nationally-popular components give way to new designs we can be sure that the manufacturer's faith in the newcomers must be overwhelming, to justify such a change.

* * *

Tuning improvements, also, should be specially attractive this year. Firms like "Formo" are coming out with iron-cored coils and tuning packs, which were simply unthinkable in point of efficiency as recently as eighteen months ago. (Do you remember when we all went "Formodenser-mad"? It was one of the "crazes" that was too well-founded to die, and I see they are turning them out in improved form for the coming season.)

Some of the new ganged condensers, too, are sheer winners. P.R.B.



S.T. SUPER-GRAM DE LUXE

—*continued from page* 202.

amplifier valve; this results in gramophone reproduction without any trace of background from radio signals.

Adjusting and Operating the Super-Gram

The adjustment of the receiver involves ganging the first three circuits which are of signal frequency. The six I.F. circuits are adjusted by their trimmers until they are "in gang."

The ganging of the oscillator section of the condenser is a simple matter and is carried out on a station at the bottom of the medium waveband, e.g. Fécamp. When the station is heard at its best the oscillator condenser section trimmer is adjusted to the loudest results.

The operation of the set is, of course, simplicity itself. There is only one knob to turn and the volume control needs no explanation. When first tuning in stations it is advisable to keep the volume at medium strength rather than "full-out."

The A.V.C. control at the back of the panel of the radio chassis is usually set at first so that the local station gives full volume. Tone is a matter of taste and the tone control will be useful on occasion for cutting down high note interference.

Ample Wave-Range

The wave-range of the set is ample and both Fécamp and Budapest are on the dial. The selectivity of the set can be made much greater than normal since the coupling of each I.F. transformer can be greatly lessened. This is a very great advantage. With nine tuned circuits the owner of this set is very well insured against any interference trouble. He has, moreover, in the I.F. coils, ample reserves.

Further operating notes will be given next month and no reader who builds or buys this radiogram should miss next month's issue.

J. S.-T.

LOUDSPEAKERS THAT SPEAK LOUDER!

—*continued from page* 210.

Incidentally, another attractive item connected with the Blue Spot "Star" speaker is the special remote control unit which costs only 10s. 6d. This permits of the loudspeaker being switched on and off as well as the volume being controlled at a distance.

Those who are interested in dual speakers, namely instruments which

are in effect two speakers mounted together, each having different characteristics and cone size so as to ensure proper reproduction of all frequencies, will be attracted by the Celestion model S.29 at £5 15s.

Indicative of the present trend of making radio apparatus attractive from an appearance point of view is the cellulosing of loudspeakers, particularly noticeable this year. The Celestion range is in an attractive shade of brown, while the Magnavox speaker chassis are finished in grey.

The new loudspeaker models are among the most attractive exhibits at the Exhibition, and it must be appreciated that here we have been able to deal only with some of the outstanding ones. British Rola, H.M.V., R. & A., etc., are all showing new and interesting lines which are worthy of your attention when you visit the show.

VICTOR KING TAKES YOU BEHIND THE PANEL

—*continued from page* 214.

is, in effect, two valves in one, but no two ordinary valves could do the same work. You can think of the two valves as being respectively an oscillator and a first detector. But they share the same electron stream and the "mixing is accomplished in this.

I must not forget to say a few words about radiograms. These were novelties a little while ago, but they have now almost entirely ousted the mechanical gramophone. That is, comparatively speaking, of course. Many mechanical gramophones are still sold I believe, but whereas their sales at one time were in excess of those of wireless sets there are probably now many more radiograms than "mechanicals" sold.

In the Forefront

It is entirely fitting that one of the finest radiograms produced bears the familiar trademark of a dog listening to "His Master's Voice." I think the H.M.V. Superhet Five-Four-Two Auto-Radiogram is a grand piece of work.

Electrical interference has been tackled in an efficient and workmanlike way by K.B. But probably you have already heard about the K.B. Rejectostat system, for it has been widely discussed for some months now.

The K.B. "Universal" 5-valve Superhet embodies sockets enabling the Rejectostat system to be brought in if desired. A strong attraction.

INDEX TO ADVERTISERS

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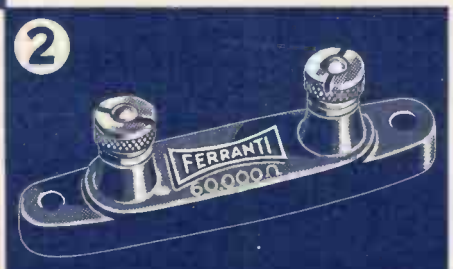
OLD FRIENDS AND NEW.....

AT OLYMPIA

At Stand No. 70 you will see some old friends. The AF3 and AF5 will be there for instance, because after years of service, these transformers have proved their title to supremacy. But the many new friends will prove to be of interest to the Radio man whose watchword is "Quality." The AF9cs; the new Resistances; the Volume controls; the Electrolytic Condensers, and above all, the comprehensive range of Ferranti Valves. The new season's range of constructor's sets alone is worthy of the closest inspection. A display of Radio at its very best. A Wireless Exhibition in itself.

1 **TRANSFORMERS**

which make any set a better set. The AF5 illustrated here, price 30/- is the choice of engineers and musicians—specified wherever high amplification and nearly perfect reproduction are essential. (Ratio 1/3.5, Inductance 260/80 henrys, 0/10 m/A).



2 **FERRANTI NEW RESISTANCES**
Types G·5, GH·5, G·1 and GH·1

Accurate to within 5% of their rated values, non-varying and maintaining the stated value even when working at full rate for long periods. Inductance and capacity negligible. From 300 ohms to 2 megohms. Price 1/- and 1/6 each. Without holder 6d. each less.

4 **THE HEPTODE**

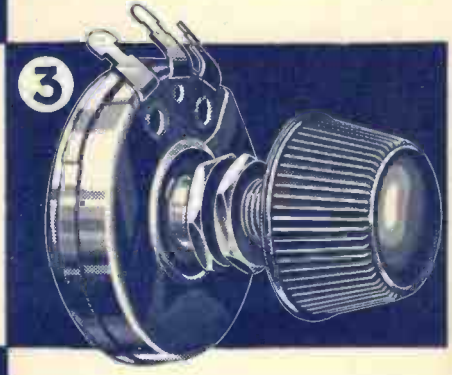
The Ferranti VHT4 combines in one valve the function of both oscillator and modulator, and, in addition, is a variable Mu type, enabling full A.V.C. to be obtained in sets with only one I.F. stage. Price 20/-

2-volt Battery Heptode VHT2 also available Price 18/6

3 **POTENTIOMETERS**

Ferranti Potentiometers are constant in value and silky in action. Although not usually required to carry appreciable current they will dissipate 0.25 watt continuously. They have a slight negative temperature coefficient. Standard values: 50,000 ohms, 100,000 ohms, 250,000 ohms, 500,000 ohms, 1 megohm.

Type P with knob as illustrated, Price 3/9
Type PS with knob and mains switch 4/6
Logarithmically graded types, 1/- each extra.



5 **CONDENSERS**

Ferranti (the lowest price quality condensers on the market) are made with extreme care to work efficiently and without possibility of breakdown. They are designed and made by engineers whose experience includes the building of condensers for working pressures of more than 1,000,000 volts. Prices from 1/-

STAND No. 70

M.1. SUPER SPEAKER

After being unsurpassed for years the M.1. speaker is now available in a still better form. A new suspension better and freer than before and a remarkable magnet of aluminium steel with a gap half-inch deep, are now incorporated.

FERRANTI

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