

# The Wireless <sup>6d</sup> Constructor

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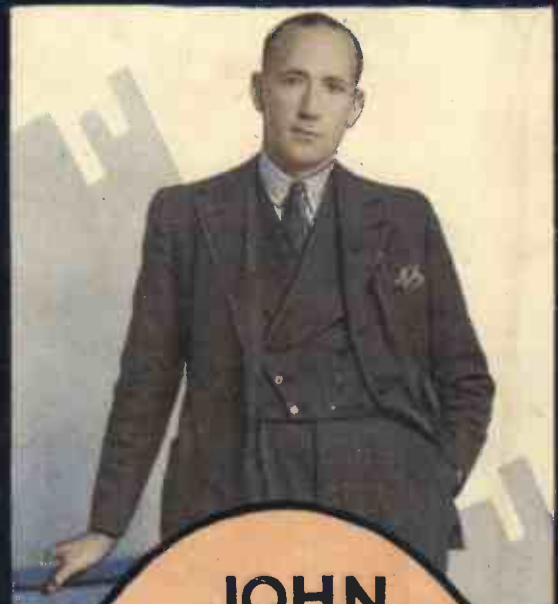
No. 84.

**HOW TO MAKE**

**" A  
CLASS B  
CONSOLETTA "**



*by*  
**VICTOR KING**



**JOHN  
SCOTT-TAGGART**  
*Contributes*

**" QUESTIONS I AM ASKED "**

— Practical replies to readers' queries —  
and

**" FROM MY ARMCHAIR "**

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SOME NOVEL LOUDSPEAKER  
DEVELOPMENTS**

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

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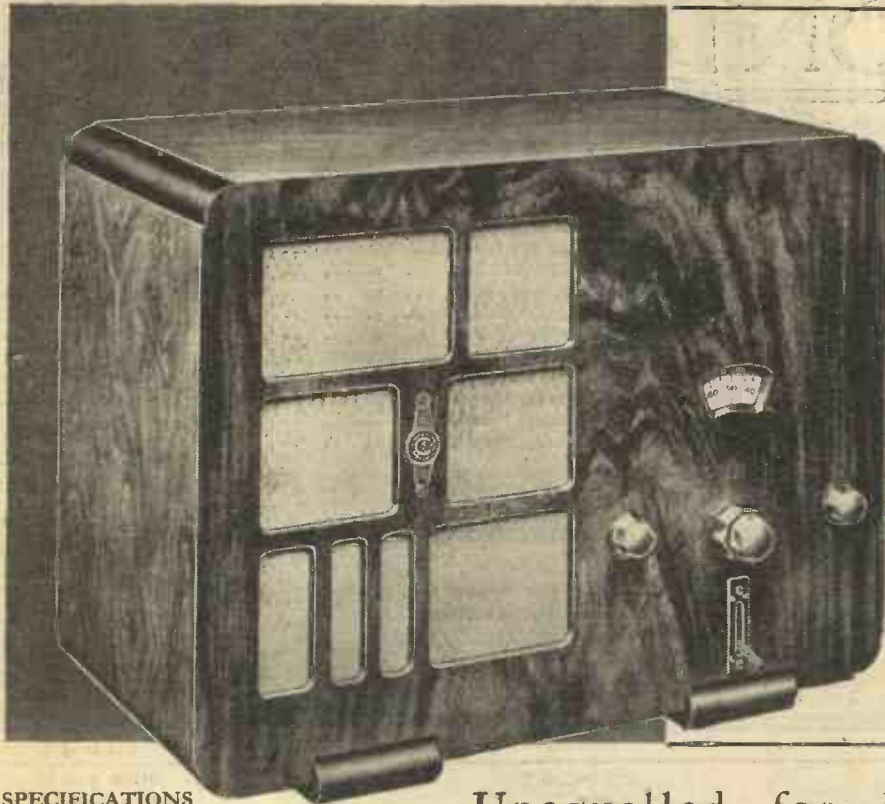
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SCREENED GRID  
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MAINS POWER OUTPUT

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To A. C. Cossor Ltd., Melody Dept., Highbury Grove, London, N.5.

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- \*Battery Model 342
- \*Battery Model 344 (Class "B")
- \*All-Electric Model 347

*\*Strike out those not required.*

Name .....

Address .....

W.C. 10/33 .....

# The WIRELESS CONSTRUCTOR

## The EDITOR'S CHAT

### Home-Constructor Efficiency With Commercial Appearances—Important Television Discovery

**T**HE fact that the "Class B" Console receiver described in this issue of THE WIRELESS CONSTRUCTOR has been designed by our distinguished contributor, Mr. Victor King, is sufficient guarantee that here the reader has a set of first-class efficiency.

As usual, Mr. King has succeeded in introducing many varied attractions into his design. For example, the "Class B" Console employs a design of console cabinet which has definite advantages over the conventional console type.

Normally, the receiver is of an attractive all-in design, but you will notice that the loudspeaker is instantly removable in its own cabinet, thus leaving a neatly-finished complete receiver intact. Furthermore, the loudspeaker can be used as part of the set, or in any desired position in the same room as the set; or elsewhere at the remote end of extension leads running from the output terminals.

Mr. King has chosen a circuit based on a modern det. and 2 L.F. arrangement, but one capable of dealing with the difficult present-day ether conditions. And, as the name indicates, Mr. King's design has "Class B" output, and is thus enabled to give high-power reproduction of a number of stations without loss of real programme quality.

We feel confident readers will agree that Mr. King has succeeded in introducing an entirely desirable battery receiver; one easy to construct, and yet every bit as handsome as a commercially-made instrument and, more important still, backed by the technical reputation of Victor King.

#### Important Television Discovery

Some weeks ago there were interesting but rather scanty newspaper reports of an important discovery in

connection with television made by Dr. Vladimir K. Zworykin of the R.C.A. Victor Research Laboratories in America. We have now succeeded in obtaining some further details, and it appears that Dr. Zworykin has invented a secret method of depositing three million photo-sensitive elements on a four-inch square of mica, and has thus founded a new television transmission system.

**WORTH £2,000!**



*To illustrate vividly the amount of silver and gold used in one year for their radio set switch contacts, H.M.V. have been exhibiting the above bars of the precious metals. Silver is the best conductor of electricity obtainable, and gold prevents oxidation.*

Dr. Zworykin's method does not involve the use of any mechanically-moving parts, but he has succeeded in transmitting televised images up to 250 lines to the inch. This works out at 62,500 picture elements to the square inch, while the most that can be obtained to-day with the average scanning disc is about 50 lines of 2,500 picture elements.

#### Like the Human Eye

The newspapers were not far wrong in likening this new system to the human eye. For the purpose of analogy, it might be said that the image of the object seen is focussed through a lens on to the retina in which are millions of rods and cones. In the eye, these rods and cones are linked up with the brain by a number of minute nerves, and it is in the brain that the image, as we see it, is registered.

It appears that in the Zworykin system of television the mica plate, with its three million photo-sensitive elements, corresponds—as near as is necessary for the purpose of this analogy—with the retina of the eye with its rods and cones; and this sensitised mica plate is swept or scanned by an electron beam moving at an extremely rapid velocity. The beam in this case corresponding to the optic nerves. It serves to conduct the vision from the sensitive surface to the transmitting amplifiers, from which it is sent to the receiver and there reproduced.

Dr. Zworykin uses a modified form of cathode ray tube, which he calls the Iconoscope. The tube is rather like a large flask with a long glass neck and a bulbous glass container.

It is in the bulbous portion of the tube that the four-inch square of mica is situated, in such a position that an image may be focussed upon it through the glass of the tube.

#### Controlled by Coils

An electron stream is discharged from the neck of the tube, the discharge being controlled by four coils mounted on a frame and placed outside the tube. When the correct alternating currents from the tube

*(Please turn to page 314)*

# THE MONTH ON



The latest happenings in this fascinating waveband.

I AM reluctant to have to admit this month that I have been virtually "on strike." The combined counter attractions of a radio exhibition and (wonder of wonders) a heat wave have proved too much for me.

The lapse from the short-wave game on account of the show is, perhaps, forgivable, but as for heat waves and holidays, well, I suppose even short-wave fans are human!

### Finding New Interest

After all, while it is comforting to know that thanks to short waves one can listen, for instance, to Madeira, I found that it offered little consolation when, on one occasion during the past month, I went through the "agonies" of seeing off a party of my friends who were actually bound for that Atlantic paradise.

But it had its reactions in another

way, for I have now suddenly taken a violent interest in short-wave television! I am afraid that I cannot tell you very much about it as yet, but I am living in hopes.

In the absence of anything really startling in the way of news during the past four weeks (no, I haven't neglected the short-wave bands entirely!) an excellent opportunity presents itself for me to delve down into my correspondence file.

Here goes, then.

M. B. (London, S.E.) and others are interested in the tremendously strong signals which are at present being put out by F.Y.A., and ask for further details. F.Y.A. is the Radio Colonial station in Paris. It can be heard most evenings from 9-11 p.m. and from midnight to 5 a.m. on 25.63 metres. The power used is 15 kw.

V. G. W. (Cheshire) asks whether

the CONSTRUCTOR H.M. tests are concluded for good. The answer is definitely no!

They have been temporarily suspended only for the summer months, and will in all probability be resumed in the very next issue. Incidentally the opinions of others would be welcomed upon the desirability of renewing our popular tests.

My special thanks to J. M. G. (Cardiff) for a most interesting letter. My records associate the call-sign of G M B J with the Canadian Pacific liner, "Empress of Britain." Can you give any further details, J. M. G.?

### Tracing a Station

Still another query. R. M. (Aberdeen) is in doubt concerning the wavelengths of four of our own Empire transmitters. The details you require, R. M., are as follows: G S G works on 16.86 metres, G S F on 19.82 metres, G S D on 25.53 metres, and G S B on 31.55 metres.

F. R. (Falmouth) is anxious to trace the identity of a station just below 20 metres that gives a news bulletin in English at approximately 3 p.m. almost daily. From your details, F. R., I rather think that the station is D J B (Zeesen) on 19.73 metres.

If it is the station I suggest, news bulletins in German and Spanish will also be radiated either before or after the English one.

G. T. K.

TOPPING up accumulators is always a bit of a fiddling job—unless you have one of the gadgets I came across the other day.

Don't ask me where you can get one, for I have been unable to find out, so far. But perhaps some reader may know the makers, when I should be glad of a line from him.

### A One-Handed Job

The filler is fitted to a cork and has a semi-flexible tube about five inches long, on the end of which is a valve that operates when a slight pressure is applied.

So one just tips the bottle upside down, inserts the tube in the accumulator filler and as soon as the end of it touches the tops of the plates (or spray baffle) the water flows. A simple one-handed job!

### Cells in Parallel

Having seen the recommendation to connect two accumulators in parallel to increase the capacity, a constructor will sometimes do the same with dry cells or batteries. It is naturally rather puzzling for

\*\*\*\*\*  
 \* "ON THE GRID" \*  
 \* Easy topping up for accumulators— \*  
 \* Batteries in parallel—Waiting for \*  
 \* the set to stop. \*  
 \*\*\*\*\*

him to be told later by an expert that this is a bad practice with dry batteries.

It is entirely a matter of voltage. If the voltage of two dry batteries is exactly the same and if it would remain exactly the same under working conditions, then they could be used in parallel with perfect satisfaction.

### Equalising Voltages

In practice, the voltage of one is bound to be at least a little higher than the other and so current will flow until the voltages are the same. This state of affairs is bound to run the batteries down quicker than if they were used separately.

The voltages of accumulators are always near enough equal under working conditions. And in any case, current from one accumulator

through the other would merely tend to charge up the latter.

### Intermittent Faults

I once heard of a case such as this. The receiver was an all-mains set and stopped working one night, so the owner returned it to the suppliers to be put right.

He was surprised to get it back almost immediately with a note to say there was nothing at all wrong. It worked all right for another four or five days and then stopped again.

This time he took it back personally. The suppliers put it on test while he was there and again it worked properly.

The owner refused to take it back, explaining the circumstances. So an agreement was reached to put the set under observation.

After having it running continuously for three or four days it stopped again. The experts immediately "jumped at it," and a few tests soon revealed a faulty valve. It was certainly a good job the owner was not one of those impatient people who expect such jobs to be executed in an hour or two!

A. S. C.

# HOW TO MAKE A "CLASS B" CONSOLETTA

THE ordinary type of consolette receiver soon lost its novelty after the introduction of the first sets using this method of construction. The reason for the new layout becoming so popular was undoubtedly the great advantages that it could boast over the style then in vogue.

The consolette receiver, with its built-in speaker and self-contained batteries, seemed ideal after the usual conglomeration of external connecting wires. So much has this aspect obtruded itself, that little thought has been given to the possibilities of improving on the standard consolette cabinet.

## Novel Design

And therein lies the reason for my referring at the commencement of this description, to the "ordinary" type of consolette receiver. The "Class B" Consolette is by no means ordinary in cabinet design, or circuit—in fact, it is extraordinary in many ways.

To start with, the biggest drawback to the usual consolette receiver has been entirely overcome. I doubt if it is necessary for me to state the nature of that drawback, but I will do so in case there are a few differing opinions on the subject.

The loudspeaker cannot be used in a room remote from the set, nor can it be moved about even in the same room as the set. Also, this difficulty is not easily overcome with an additional loudspeaker because impedance-matching or, alternatively, connection-changing "snags" arise.

## An Attractive Feature

Even close inspection of the "Class B" Consolette does not reveal anything unusual in its construction. It appears to be just an attractive consolette receiver.

But actually, the loudspeaker may be lifted bodily off the receiver part, giving two entirely separate but quite pleasingly-finished units—the set and the speaker. The speaker may be used in any part of the room, or at the distant end of extension leads.

I must not, however, dwell longer on the general design, for the circuit—



By VICTOR KING.

*Something new in consolette design! An attractive "all-in" set that can be instantly transformed into two completely independent units—loudspeaker and receiver.*

*This unique instrument is especially easy to build and will give you economically-provided, full-volume programmes from its "Class B" output stage.*



## UNIT CONSTRUCTION

*The receiver is provided with a separate section for the batteries above the valves and other components. Fitting on top is the loudspeaker, which can be lifted off in the manner illustrated by the photograph at the top of the page.*

the vital part of any set—is quite as worthy of our attention.

In view of the special speaker innovation, the circuit has been chosen more for the good reception of nearer stations, for their programme value, than for distance listening. And to ensure adequate volume for this purpose, with economy, "Class B" amplification is adopted.

In view of modern ether conditions you may be surprised to see that the circuit does not employ any H.F. amplification. But this seeming reversion to old ideas is explained by the efficient coil and the avowed purpose of the receiver.

## Tuning Efficiency

The dual range coil is a Ferrocart iron-cored coil, and permits the necessary degree of selectivity on both bands without passing too weak impulses to the detector, an important point with detector-L.F. types of receivers. In order to aid the coil in its functions of providing selectivity and efficiency, the grid of the detector valve is tapped down from the end of the tuned coil, thus reducing the possible damping effects of this first valve.

Grid rectification is used, and an interesting reaction circuit. The main feature of this latter is that the input, or aerial winding, acts also as the reaction coil.

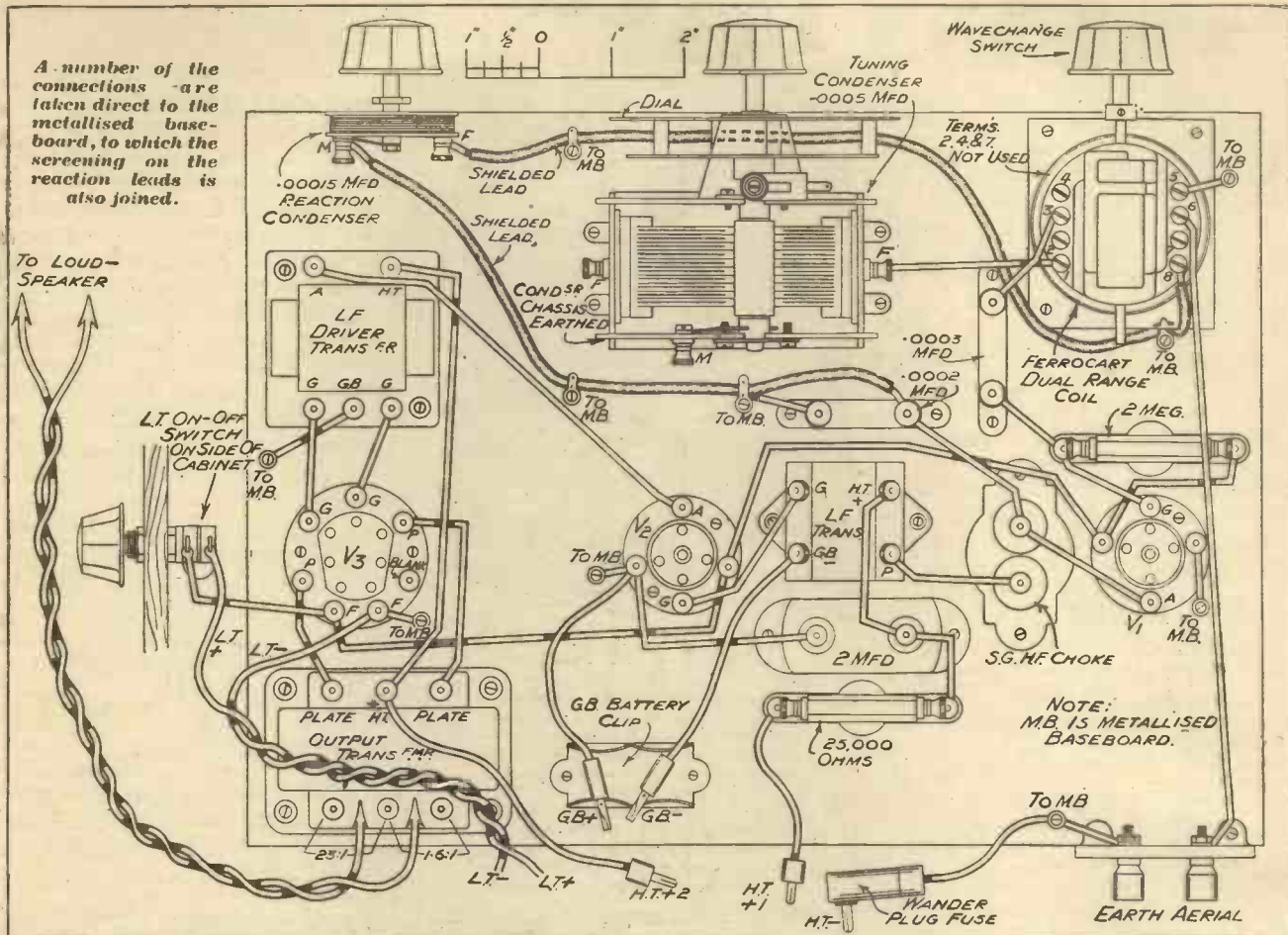
The reducing of the aerial winding for medium waves by shorting a section of it at the same time cuts down the size of reaction coil in use. Critical readers who carefully examine the theoretical circuit in conjunction with the wiring diagram may be inclined to raise the point that the moving vanes of the reaction condenser go to the plate.

## A Reaction Point

Since the reaction condenser is on the anode side of the reaction circuit, both sets of vanes are at H.F. potential, and it is immaterial which way round the component is connected. In any case no hand capacity effects are present in the set, and there is no reason why the connections should not be the other way round if you particularly wish to be conventional.

Both the low-frequency stages, one of which is the driver stage for

# How to Make a "Class B" Console—continued



A number of the connections are taken direct to the metallised base-board, to which the screening on the reaction leads is also joined.

the "Class B" output, are transformer coupled, and the detector valve is carefully decoupled to obviate any risk of instability due to "feedback" effects in the H.T. supply circuit.

A metallised baseboard is used, and the leads to the reaction condenser are screened by their metallised

insulating cover; this feature being indicated by dotted lines on the theoretical diagram.

Only the first L.F. stage requires grid bias, which is entirely dispensed with in the case of the "Class B" stage. A small 4½-volt battery is sufficient for the job.

A tapped transformer is used in the

output circuit of the last valve, different ratios thus being available. A tapped transformer on the loud-speaker itself makes a useful range of overall ratios available by various combinations of the terminals on the two transformers.

A fuse in the negative H.T. lead provides a degree of security against

## A GUIDE TO THE PARTS FOR BUILDING THIS FINE CONSOLE

Component	Make used by Designer	Alternative makes of suitable specification recommended by Designer	Component	Make used by Designer	Alternative makes of suitable specification recommended by Designer
1 cabinet for set and speaker	C.A.C.	Peto-Scott	1 "Class B" output transformer	Ferranti OPM17c	—
1 -0005-mfd. tuning condenser and dial	Telsen	—	1 rotary on-off switch	Bulgin S.91 L.B.	—
1 -00015-mfd. reaction condenser	Telsen	Bulgin, Lissen, Polar, British Radiogram	2 four-pin valve holders	W.B.	Benjamin, Telsen, Lissen
1 2-mfd. fixed condenser	Lissen	Dubilier, Telsen, T.C.C.	1 seven-pin valve holder	Wearite	W.B., Benjamin, Ferranti
1 -0003-mfd. fixed condenser	T.C.C. type 34	Telsen, Dubilier	1 Metaplex baseboard 14 in. x 10 in.	Peto-Scott	—
1 -0002-mfd. fixed condenser	T.C.C. type 34	Telsen, Dubilier	1 terminal block 2 terminals	Sovereign	Belling and Lee, Bulgin
1 2-megohm grid leak and horizontal holder	Graham Farish "Ohmite"	Dubilier 1 watt and Dumetohm holder	4 plugs	Belling and Lee	Bulgin, Belling and Lee, Igranac
1 25,000-ohm resistance with horizontal holder	Graham Farish "Ohmite"	Dubilier 1 watt and Dumetohm holder	2 accumulator tags	Clix	Igranac, Ealex, Belling and Lee
1 Ferrocart coil	Colvern F5	—	1 wander fuse	Ealex	Clix, Belling and Lee
1 Binocular H.F. choke	Igranac	Telsen, Graham Farish, British Radiogram	4 matching control knobs	Belling and Lee	—
1 L.F. transformer	Varley DP21	Lissen, R.I., Telsen	1 bias battery clip	Bulgin K8	British Radiogram
1 "Class B" input transformer	R.I. type DY.39	Lissen, Varley, Telsen	1 reel of insulated wire	Bulgin No. 2	Goltone
			2 feet screened wire	Radiophone	—
			Flex, screws, etc.	Goltone R43/99	—



## How to Make a "Class B" Consolelette—continued

H.T. shorts, and there are only two H.T.+ tappings to deal with. Flex leads to the appropriate terminals are used for connecting up the batteries.

switch, are fixed direct to the cabinet by flex leads, the switch being on the side (see diagram).

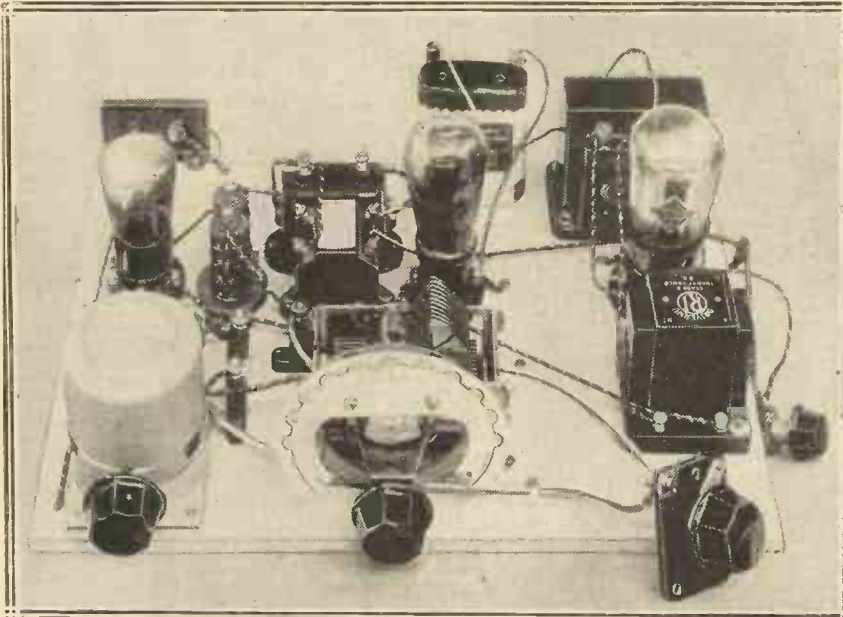
The positions of the holes on the

front of the cabinet for the knob spindles and dial escutcheon are given a special diagram that makes them quite simple to locate. Incidentally, it is worth pointing out that in the wiring diagram the reaction condenser appears as if it is mounted on the baseboard. Do not be confused by this, it is merely shown thus to illustrate its position relative to the other components when the set is completely assembled.

### Simple Wiring

The wiring is simplified by the metallised baseboard. The actual baseboard I employed was one of the Metaplex type, which are spray-treated with a covering very similar to that used for metallising valves.

It is possible to use this coating for making connections just as a sheet of copper foil can be used. You will see from the wiring diagram that a number of wires are joined to the baseboard, and for this purpose ordinary wood screws and washers clamp the



### CAN BE BUILT BY ANYONE

*Even if it is your first set you will be able to make a success of the construction of this "Class B" Consolelette, the inherent simplicity of which is strikingly portrayed in these photographs. And when completed you will have a receiver that will hold its own in appearance and performance with any professionally made instrument.*

For a consolette receiver, the constructional work is unusually simple. Indeed, it is even easier than for an ordinary design because there is no panel to get in the way of the wiring.

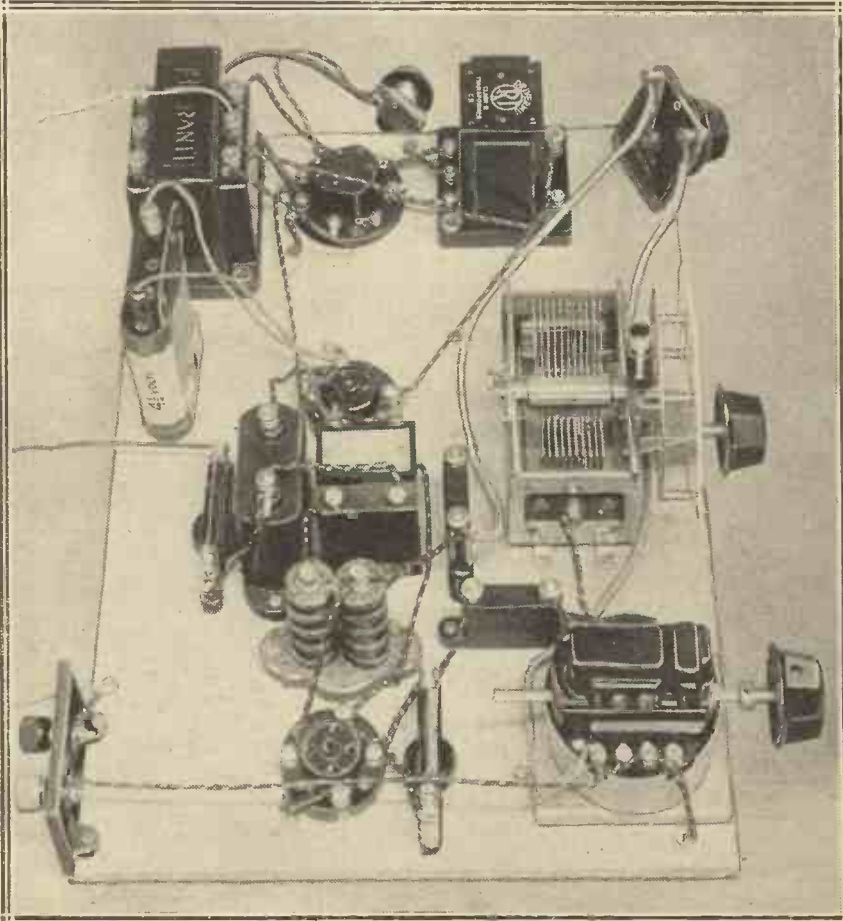
Two of the controls are carried on the baseboard itself. The other two, the reaction condenser and on-off

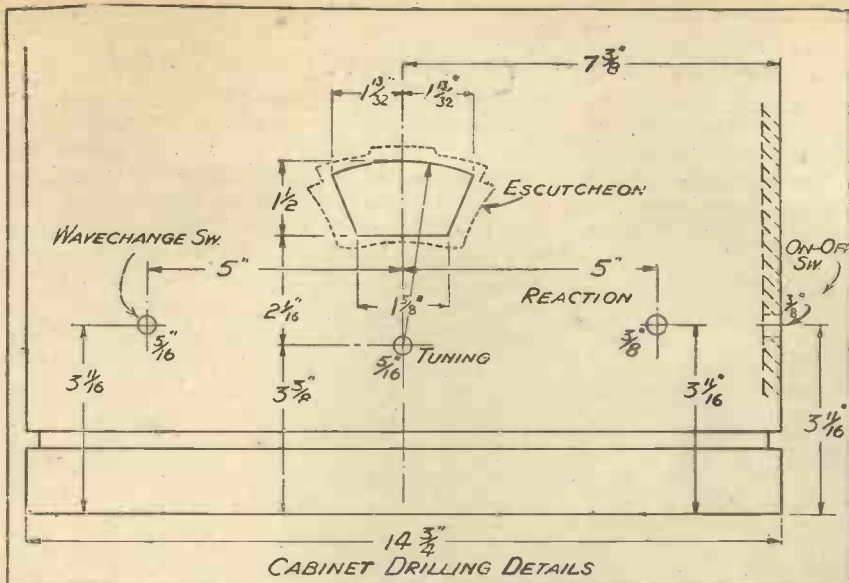
### ACCESSORIES TO USE

**LOUDSPEAKER**—W.B. permanent magnet, Rola, R. and A., Marconiphone, Ferranti, Blue Spot, Celestion, H.M.V., Atlas, G.E.C., Ormond, Epoch, Magnavox, Peto-Scott, etc.

**BATTERIES**—H.T. 120 volts. Ediswan, Marconiphone, Ever Ready, Lissen, Pertrix, Siemens, Drydex, etc.  
L.T. 2 volts. Exide P.C.2, Lissen, Oldham, Block, Pertrix, Ediswan, etc.  
G.B. 4½ volts. Siemens, Lissen, Marconiphone, Ever Ready, Drydex, Pertrix, Ediswan, etc.

**AERIAL AND EARTH EQUIPMENT**—Goltone "Akrite," Electron "Superial," Graham Farish "Filt" earthing device, Radiophone "Receptru" down-lead, Bulgin lightning switch.





cabinets for the flex lead joining these together. This flex lead should be long enough to meet the requirements of the room in which the set is to be used.

Should the speaker sometimes be wanted at the remote ends of long, permanent extension leads, then it is a good idea to mount two terminals on the back of the speaker and two on the back of the set. These can then be joined by a short length of flex when the extension wires are not in use.

**Dial Light Wiring**

A flat type of celluloid accumulator is specified for this receiver, whose compact nature and separate battery section do not permit of one of the more common glass ones being utilised.

Some people consider a dial light rather an unnecessary luxury on a battery receiver because of the extra

The general arrangement of the Consolette is clearly depicted by the sketch on the right, in which the cabinet and battery shelf are shown cut away to reveal the components. The flex lead joining the speaker and output transformer may, in practice, be of any length desired. The dimensions of the holes for the controls and escutcheon are given in the drilling diagram above.

ends of the wires into contact with the metal coating.

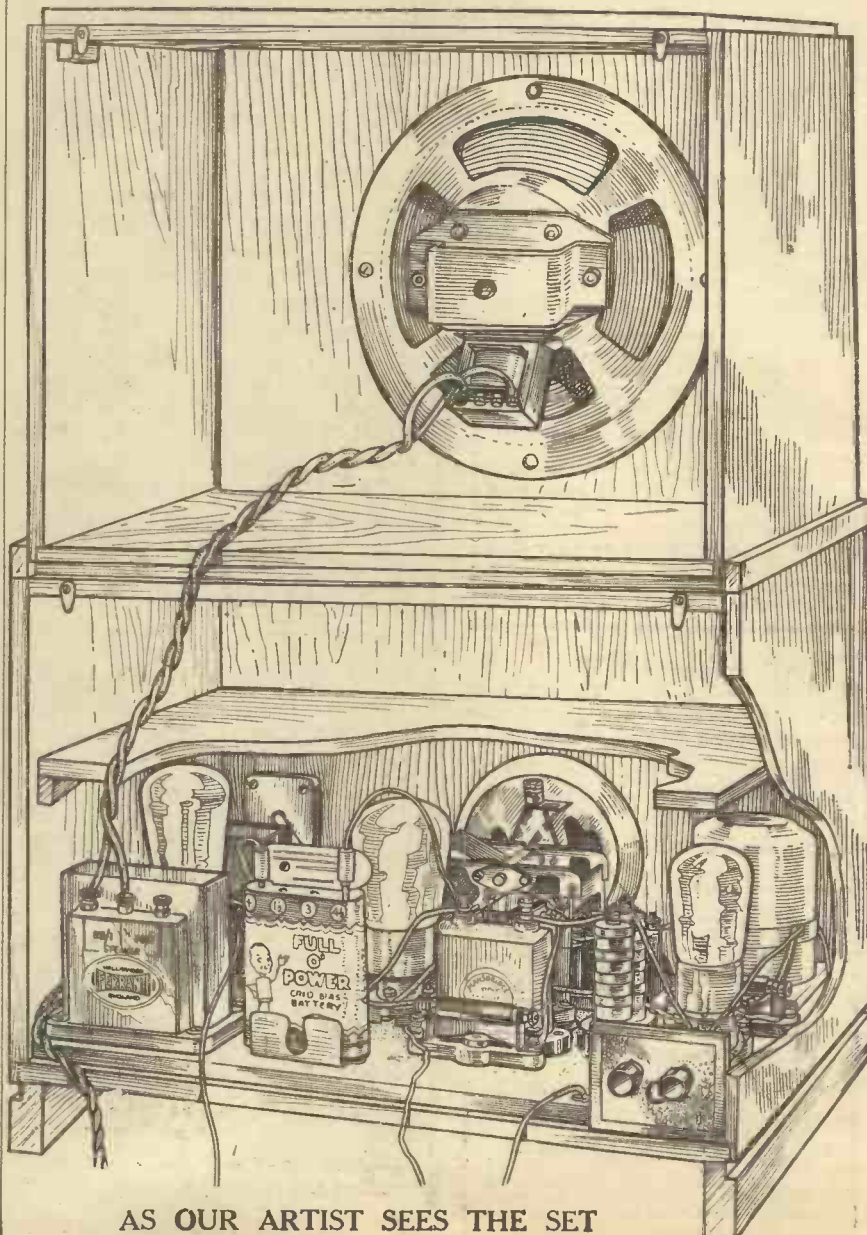
The screened leads are also earthed to the metallising by means of screws and soldering tags, the latter overlapping the armoured casing. The frame and, therefore, moving vanes of the .0005-mfd. variable condenser are earthed by being held against the metal baseboard covering by the fixing screws of the condenser.

**The Output Valve Holder**

When you come to wire up the 7-pin valve holder that takes the "Class B" valve, make sure the sockets on it are orientated exactly as on the wiring diagram. You will then be sure of making all the connections properly.

The shelf on which the batteries are housed will be supplied ready fitted in the cabinet, and the leads to the batteries may be brought up through a small hole or a slot cut near the back edge of this shelf.

Small holes will also be required in the backs of the speaker and set



AS OUR ARTIST SEES THE SET

**SUITABLE VALVES**

Make	Detector	Driver	Output
Cossor ..	210H.F.	220P.A.	240B.
Mullard ..	P.M.I.H.L.	P.M.2A.	—
Mazda ..	H.L.2	P.220	—
Marconi ..	H.L.2	LP.2	—
Osram ..	H.L.2	LP.2	—

## How to Make a "Class B" Console—*continued*

current taken from the L.T. accumulator. For this reason the dial light is not shown wired up.

But it is quite simple to make the necessary connections if they are desired. Both the contacts on the bulb holder are insulated from the condenser frame, so that all that is necessary is a piece of twin flex running to these two connections from the two filament terminals of the driver valve holder. Ordinary connecting wire could, of course, be used in place of the flex.

### The Controls

An ordinary 2.5-volt flash-lamp bulb can be used for the dial light, or a special bulb of lower current consumption. The L.T. switch will automatically switch out the dial light when the set is turned off.

About the operation of the receiver there is really nothing to say. The reaction and tuning controls are

perfectly normal, as also is the on-off switch. The wavechange switch is rotated for changing from one band to the other.

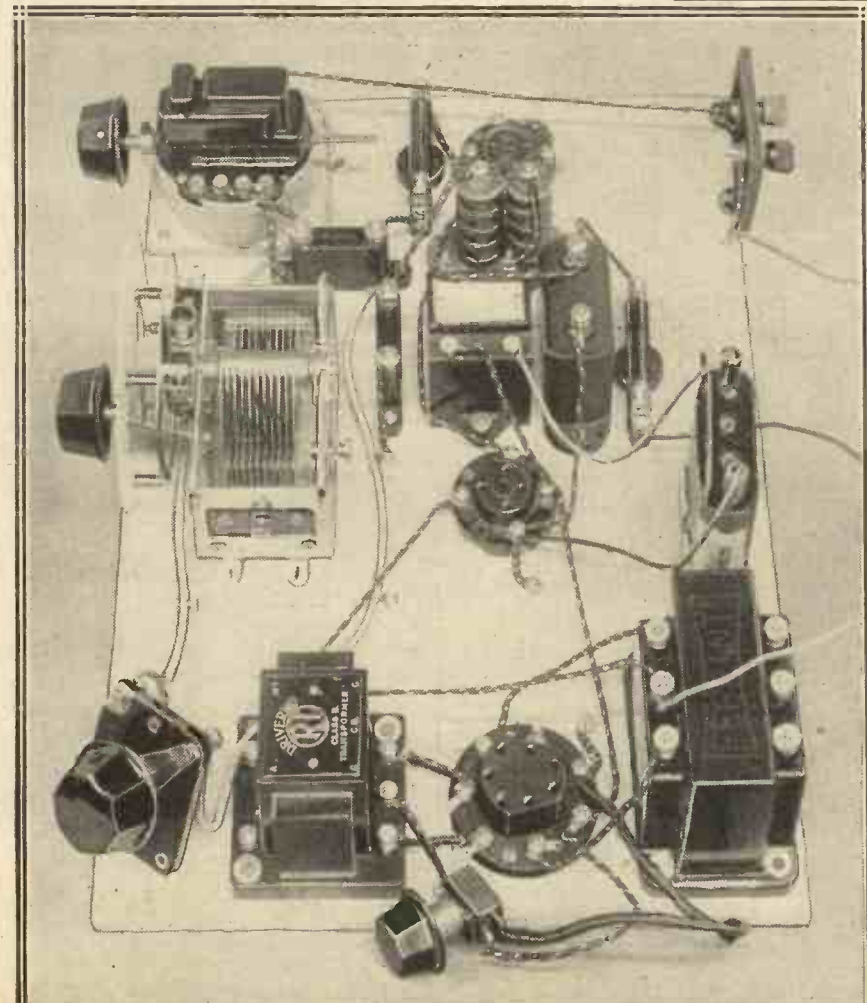
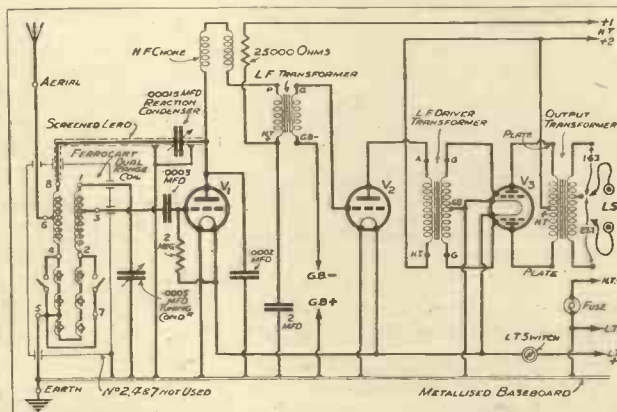
Actually, this switch can be rotated continuously and there are two positions for long waves and two for medium. But no matter which band you are on, if you turn the switch

one "notch" in either direction, you will be on the other band.

It is possible to tell whether the receiver is adjusted for long or for medium waves in the following manner. On the spindle which passes through the dual-range coil and actuates the switch, you will find a flat surface. When this surface is

### AN OLD FAVOURITE IN MODERN FORM

*The circuit is a det. and 2 L.F. in modern guise. The efficient Ferrocart coil and "Class B" output make it a receiver well able to cope with the difficult conditions of present-day reception.*



vertical, the coil is switched to long waves, and when the flat is horizontal the console will pick up medium waves.

With a receiver of this type, it is only natural that some constructors will want to use a pick-up. The addition of this is quite an easy matter and you should proceed as follows:

A single-pole change-over switch is fitted on the side of the cabinet opposite to the on-off switch. Terminals for the pick-up leads can also be mounted on this side of the set, or they can be arranged at the back of the receiver above the aerial and earth terminals.

### Pick-Up Connections

The alterations in the wiring will start with the removal of the lead from the G terminal of the detector valve holder. Fix this lead instead to one of the "outside" contacts of the radiogram switch.

Take the centre switch contact to the G terminal thus freed, and the remaining contact to one pick-up terminal. The other pick-up terminal should go to G.B. neg. 1½ volts. That completes the pick-up fitting.

A volume control will be needed for record work, and it should be connected directly across the pick-up and mounted on the motor-board.



Practical notes on what stations to look for and how to get the foreigners that are coming over well.

**H**AVE you noticed the recent daylight strength of Paris, Poste Parisien? The really keen long-distance listener generally does a little week-end ether-searching in broad daylight, just to see what a set can do under that great disadvantage, and many of those who have happened to tune to 328.2 metres have had a surprise during the past few weeks, when Poste Parisien has appeared at remarkable strength.

Just why a particular station should take it into its head to blossom out like a local, instead of providing the mere thread of sound that the distance leads one to expect, is a question that has been much discussed. But whatever the reason the interesting fact is that such spectacular increases do occur, in daylight, now and again. And we have recently had a remarkably good instance of this from Paris.

On the long waves the chief focal point of interest has been the top of the dial, where the new Radio Kootwyk has been testing. This new Dutchman works on the same wavelength as the Huizen station, 1,875 metres. And incidentally "Huizen" is announcing himself as "Hilversum" until October 1st; so it is when the long wave "Hilversum" programme has closed down, or before it begins, that Kootwyk is to be found.

Reports indicate that this station is going to be a prime favourite with British listeners, the strength being a very notable improvement on anything previously heard from Holland.

Considerable disappointment has been expressed at the situation on 1,153.8 metres, near the bottom of the long-wave dial. The new Kalundborg station, eagerly looked forward to, has been heterodyned by the new Swiss long-waver, Monte Ceneri, on

the same dial-reading, and it seems a thousand pities that two interesting programmes should cancel themselves out in this manner. (Incidentally, the Swiss announcer is a lady, who speaks in Italian.)

On medium waves there is now a galaxy of good programmes to choose from after dark, and now that the longer evenings are with us it is surprising to note how well and how early some of the distant stations can be picked up.

In this connection it is worth mentioning that even serious earth and aerial faults may go unsuspected because many foreigners will find their way over what would at one time have been insuperable barriers of bad contact. So if you have been a little careless in your autumn overhaul, don't forget that now is the time to give the aerial and earth connections the once-over for the winter.

Any time and trouble now involved will be repaid a thousand-fold by the improved reception which will result.

And having attended to that, just tune carefully down from Vienna and Budapest at the top of the dial to Fécamp, Nürnberg, and the rest of them near the bottom. You will find that the whole range bristles with interesting "possibles," and there is promise of a winter's entertainment by ether such as we have never before experienced.

**L**ARGELY as a result of inquiries received at the recent Radio Exhibitions a great many manufacturers have been asking themselves whether they have not been neglecting a very interesting field by paying so little attention to short waves.

That reproach cannot be levelled against the Igranic Electric Co., Ltd., whose sets of short-wave coils are justly famed. The new season's price for those ranging from 13.8 to 27.5 metres and from 27 to 78 metres is 12s. 6d.

This firm has also brought out two short-wave adapters, an A.C. model at £6, and a battery model for £4 10s., particulars of which will be supplied on application to 147, Queen Victoria Street, London, E.C.4.

**Reliable Resistances**

Those ingenious colour-coded fixed resistances which were introduced by the Radio Resistor Co. seem to have been almost too successful!

Not in use, of course, for no resistance can ever be too reliable; but in

\*\*\*\*\*  
**POINTS FOR PURCHASERS**  
 Interesting details from manufacturers about recent trade activities.  
 \*\*\*\*\*

practice the excellent scheme, by means of which the resistance value is identified, has been copied in such a way that purchasers have been misled into thinking they had a genuine "Erie" Radio Resistor, when, as a matter of fact, they hadn't.

So note that the genuine product of this firm has a neat little printed label round it, clearly stating "Erie Resistor," number of ohms, colour code, and rating in watts, and is marked "Radio Resistor."

**The "S.T.400"**

This famous set is still finding new admirers, and many would-be builders of the "S.T.400," having read Mr. Scott-Taggart's advice about getting the correct parts for the new set, do not realise that these are automatically

obtained if they purchase an Author's Kit of specified parts.

Full details of these kits can be obtained from the Peto-Scott Co., Ltd., 77, City Road, E.C.1, and attractive easy terms are available for those who prefer to spread the payments out whilst the set is actually "delivering the goods" in the home.

**Condenser Progress**

Michael Faraday, the father of the farad, was probably the most farsighted experimenter who ever connected up a condenser, but even he would have been astonished at the condenser developments which have recently taken place.

It seems almost incredible, for instance, to see from a T.C.C. catalogue that an 8-mfd. dry electrolytic condenser can be obtained for a mere 6s. 6d.

Incidentally, when buying condensers, don't forget to give the whole catalogue a good look over. Many people still put up with a this-will-do-nicely type, when for the asking they might just as easily have one of the made-for-the-job class.



**D**o you ever experiment and find the programme, or a snatch of it, so appeals to you that momentarily you have to stop work and listen? Recently, I was told we were to have a talk on "The glow-worm, cuckoo-spit and silver-fish."

With half-contemptuous amusement I listened and found it all quite interesting. The glow-worm is a small brown flying beetle which gives forth a faint green light. The female glow-worm is a grub and does not fly at all. It shines much more brightly than the male, and hangs about in conspicuous places like tops of bushes where the males can readily find it.

**An L.F. Glow**

The glow from a glow-worm is not steady but flashes in and out at the rate of eighty to a hundred times per second—quite L.F. in fact. The female glow-worm glows much more brightly when surrounded by several males.

**A TALK ON CUCKOO-SPIT**



"Bubbles are thus formed and the cuckoo-spit spends the best years of its life in the resultant lather."

Now for the cuckoo-spit. It has nothing whatever to do with the cuckoo except that this greenish yellow creature hatches out in May. It crawls up a grass shoot sucking the succulent stem to extract the sap.

This passes through its body and ends up as a liquid bath surrounding the darling little insect, which proceeds to blow air out of the various breathing holes in its body. Bubbles are

*The famous armchair seems to have been particularly inspiring this month, and Mr. Scott-Taggart deals in these pages with an exceptionally wide diversity of radio topics. His inimitable style has made these monthly notes the most popular feature of its kind in the world.*

thus formed and the cuckoo-spit spends the best years of its life in the resultant lather.

Later on it grows long back legs for hopping purposes and wings for flying.

The third insect in the B.B.C. talk—the silver-fish—is altogether too disgusting a creature to describe to anyone but schools.

\* \* \*

This subject reminds me of the inductance weevil which at this season is causing havoc in many wireless sets. The insect was first

identified in Shropshire where so many L.F. transformers went "dis" that an investigation was made.

It was found that the cause of the trouble was the inductance weevil, a microscopic insect more like a germ, which lives chiefly on a diet of copper with shellac as a savoury. Ordinary copper does not appear to be attacked, but when wound into a coil becomes irresistible to this new pest.

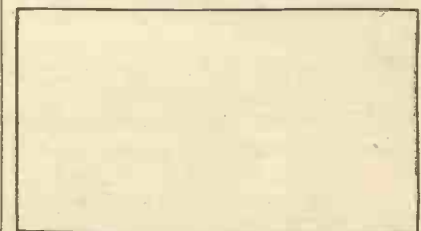
**Causes Dry Joints**

Ordinary tuning coils are subject to the ravages of the inductance weevil and many dry joints are caused by it. Although the trouble was first noticed in Shropshire, many other districts, notably Ilford and Burnley, have suffered.

The best way to exterminate the inductance weevil is to syringe all coils with a nicotine solution.

Much trouble is also being experienced just now with the condenser moth, about which I shall have more to say next month.

**MAGNIFIED 5,000,000 TIMES**



In the above is an illustration (magnified five million times) of the inductance weevil. If you have difficulty in seeing it, this simply proves the extremely small size of this virulent pest.

## From My Armchair—continued

Odd remembrance item: The first regular publication of foreign programmes was on March 4th, 1925, when I published "The Foreign Radio Times" as a supplement to a weekly wireless paper of which I was editor.

The foreign programme supplement paved the way for the B.B.C.'s own separate journal.

### CAPTAIN PLUGGE



"... but we are still friends," says S.-T.

The supplement consisted of four pages prepared by Capt. Plugge, who knew more about foreign radio than anyone in this country. I paid his organisation £20 per week for the information.

Capt. Plugge still knows more about foreign radio than anyone else. He is the man behind the sponsored programmes from foreign stations, but we are still friends.

Ultra-short waves are nothing startlingly new. I am reminded of this once more by seeing an article in the above-mentioned weekly journal dated December 31st, 1924. Practical information is given on 5-metre communication.

I wonder how the big infringement action of Marconi's v. Philips is going to turn out. The case, as I write, has just finished, after about ten day's hearing and a cost of about £40,000.

Curiously enough, the bother is all about a patent that is now dead—the reaction patent of 1913. Damages are claimed for past infringement.

This has been a battle between giants, Philips, of course, being, I suppose, the largest electrical and radio manufacturers of Europe.

I am personally specially interested in this case for two reasons: I prepared the case for counsel when the Marconi Company sued the Radio Communication Company, Ltd., for alleged infringement of the same patent and others. It was the great regret of my life that the case never came to a hearing.

Secondly, in the present case, the Philips Company invited me last March 15th, to act as their technical expert and witness in this case with Marconi's. In this, as in other cases, I declined because in view of my radio designing activities, spasmodic patent litigation work is unattractive.

Only when "retained" for a period of years is the concentration, anxiety, strain and study worth while; otherwise it is a distraction—albeit a very well paid one.

I suppose the least technical radio man knows that sounds have "frequencies" and that all musical instruments have a range of frequencies which they radiate or are capable of emitting. The following limits are of fundamentals and/or harmonics which have been observed.

A piano, for example, has a range of from 90 per second to 6,000. A bass saxophone can annoy or charm us with frequencies from 70 to 12,000.

The lowest frequency is 50 from a bass tuba, which has an upper limit of 6,000. Tympani have the narrowest range; 60 to 3,000. The bass drum's limits are 80 to 4,000.

The instrument which has the highest low limit is the piccolo—500 to 12,000.

### Speech Range

Human speech covers an unexpectedly wide range of frequencies, the male voice covering from 100 to 8,000; the female of our species is rather higher pitched in voice, viz., 200 to 10,000.

A wireless receiver has thus to respond very nearly perfectly if the finest results are to be obtained. Actually, 4,000 or 5,000 represents the highest limit in the reproduction from most stations, and most people are well satisfied with this.

Footsteps sound very simple low frequencies, but actually they produce frequencies of from 90 to 12,000! Key jingling is fairly complex, too—700 to 15,000.

The record for complexity goes,

however, to hand-clapping, which produces sounds from as low as 100 to sounds as high as 15,000.

In order to enjoy to the uttermost the applause of the studio claque, you will need an almost perfect set. If, however, the average B.B.C. joke were as good as the average set, no one would complain.

\* \* \*

A doctor of Cornwall tells me that he has persuaded *fourteen different people* to build one of my sets. Messrs. Frencham, Le Frank, and other critics, would probably say it was so that he would have the job of treating the users later for eyestrain, loss of memory, and S.T.400-users' cramp!

Nevertheless, here is a doctor who took his own medicine first—and liked it! I thank him—and all those who have acted likewise.

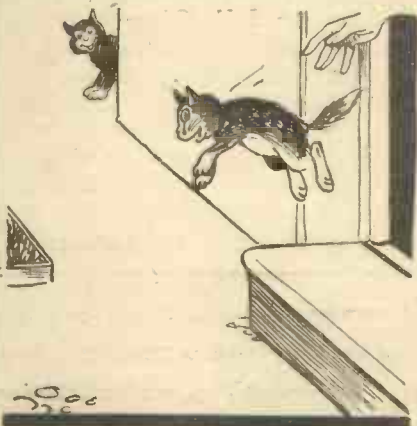
\* \* \*

(Mrs.) Effie Woolaston, of Hull, writes:

"Picking up my grandson's magazine, I was troubled to read about your advice to a reader who heard crackling noises and howls when his neighbour's cat was turned out at night. This matter is very near the heart. It is cruel and utterly unnecessary to put cats out at night, and I wish you would use your influence to have the practice stopped."

I was, I'm afraid, rather under the impression that the cats preferred it.

### SHOULD CATS BE PUT OUT?



A feminine reader is put out because cats are put out.

As for the necessity or otherwise of putting cats out at night, I am afraid I cannot discuss what is a matter more for a member of the Royal College of Veterinary Surgeons than

# Moon-Struck, Star-Struck, Stage-Struck Deadheads!

of the Institution of Electrical Engineers.

I get a lot of letters from readers who have known a Scott-Taggart (usually during the War, for some reason) and want to cash in on the fact. They hope it is me; but usually it is a brother, father, or even grandfather. ("Do you remember," recalls one reader, "when I was a student in your form, way back in 1863?")

## An Acid Test

Please note, dear reader, that although the breed is very rare, there are a few Scott-Taggarts who are not me. They may be recognised by the fact that they all claim a wide knowledge of wireless, although actually I am the only one of the family who knows a thing about it.

An acid test is to ask: "What is the twenty-first claim of Patent 205,837?" As far as I am aware, I am the only member of the family who could recite it.

A fellow from Rochdale came into my office in 1924, and borrowed £7 13s. 10d. (Hint to borrowers: Never ask for a round sum; an odd amount looks terrifically genuine—and the lender will probably forget the odd shillings.) This man said he knew me in the Great War. He prattled convincingly about the old home town, although I didn't know him from the 378,427 other men I had met in the War. Of course, it was one of my brothers he had met.

He was broke and needed the railway fare to the Isle of Skye, or somewhere amazingly north, where a job awaited him. He wanted my "advice."

## Two Letters

I asked him how much advice he wanted, and he said £7 13s. 10d. I asked him if he couldn't find a job which wasn't at the extreme end of one of the railways, but he said no, it was the Isle of Skye or nothing.

Of course, that was when I was in the flower of my youth, full of generous impulses and not soured by the ingratitude of Chorlton,\* the sneers of Lostwithiel, and the nose-twitching of Papplewick.

All this has arisen through the receipt of a couple of letters received during the last month. I may as well deal with them here.

\* cum Hardy.

Letter No. 1. "Are you the Scott-Taggart I met in France during 1918? What rollicking times we used to have together at St. Pol! Do you remember that night..."

Reply. No. It must be my brother.

Letter No. 2. "I met a fellow called Scott-Taggart out in Egypt in 1915. Tall, very good-looking fellow. Now I come to think of it, I owe him a fiver I once borrowed

## IS THIS HARRY?



"What," asks S.-T. of a Billingsgate reader, "would you call a chap who dropped a barrel of salted herrings on your toes?"

from him in Cairo. But perhaps it was your brother..."

Reply. No, it couldn't have been. A registered letter addressed to Tallis House will find me.

Harry E. W., of Billingsgate, desires to know the meaning of the five

asterisks in column 3, page 178, of the August CONSTRUCTOR. Now, Harry, what would you call a chap who dropped a barrel of salted herrings on your toes? Exactly.

The chief requirement of many listeners these days is C.A.V.C. This, of course, means Claque Automatic Volume Control, and I am busy working on the problem at present and hope to give you all the circuit shortly.

## Exaggerated Applause

I am one of those listeners who resent the sycophantic and exaggerated applause of those toadying lick-spittles who are so cringingly grateful for their free tickets to a B.B.C. studio that they reward clap-trap with hand-claps.

If it is essential that some feeble-minded comedian (*sic*) should have facing him rows and rows of inane, half-witted, time-serving flunkeys, whose vacant faces, dropping jaws and goggling eyes are deemed vital to his inspiration (*sic*)... Well, take India, for example...

My point is this: Assume that this body of obsequious pick-thanks, with their cackling laughter and phrenetic delirium, is necessary to butter-up the half-starved egos of adulation-crazy fun-merchants. Assume that, I say. Well, is there any reason why *we*, decent citizens like you and me (like me, at any rate) who don't go gadding about Portland Place at nine o'clock at night—well, is there any reason why *we* should have to listen to the thundering fanaticism of moon-struck, star-struck, stage-struck deadheads?

No.

Is there any reason why our detector valves should be overloaded by the horny-handed gloze of a pack of humourless clawbacks?

No.

## The Studio Audience

You may, by now, have gathered a hint that my remarks could be interpreted as derogatory to the studio audience. It should not be beyond the capabilities of the technical brains of this country to devise a circuit which immediately and automatically silences the set when the

\* Yes, like you, I was told I should have to wait three years to get in.

# The Artist and the Old School

applause at some feeble joke begins. C.A.V.C., in fact.

I suppose that, in spite of Lu Chuang Ty's famous epigram,\* it would be too much to expect a set to be selective enough to tell whether a joke was feeble or good. The vaudeville from the B.B.C., however, is such that this technical point hardly arises.

Some day, perhaps, one could arrange that if the listener laughs aloud, the full claque applause is allowed to come through; a titter would allow only small amplification of the studio applause; a simper or smirk would permit only very slight amplification, say 3 mk/s.†

All one needs for ordinary C.A.V.C. is an L.F. circuit which responds to the special assortment of sounds constituting applause (50 to 15,000 cycles). This current is rectified, and the result fed as an high negative potential to the grid of a variable- $\mu$  H.F. valve.

It would be child's play for a duplex-triple-diode-quintode-variable- $\mu$ -nonode.‡

\* \* \*

I wonder where we shall get to with these latest valves? Valve manufacturers are certainly on the run. Many of the latest types are based on the principles contained in my patent of 1919, which was of no little importance, as I was the first British inventor to take out a patent for a receiving circuit using a multiple grid valve to which different varying potentials were applied. This process is involved in all the latest A.V.C. systems, and in superheterodyne mixers.

Many applications and circuits were mentioned in my patents, and the multiple grid valves were exhibited at the Physical Society Exhibition, January, 1920. These valves were made by myself at the Ediswan works while I was in charge of the Government Valve Department (incidentally designing and marketing the E.S.2 and E.S.4 valves—the first to be specially designed for the general public).

After leaving the Ediswan Company, I attempted to persuade Mul-lard's to market a double-grid valve

necessary for my circuits. They quoted me £10 each, and frankly stated they did not desire the business!

This was natural, and would, no doubt, have been the attitude of any firm. There was no demand for a "complicated" valve. And yet, if you asked them to-day for a valve with three cathodes, six anodes, and a couple of dozen grids, they would probably deliver it to you to-morrow!

However, I have had full credit for most of my inventions. The

"What is your old school tie?" asks a reader piqued by a reference I made in these notes. (I called an empire-builder "old cock," and admitted later that the expression was used on an occasion when I was not wearing my old school tie!)

## My Striped Tie

I refer my correspondent to the coloured covers of this magazine, which are decorated occasionally with my photographs.



*The band-pass crank.*



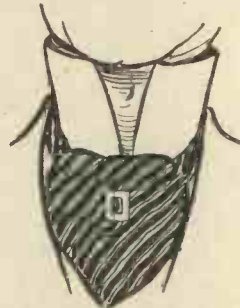
*"Nothing like the old crystal."*



*Anode-bend maniac.*



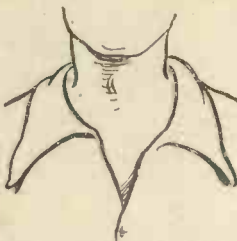
*Bigoted grid-leak detector.*



*"No modern circuit can beat the good old coherer."*



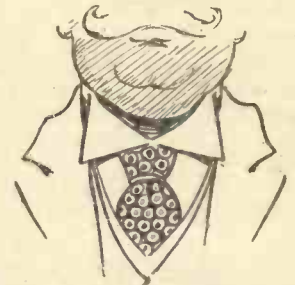
*"What we need is reaction on the aerial."*



*"Loose coupling every time."*



*"Loss-of-top" fakir.*



*"Take India, for example..."*

multiple grid patent acquired great importance abroad, and two leading concerns in Germany and France bought the foreign rights from the Radio Communication Co., Ltd. The patent agent of La Radiotechnique, the great French valve manufacturers, even chased me to the South of France where I was holidaying.

In England, multiple electrode valves have been very slow in coming forward, but now one is getting almost tired of them.

My favourite striped tie always figures in these, but the artist disapproves of my conservative attitude and gives the stripes a different colour on each occasion.

So far, I have worn the tie of the Brigade of Guards, the Firth of Forth Men's Rowing Club, Eton Old Boys, Abergele Deep Sea Fishers, and the Burnley High School Old Girls' Basket Ball team.

(Please turn to page 315)

\* "Anything can happen."—Lu Chuang Ty. 1743 B.C.

† Mickles.

‡ Still easier for the triplex-quadrado-bio-octavo-duodecitate which was evolved last week.





# B.B.C. NEWS

*A review of recent events and tendencies in programme matters with notes on outstanding personalities and forthcoming radio events.*

By Our  
Special Correspondent

## The General Post

As the new organisation of the B.B.C. takes shape, there is a great movement to and fro of officials of all kinds.

As each administrative officer is to have a kind of joint manager in the person of an output officer of the same status but independent, so each Regional Director is being provided with an administrative specialist. Thus a number of headquarters officials will find themselves in Cardiff, Belfast, Birmingham, Manchester, and Edinburgh before the end of the autumn.

## New B.B.C. Stations

I hear that Norwich, Inverness, and Newcastle-on-Tyne are the most probable sites for the new stations which will be made possible by the release of wavelengths from Regional transmitters on the impending reshuffle based on the new Lucerne plan. There may be also a number of minor relay stations working on international common-waves.

## The Ten-Year Bonus

Great satisfaction has been caused to the original members of the B.B.C. staff by the decision of the Board of Governors to award a special bonus of ten per cent of one year's salary to each member of the staff who has served with good conduct for a continuous period of ten years. About twenty have had their cheques and others will be awarded as the qualification is registered.

## Television Doubts

There seems much perplexity and some confusion about the future of B.B.C. policy towards television. In the third week of August there was

to have been a special anniversary celebration to mark the conclusion of the first year of Mr. Eustace Robb's excellent experimental programmes. Indeed, it was announced that Mr. Roger Eckersley, as head of programmes, would be present on the occasion and would be televised making an appropriate address.

Suddenly the plans were changed and the arrangements cancelled without explanation. The inference is that important policy changes may be contemplated.

I should think it unlikely, however, that the present transmissions will be suspended, at least this year. Even if further experiments are undertaken with ultra-short waves, it will be some years before they can be

applied in the programme sense, even if successful.

It would be a pity if, meanwhile, the B.B.C. were to lose the advantage of the experience that has been gained through the excellent enterprise of Mr. Eustace Robb and his capable assistant Miss Jean Bartlett.

## No Board Changes This Year

I understand that the Prime Minister, before the Recess, consulted with the Postmaster-General and accepted the view that it would be undesirable to make any changes in the Governors of the B.B.C. until at least the end of 1934.

The present Board has not yet served its normal five years period; but there is the more important

## PRESENTATION BY RADIO TELEPHONE!



*Mr. J. H. Thomas (right) is shown thanking audiences at the other end of the world by wireless telephone for the gift of a chair made of Australian and New Zealand woods.*

## Latest News of British Broadcasting

reason that the National Government wishes to see the new organisation completed, in particular the inclusion of Colonel Dawnay, before the Governors are again changed.

This decision will cause disappointment to the still substantial list of those who have been waiting for years to get on to the Board of the B.B.C.

### Mr. Ironmonger at Work

Mr. Ironmonger, who is taking over the religious work of the B.B.C. formally in charge of the late Mr. Stobart, is approaching his task in a very broad-minded and enterprising fashion. It is believed that Mr. Ironmonger will make the microphone

Transmissions should begin in August or September of 1934, by which time the new wavelength allocation will be finally settled. It is already known that this will put Daventry National on 1,500 metres, a slightly less efficient channel than the one at present in use. On the other hand, the B.B.C. was probably lucky to retain a wave anywhere near the old one.

### Less Gramophone Music

There has been a good deal of comment among listeners about the unusual amount of gramophone music which has appeared in the summer programmes this year. I think there is no doubt that it has been overdone.

They are convinced that a decisive legal action must be imposed before results can be secured. Therefore, I prophesy more litigation on this subject before Christmas.

### End of the Radio Circles

Many regular listeners to B.B.C. programmes will feel something of a pang at the knowledge that Radio Circles are doomed to disappear within a year.

This part of the work of the Children's Hour has helped charity substantially, has brought joy to many children, and has built up for the B.B.C. a valuable stock of goodwill. But now it is decreed that, in the interests of dignity, it is no longer compatible with the high status of broadcasting to let it dally with such childish pastimes as Radio Circles.

It will not be long before the Children's Hours likewise will be massacred. My view is that both these actions are retrograde, and will be lamented when it is too late.

Incidentally, certain active Continental stations are getting ready to take over both the British Radio Circles and the Children's Hours when the B.B.C. abandons them.

### Anonymous Announcers

The wide general publicity given to the new woman announcer has, naturally, caused some unrest amongst the regular established announcers, who have been subjected to a rigid rule of anonymity. They feel that it is unfair that this innovation should be made an exception.

They also feel, I believe quite rationally, that unless they are given some personal publicity they have very little chance of getting on in life either inside or outside the B.B.C. If the appointment of a woman announcer does no more than to doom the tyranny of anonymity, it will have more than justified itself.

While the personal publicity accorded the new lady announcer has caused some perturbation among her male colleagues, it does not, on the other hand, seem to have inspired a great deal of interest among listeners.

In view of the fact that British programmes are being announced by a feminine voice for the first time, a greater show of interest might have been expected on the part of the listening public.

### YOUNG GERMANS SING TO U.S.A.



Every month on the first and third Tuesdays a children's programme is broadcast from Germany to the United States. Here the young performers of a band are shown in the Berlin studio.

a good deal more tolerant of differing religious opinions than has been the case in the past.

His experience as a journalist before he accepted a parish has given him exceptional equipment for his present difficult and delicate work.

### All Mains at Droitwich

Experiments are making good progress in the direction of operating the new National and Midland transmitters at Droitwich on the all-mains principle, instead of by the use of batteries. Work on the buildings and equipment is going forward satisfactorily.

It is the ordinary "unpresented" transmissions that have met with disfavour. The special programmes supervised by Mr. Christopher Stone are as popular as ever.

### More Song-Plugging Actions

Although the B.B.C. appears officially to be satisfied with the results of its first legal proceedings about song-plugging, I happen to know that a final solution is by no means in sight. Those who are close to this department of the work at Broadcasting House make no secret of their chagrin at the inconclusive nature of the proceedings in July.

# SOME NOVEL LOUDSPEAKER DEVELOPMENTS



By VICTOR KING

A highly interesting review, by our popular contributor, of some of the more outstanding advances in loudspeaker technique during the past year.

LOUDSPEAKERS don't seem to change much in appearance, and I suppose that is because their fundamental forms are fixed by immutable laws. Or aren't they? Anyway, these loudspeakers you are

## SINGLE OR DUAL



*Rola moving-coil loudspeakers are available either singly or in scientifically balanced pairs. The type shown is one of the permanent magnet models.*

now seeing in the shop windows and exhibitions are not the same instruments that were being offered for sale two and three years ago. They are essentially different.

Most of you probably realise that. But I wonder what you consider to be the most striking change in loudspeaker technique of the past year?

In my view it is the redevelopment of the energised moving-coil type. You will probably remember that in the beginning of its history, right back in the days when B.T.H. first staggered the world with the original R.K., every M.C. speaker had an electro-magnetic field winding energised either by the mains or by a battery.

## Saving a Component

And then someone introduced the permanent magnet variety and, like a great flood, this enveloped the whole market. Permanent magnet types must at one time have greatly outnumbered the others.

But then came the mains set boom, and it was discovered that an energised speaker's field winding could also be used for smoothing and thus save a component.

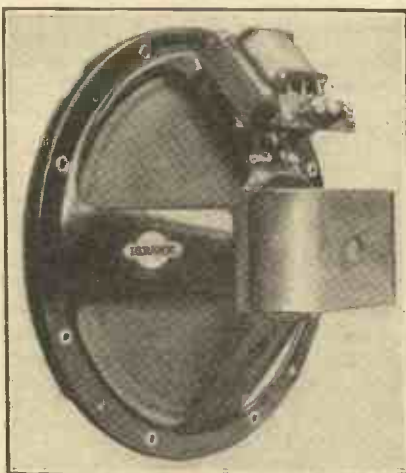
Also, of course, the type received a stimulus in popularity because of the

comparative ease of developing an intense magnetic field with small magnetic systems.

And so the energised moving-coil speaker came right into its own again. Even Blue Spot, hitherto staunch permanent-magnet advocates, turned their attention to the type, and most successfully, too, as was only to be anticipated.

And there doesn't seem to be any argument in favour of using a permanent magnet in a mains set, although it must not be overlooked

## GOOD SENSITIVITY



*The Igranite type D9 moving-coil speaker is sufficiently sensitive to operate on an input of 200 milliwatts, and yet will handle as much as three watts without distress.*

that it is only fairly recently that the "all-in" receiver of the consolette type has become all but universal.

When a speaker is separated from the set it means extra connections if it requires energisation.

So it has really taken two things to create this present revival of the energised moving-coil speaker. The popularisation of consolettes and the increasing use of the mains for radio.

But once given the energised speaker its usefulness is very apparent. I have already referred to one economy

of its application, and that is the dual use of its field winding, making it act also as a smoothing choke.

There are other things it has been made to do alternatively to that. I notice that in one of the Ferranti sets the voltage drop across it is employed for grid-biasing purposes.

## Preventing Mains Hum

Again, in, I think, a Cossor receiver it functions as an output choke. This appears to me to be a very ingenious and novel idea—and rather quaint to force a loudspeaker to provide its own output choking!

It is in connection with the "mains driven" speaker that a novelty derived from America is encountered. I mean the "hum-bucking" coil.

The name alone would indicate its country of origin, wouldn't it?

The "hum-bucker" comprises a turn or two of stout copper wire interposed between the field winding and the speech coil in order to absorb hum energy.

It is very necessary when the speaker is directly energised by the

## WELL DESIGNED



*High flux density is an essential feature of a good moving-coil instrument. The R. and A. "Challenger," for example, has a flux density of no less than 7,200 lines per square centimetre.*

## Some Novel Loudspeaker Developments—continued

mains and its field winding is used as a smoothing choke.

Another interesting development, this time of an even more general nature, is the evolution of unilateral quality. I know that sounds somewhat academic, but I could not express my meaning clearer in as few words. And, after all, we moderns must be allowed our phrases!

### Milliwatts to Watts

In simpler but more numerous words, I mean that present-day moving-coil loudspeakers are able to handle wide differences of power equally well.

In earlier days it was not possible to operate most moving-coil speakers

### ENCLOSED MAGNETS



*This Blue Spot model 45 P.M. is provided with side plates on the magnet to prevent dust and foreign bodies from being attracted into the powerful gap. This instrument is capable of handling four watts without distortion.*

under a certain power input without the quality going to blazes.

But take as an example one of the most popular Epoch models. This, by the way, is a striking example. It can do full justice to a first-class 8 watts, from which it will be gathered that public address work is not beyond it.

And yet you can feed it with 100 or so milliwatts from a tiny two-valver, and it will still give proportionately magnificent results. I know, because I have tried it under both conditions.

### Stereophonic Reproduction?

What does this modern miracle cost? Forty-five shillings!

Another intriguing innovation is the dual type of speaker. You know it; it really comprises two loudspeakers built into one cabinet, or on to one baffle.

I like the scheme; it is satisfying both to one's ears and to one's idea of the fitness of things.

But I don't accept the "stereoscopic" theory. True, one's got two ears, just as one has two eyes, but

### SUITS ALL OUTPUTS



*Instantaneous matching to any type of output circuit is a feature of this W.B. Microlode speaker, which incorporates one of the most versatile transformers ever designed.*

there the similarity between acoustics and light all but ends.

If there were stereoscopy of sound in the same way as there is of sight, we would, I suggest, each possess two mouths! But actually, whereas sight takes in three dimensions, sound is occupied only with two. It can lay down a mere volume and pitch as against the length, height and breadth of sight.



### "CLASS B" EFFICIENCY

*A "Class B" amplifying stage and moving-coil speaker combined in one compact unit is one of the attractive items in the Epoch range for 1933-34.*

We've each got two ears for direction-finding purposes. "Ah!" I hear you say. "Two speakers spread out the sound and give the illusion that an orchestra, for example, with its differently-positioned instruments, is in the room."

And that a singer or talker is in two places at once? Or that, instead of one orchestra, there are two? I can defeat the argument *ad infinitum!*

### Preserving a Balance

Nevertheless, I can't dispose of the value of two speakers operating in proper dual formation, because it is based on a firmer foundation. And that is, that with two balanced speakers a better over-all response is possible. But they must be balanced so that they each compensate for the inevitable deficiencies of the other.

However good a speaker may be, it is bound to possess some unwanted

### ATTRACTIVELY HOUSED



*One of the H.M.V. range, this handsome cabinet model permanent magnet moving-coil speaker includes a multi-ratio matching transformer.*

resonances somewhere in the audio scale, and it is bound to fall away a little in the bass or treble.

Boldly acknowledging this, and setting about the business of overcoming it, Rola, for example, have scientifically designed balanced pairs of speakers. Without scientific balance, however, the result might easily be worse instead of better.

### Multiple Matching

Talking about balance inevitably brings me to that important matter of balancing the output of a set with the speaker.

I fancy the peak of achievement in this has been reached by W.B., who supply their new Microlode loudspeakers with one of the most versatile transformers ever designed.

(Please turn to page 319)



# A PRACTICAL MAN'S CORNER

By R. W. HALLOWS, M.A.

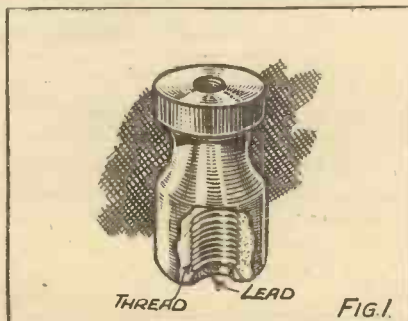
THE particular terminal to which you are making connections is a very short one, in any case; but, by some means or other, it has to be persuaded to take two wires beneath the nut. You get the wires into position and, having pushed them well down, see that there are just a couple of threads visible on the shank. You heave a sigh of relief. All is well; those two threads should give plenty of grip for the nut.

## Will It Grip?

But is all well? Will the nut grip? In nine cases out of ten you will find that it will not. It slides straight down over the protruding end of the shank until it is sitting upon the wires, and, try as you will, you cannot make it "bite." Possibly you come to the conclusion that either the male threads of the shank or the female threads of the nut are stripped. They are not. The whole cause of the trouble is the way in which the nut itself is made.

Fig. 1 illustrates the way in which the great majority of terminal nuts are made nowadays. If you look carefully at the hole in the base of one, you will see that it begins with

## A COMMON TROUBLE



On this page Mr. Hallows explains how the lead, shown above, causes the nut to fail to grip properly.

an unthreaded countersunk portion, and that the female threads themselves start at a point which may be one-thirty-second or even one-sixteenth of an inch up from the bottom of the nut. This countersunk unthreaded part is known as the lead,

*Nuts which refuse to "bite" on the wires placed under them are familiar to all constructors; but do you know how to overcome the difficulty?*

*Useful hints on this, together with methods of doctoring old "pre-set" condensers, and other money-saving ideas, are entertainingly dealt with by our contributor this month.*

and its purpose is not merely to exasperate the constructor. It is made because its presence facilitates the operation of machine-tapping the nut.

Nuts of all kinds are machine-made nowadays in large quantities and at tremendous speed. So long as the lead is not too deep, it is useful to the constructor, since its presence makes the starting of nuts on awkward threads rather easier. But, unfortunately, many makers do overdo the depth of the lead in their nuts and, through the curious workings of fate, it is generally these makers who provide the shortest shanks for their terminals!

## Two Ways

There are two ways of overcoming the difficulty. One is a makeshift; the other a permanent job. The makeshift is illustrated in Fig. 2. It consists in nothing more complicated than turning the nut upside down. If you make a further examination of a terminal nut, you will see that, though there is a lead at the lower end where the machine tap went in, there is none at the upper end where it came out.

The female threads start flush with the surface of the top of the nut, and, by making use of the simple expedient suggested, you can generally induce a nut to start on and to grip the male threads of a very short shank, even if nothing more than about one turn is visible.

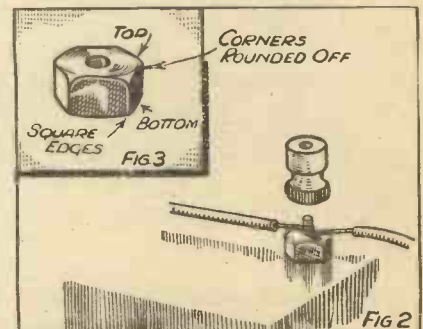
The same remarks apply to hexagon nuts in general. There is usually a lead at the bottom of the nut—the side where the surface is practically flat—and none at the top where the corners of the six faces are rounded off. This is illustrated in Fig. 3. Full nuts are always made in this way, but lock-nuts or "half-nuts," which are a good deal thinner, often have the edges rounded off at both top and bottom.

## Makeshift Method

Even with half-nuts, though, you will generally find that the lead is very much more pronounced at one side than it is at the other, and by putting the side at which it is shallowest downwards, you can often make such a nut bite where it otherwise would not.

The permanent job consists in placing the nut bottom upwards in a vice and filing it down until the lead

## TURN IT OVER

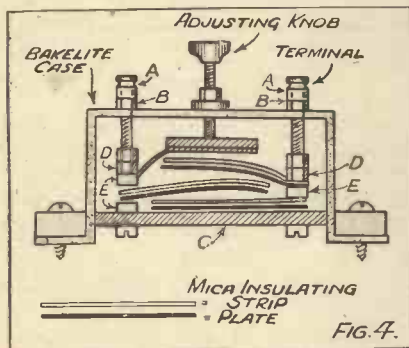


The mere reversal of the nut will often be sufficient to make it "bite" on the shank.

## A Practical Man's Corner—continued

has been removed. This tip is particularly useful for any female threaded part which cannot be reversed, as a hexagon or terminal nut can. The little sockets, for instance, that screw on to the plate contacts of screen-grid valves in order to enable a clip-on connector to be used have often rather deep leads.

### PRE-SET CONSTRUCTION



How the plates are arranged.

This does not matter very much if you are using them for their proper purpose, but they are very handy also for quick connections to adaptor plugs and so on, where frequently only a very short piece of studding is available. The tip is also useful for screw-on knobs which cannot be made to grip on very short spindles.

### Loss of Springiness

Probably you have noticed that when a preset condenser of the little time, there is a tendency for compression type has been in use for some there to be very little difference between the maximum and minimum capacities. The reason is that under constant compression the metal plates within lose their springiness and fail to separate properly when the adjusting screw is loosened.

Fig. 4 shows a section through a condenser of this kind which illustrates the make-up. If you remove the terminal nuts A A, and the locking nuts B B, a slight pressure at the tops of the bolts will cause the bakelite piece "C" to slide out of the case, bringing with it the whole assembly of plates and insulating pieces.

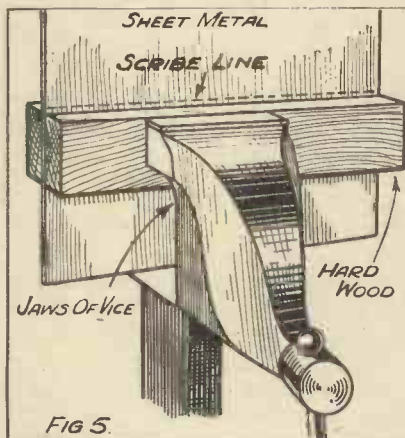
You will see that the bottom plate lies flat, or very nearly so, upon the base, whilst the others are arched above it. Over the whole collection of plates comes the heavier piece of

metal upon which the point of the adjusting screw bears. When a condenser that has become tired after long use is examined, it is generally found that the plates lie very close to one another without any pressure being applied to them. This is sometimes caused by the nuts D D being loose.

### Tighten the Nuts

If these are not properly tightened down the plates, even if they have not lost their shape, will not spring apart properly, but will sag down on top of one another. Try first of all the effect of tightening these nuts well down and fixing them firmly with locknuts above them. If this does not answer, the condenser should be taken to pieces by removing the locknuts and the nuts D D.

### A GOOD METHOD



The metal is easily bent after a deep line has been scribed as shown.

The plates, with their covering strips of mica, are then easily slipped off the bolts. Be very careful that you do not break the mica pieces. Each plate can now be given a slight upward bend or alternatively, better separation can be obtained by using thicker spacing washers, E E. When you are assembling the condenser, be very careful to put a mica strip back on top of each of the metal plates.

### The Popular Chassis

The making of sets for both mains and battery operation upon a metal chassis is becoming more and more popular amongst constructors. The old panel and baseboard method had matters all its own way for a very long while, and it will no doubt remain with us for many years yet.

But the chassis, now almost universal amongst manufacturers, will gradually replace it with home constructors also, for it certainly makes for neater and more compact receiving sets and for short, high-potential leads.

From time to time I have given a hint or two about metal chassis work, but as some of these were probably born prematurely, I am going to return to the subject now. First of all the question of bending your sheet metal into shape. A convenient method is illustrated in Fig. 5. At each place where a bend is to be made, a rather deep, scribed line is made in the metal. The sheet is then placed between two pieces of hard wood.

### Use Hard Wood

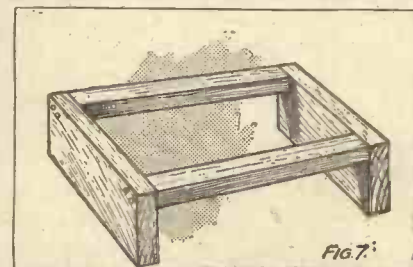
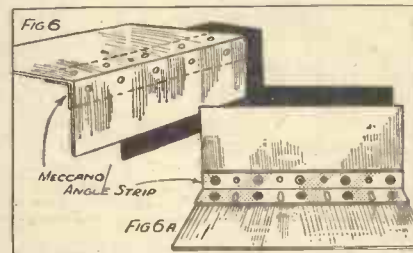
One-inch oak or teak serves admirably for the purpose, or you may use, if they are available, strips of mahogany cut from an old cabinet.

The strips should be at least as long as the metal sheet is wide, and not less than 2 in. in width. Sandwich the sheet between them so that the scribed line is a small fraction of an inch "proud" of the top of the wood. Then use a light wooden mallet and you will have no difficulty in making a neat right-angled bend.

What is the best material to use for a home-made metal chassis? Manufacturers employ sheet steel, but, then, they have presses in which it can be shaped without any trouble.

(Please turn to page 317)

### WORKING SHEET METAL



Some useful suggestions for those not equipped to do the more ambitious metal-chassis jobs.



THE lot of an exhibitor at almost any exhibition is rarely a happy one, and never was this more true than of the Show which has just concluded at Olympia.

From the point of view of exhibitions, the unfortunate part of radio is that however original a circuit may be, there is inevitably a certain similarity in general appearance between one model and another. You may be advised to go to Stand No. So-and-so to examine a radiogram. You do so, and are probably duly impressed. But then as you continue your tour of the exhibition you will probably find that there are umpteen other radiograms exhibited, all of which from general appearance seem similar to the one you have just examined!

### Never Monotonous

Actually they are not. Electrically they are probably as different as chalk and cheese, but the fact remains that to the visitor who is not able to appreciate the technical distinctions, they are all just radiograms.

The same thing applies, although possibly not quite to such a marked extent, to components, to accessories and to all the other things which find their way into Olympia's gigantic shop window.

And yet the curious part about it is that when you are actually at Olympia the question of the Show being monotonous never even arises. Why is it? How is it that the exhibitors manage to capture your interest from one end of Olympia to the other? Why is it that you do not tire of seeing sets, and sets, and still more sets, all of which, in general appearance, have so much about them that is the same?

### Subtle Methods

It is all due simply and solely to the ingenuity and resourcefulness of the manufacturers. They call your attention to the merits of their receivers, not by showcards, not by illuminated posters, but by far more subtle means!

*A graphic and entertaining description of some of the novelty exhibits which were to be seen at this year's National Radio Exhibition at Olympia, which was the most successful of all.*

By G. T. KELSEY

Your eye catches sight of a small crowd. Human nature is nothing if not curious, and so you go over and join the throng. You probably find that you are looking at some sort of a working model which may or may not have a direct connection with radio. That doesn't matter. The fact remains that your attention has been attracted, and once you are on the stand, or round it, subconsciously you find yourself taking more than a passing interest in the wares exhibited. If you find something in which you are particularly interested, then the rest follows automatically.

That is why Olympia is never monotonous. It never will be while, every year, there is this unostentatious battle of the wits between the various manufacturers to make the presenta-

tion of their models just a little bit different; just a wee bit more original. And in this connection, it is true to say that the radio displays at Olympia this year were better and brighter than ever.

Take, for instance, the Marconiphone stand. From eleven o'clock in the morning until closing time each day, it was rarely possible to get near it. The reason? As a matter of fact, there were three of them.

### "Set of 1960"

Perhaps of the three the biggest draw was the Marconiphone version of the set of 1960. Fashioned somewhat on the lines of their gigantic searchlight pattern public address loudspeakers, the "Set of 1960" was without controls of any description. You just had to ask it for what you wanted, and automatically you got it.

No, there wasn't a man inside. It was simply a product of Marconiphone engineering skill and, moreover, it worked. On one morning bright and early during the run of the exhibition, a certain newspaper representative

(Please turn to page 318)

### THE "BETTER RADIO BRIGADE"



Built on the lines of a medieval fortress, the Mullard stand was one of the most arresting displays at Olympia.

# TESTING INSTRUMENTS FOR NOTHING

A money-saving article experimentally-minded readers will enjoy.

By  
H. M. LOWE, M.Sc.

THE correct instrument to use to measure resistances is a Wheatstone bridge, but it may be interesting to remind experimenters how far they can go with very improvised material, some ingenuity, and a good knowledge of Ohm's Law.

## Ample Accuracy

Usually for most wireless purposes an accuracy of 10 per cent is ample. Such an error clearly shows up dud grid leaks, anode resistances or valves, and will pick out a variable resistance with a bad contact with certainty.

Well, where do we start? What is our instrument for doing all this? And is it expensive?

Actually many readers must be able to get it for nothing! Of course, if you go to an office "somewhere in the City," this doesn't apply to you, but if you're "something on the works" there's plenty of hope.

You see, many years ago a large number of industrial concerns, making all kinds of different products, found that they could measure temperature better by electrical thermometers than by the old "mercury-in-glass" instrument. So they installed pyrometers at various points.

## An Old-Timer

Now a pyrometer consists of two wires (which you don't need) joined to a millivoltmeter. Usually these installations proved so successful that they have been replaced years ago by improved instruments of more robust type, or self-recording, or multi-point, or some other of the numberless modifications invented, and the old millivoltmeter is lying unused in a cupboard, covered with the dust of ages, waiting to be tenderly looked to, and brought again into the daylight.

Best of all, it is probably a highly sensitive instrument, for the old pyrometers needed a really sensitive

millivoltmeter, whereas modern ones do not demand them.

Wipe off the dust and look at the scale. It is probably marked directly in millivolts—only the newer ones read directly in temperatures—and probably the resistance of the instrument is also marked. The author came across a beauty reading 0-15

unknown. You will have to calibrate the instrument. This is easy to do within the limits of accuracy we decided on.

You need just a little junk, but you must have also a real working knowledge of Ohms Law.  $C = \frac{E}{R}$  is so easy when once you take the trouble to understand it, to recognise it inside out, upside down, and rear-side first. You must be able to "solve" it for C, E, or R, to spot it in circuits and parts of circuits, and to nail it down where you want it.

## How to Make

Now the "components." Iron wire is so accurately drawn these days that its length may be looked upon as proportionate to its resistance—a new dry cell is almost exactly 1.5 volts, a yard stick or a metre scale is available anywhere. First, measure off exactly 10 metres of the wire, (or 10 yards if you like, but your calculations will be a little more difficult). Wrap most of it round a piece of wood so that the coils don't touch, but leave two feet or so unwrapped.

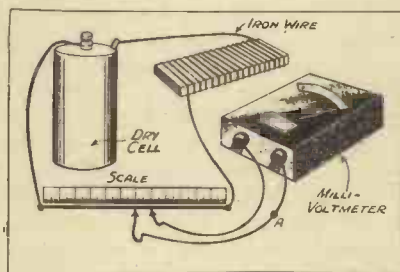
Tack about a foot of it firmly in a straight line to the workshop table, alongside of the metre scale (or the inch rule). Join the two ends to the dry cell, and you have an instrument called a "potentiometer" (though it isn't exactly the same as the fellow you use for grid bias!).

## Simple Calibration

Along every centimetre of it is a fall of potential of 1.5 millivolts. Join two copper wires to the millivoltmeter and place these across the iron wire exactly 1 centimetre apart.

The reading is now 1.5 millivolts, and you make a note of where the needle stands. Similarly 2 centimetres apart give 3 millivolts and so on up the whole scale.

(Please turn to page 316)



## HIGHLY SENSITIVE

results are obtainable with the apparatus above, which many readers will be able to secure at little or no cost.

If joined up as explained in the article, the instrument will prove to be extremely

## USEFUL FOR TESTING



millivolts and marked "98 ohms at 20° C."

But you need not be discouraged if it only reads 0-1,000 goodness-knows-what's and the resistance is





# QUESTIONS I Am Asked

by **JOHN  
SCOTT-  
TAGGART**

**Q. 45.** Why do I get better quality with a theoretically poorer L.F. transformer than with one having an excellent straight-line response curve?

A. The "quality" yielded by a set, as I have so often preached, is a matter of the whole set and speaker. On the H.F. side you may be using reaction which prunes the higher sidebands (corresponding to the high notes) and exaggerates those near to the carrier frequency (the low notes).

In these circumstances, a "poor" transformer having a "rising characteristic (poor bass response) may give excellent quality. Furthermore, the speaker may possess a bass resonance—i.e. it will exaggerate bass notes. This trouble is lessened by feeding it from a transformer possessing a poor bass response.

Sometimes it thus happens that poor quality components may give good reproduction, while a single first-class component, if introduced, may upset the whole design!

A first-class L.F. transformer usually calls for a first-class speaker, but the constructor is advised to abide by a designer's advice.

The theoretically perfect L.F. transformer is not, nowadays, the object of veneration it once was. Apart from tone-compensation considerations, a cut-off at above 5,000 cycles is popular where foreign listening is indulged in; heterodyne whistles and much interference can be thus reduced.

**Q. 46.** Should a receiver employing "Class B" amplification be arranged to provide for decoupling?

A. Decoupling, in general, is essential where mains units are employed, but as "Class B" is principally (though not exclusively) a battery scheme, the need for de-

coupling is not so imperative. The ideal procedure, however, is to decouple both the detector and "driver" valves.

In the anode circuit of each is connected a resistance and the usual condenser (2 or 4 mfd.). The H.T. battery itself may be shunted by a 4-mfd. condenser.

**Q. 47.** I desire to do without tapplings on my H.T. battery. Can I use a potentiometer to supply the screen of my variable- $\mu$  S.G. valve?

A. Not advised. When you increase the negative grid potential of your variable- $\mu$  valve, you will decrease both the anode and screen current. The screen current, if made to pass through a resistance (e.g. a

*In his unique position as a world-renowned radio consultant, Mr. John Scott-Taggart deals with all kinds of wireless problems. Those to which he replies on this page are specially selected as being of particular interest to readers of "The Wireless Constructor."*

potentiometer); will establish a voltage across it, and changes in screen current will result in changes of screen voltage. This is undesirable.

To reduce the effect, you can use a potentiometer of low resistance. Unfortunately, the potentiometer will then take more H.T. current than the valve, and the scheme is uneconomical.

**Q. 48.** What are the merits of the new "Catkin" valves?

A. The following claims are made: strength, uniformity, non-microphonic properties, higher output due to cooling of anode by contact with the air, small size, higher vacuum through virtual absence of glass in the structure.

The development is a most ingenious one, but the valves do not function in any new way, and, in fact, are made at present to be inter-

changeable with existing glass types. The most important claim that affects constructors relates to the question of microphony.

Much trouble has been experienced by set manufacturers and constructors with microphonic S.G. valves. This brings me to another question:

**Q. 49.** How can an S.G. valve be microphonic, since it does not deal with L.F.?

A. Sound waves from the speaker may cause vibration. Vibration of the electrodes of the S.G. valve will modulate the carrier-wave which, after detection, produces L.F. currents which operate the speaker.

The speaker maintains the microphony, and this rather complicated reaction chain will probably cause the building up of an irritating and pleasure-spoiling note.

**Q. 50.** My H.T. current seems quite abnormal, as the H.T. battery has a very short life on my set. What do you advise?

A. Excessive H.T. may be caused by leakage. On-off switches, valve holders, panels and baseboards, decoupling condensers, etc., may be the source. A milliammeter is almost essential to trace the trouble; it should be tried in each anode circuit with the set "on," and also when the set is "off."

A common cause of excessive H.T. consumption is inadequate negative grid bias on one of the valves, usually the last. A dud G.B. battery or a faulty plug connection will cause excessive H.T. current to pass through the valve. The grid bias on the last valve should be as great as possible without permitting distortion of loud passages.

Sometimes a dud valve (especially an S.G. tube) will be the culprit.



# AS WE FIND THEM



# NEW APPARATUS TESTED

### New "Audirad" Choke

READERS will be interested to learn that Messrs. Radio Instruments have introduced a new model of their well-known "Audirad"—a clever combination of L.F. and H.F. chokes in one compact unit.

In both appearance and size the "Audirad" is precisely similar to an



**H.F.  
AND  
L.F.**

*The R.I. "Audirad" is a versatile component which combines H.F. and L.F. choking systems in one compact unit.*

ordinary L.F. choke, but its versatility is at once evident when some of its many applications are considered.

The component has three terminals, one of them being common to the H.F. and L.F. choking systems, a feature which enables it to be used in a variety of ways. For example, the new "Audirad" can be employed in any circuit purely as an L.F. choke, or alternatively as an H.F. choke. On the other hand, its dual properties fit it particularly well for smoothing duties, when it can be relied upon not only to carry out its work as an efficient L.F. choke, but also to suppress any unwanted H.F. energy that may be present in the supply.

### Reduces Hum

Much of the interference experienced with D.C. mains receivers is, of course, due to high-frequency currents picked up by the mains and subsequently modulated by the low-frequency ripple in the supply.

Receivers with sensitive high-

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

frequency stages will readily pick up interference of this nature, and the result is a hum, which may, as often as not, be attributed to poor smoothing or some other factor which has no bearing upon the trouble.

One very successful method of preventing these stray H.F. impulses from passing through into the receiver portion of the equipment is to insert an H.F. choke in series with

### WELL SCREENED



*Two H.F. chokes from the Telsen factory.*

the mains, and the "Audirad" is designed to meet these cases.

This versatility should strongly appeal to the home constructor, since by purchasing an "Audirad" he is providing himself at no additional cost with a component that can be applied equally well to so many different tasks.

The resistance of the new "Audirad" has been reduced to 500 ohms, while the high inductance together with the ability to handle heavy currents of the original model have been fully maintained.

Messrs. R.I. are to be congratulated. To produce an ingenious multi-purpose device with such excellent electrical characteristics as are possessed by the "Audirad" is no mean feat. But to sell it for a mere 8s. 6d.,

the price of an ordinary L.F. choke, is nothing short of an achievement, and one which cannot fail to attain the success it so justly deserves.

### W.B. Loudspeaker

However well designed a loudspeaker may be, its resulting reproduction will bear but little resemblance to the real thing if the output circuit is incorrectly matched. The word "fidelity" in its practical application implies a good set, a good speaker, and accurate output matching. The latest W.B. P.M.4A moving-coil loudspeaker is a noteworthy attempt to provide the listener with a simple instantaneous means of obtaining the correct optimum load irrespective of the type of output circuit.

Integral with the loudspeaker there is a multi-ratio matching transformer giving as many as seventeen ratios for power or pentode valves and four ratios each for "Class B" or Q.P.P.

With the aid of two switch arms and a letter code the fortunate owner of this W.B. instrument can adjust

### ACCURATE MATCHING

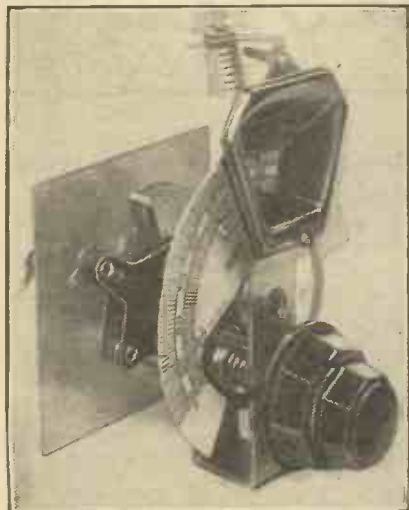


*This W.B. moving-coil loudspeaker is designed for instantaneous matching up with any type of output circuit.*

## As We Find Them—continued

the "speaker to valve" impedance with the utmost ease and with the knowledge that the ultimate setting is not merely a compromise.

### COMPACT ASSEMBLY



This Magnum two-gang condenser has an independent drive for trimming in addition to the main slow-motion control.

This ingenious device is cleverly built into the base of the speaker, which incidentally is one of the new "Microlode" permanent magnet models possessing excellent sensitivity, a marked absence of cone resonances and an ample power-handling capacity. When coupled to a good amplifier the reproduction given by the P.M.4A leaves little room for criticism and should adequately satisfy the most fastidious listener.

The makers are Whiteley Electrical Radio Co., Ltd., Mansfield, Notts, and the price is 42s.

### Magnum Condenser

A new Magnum component takes the form of a two-gang solid dielectric condenser. Two .0005 mfd. "Magnadensers" are ganged together and driven by a slow motion drive having an independent drive for trimming.

The condenser is suitable for panel mounting or direct baseboard fitting and is available with a grey cellulosed cover if required.

We found the sample submitted to be substantially constructed and to function admirably when connected in circuit with two matched inductances. The drive is smooth and

without slip, and the compact dimensions of the condenser make it particularly applicable to portable designs.

The dial can be supplied calibrated in divisions (0-100) or wavelengths to match up with Magnum coils.

The price is 10s. 6d. and the makers are Burne-Jones & Co., Ltd., 296 Borough High Street, London, S.E.1.

### For Neat Connections

Set wiring methods have undergone various changes since the inception of broadcasting. First systoflex covered bare wire, then square and round section bare busbar, and latterly insulation covering in some form or another. Generally the choice rests either with "spaghetti" tubing which is measured off, cut to size, and slipped over the requisite length of bare tinned copper conductor or one of the insulated wires in which the sleeving and conductor are *in situ*. In the latter case the ends of the conductor have to be bared with a pair of cutting pliers or a penknife prior to making the connection to the terminals.

There is another type of connecting lead known as "Pull-Back" which takes the form of a tinned copper conductor having flexible insulating sleeving on it. In use the sleeving is simply pushed back with the fingers, leaving the clear wire end ready for connecting. And when it is secured to its terminal the sleeving can be slipped back again, thus ensuring a

neat and tidy job, with the absolute minimum of trouble. "Pull-Back" is a very handy material and we can recommend it to constructors. It is

### SIMPLIFIES WIRING



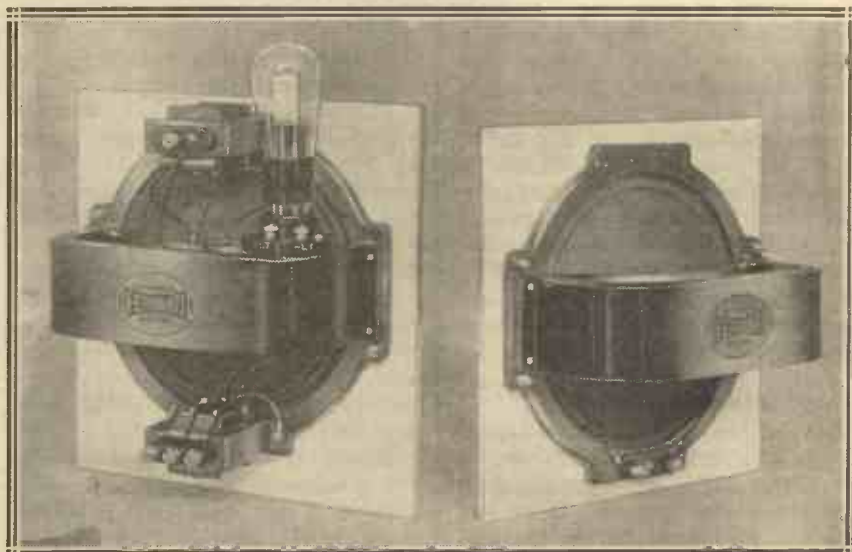
"Pull-Back" connecting wire is a very handy material for home-constructors. This photograph shows the wire actually in use in a set.

obtainable from British Radiophone, Ltd., Aldwych House, London. W.C.2.

### Telsen Chokes

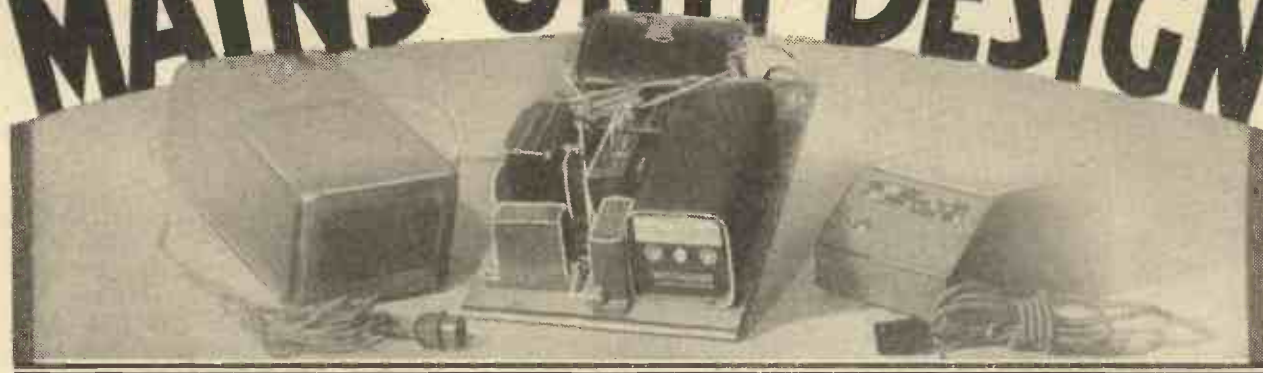
The Telsen range of components for the 1933-34 season covers a wide field, and includes a series  
(Please turn to page 318)

### PRODUCTS FROM A FAMOUS FACTORY



Two of the latest Ferranti products. On the left is the "Class B" amplifier-speaker, and on the right a moving-coil loudspeaker of the permanent magnet type.

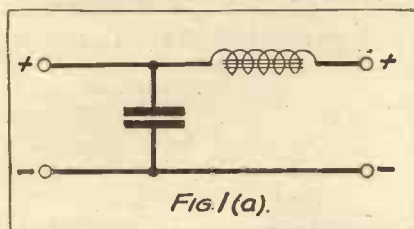
# MAINS UNIT DESIGN



In this interesting article our contributor, Mr. Handel Rees, discusses in a simple and lucid manner the principles underlying the design of mains units for high-tension supply. Likely to prove of particular value is the explanation as to how different tapping voltages may be worked out to suit individual requirements.

A WELL-DESIGNED mains unit should at least provide a current supply equal to that obtainable from a good battery. It has, of course, other special advantages, such as plentiful power at low cost, but

## ELIMINATING RIPPLE



The fundamental smoothing circuit consists of an L.F. choke and condenser of large capacity connected as shown above.

the following is a brief summary of the essential features.

The output must be free of irregularities that would cause hum or noises; voltages must be correct and reasonably steady, and also adjustable where necessary; the feed circuits should be well decoupled, to prevent oscillation troubles; and, lastly, the unit must be well insulated and protected against accidents.

## Satisfying Requirements

Taking these in order, we see that the first is a question of efficient smoothing arrangements; the second depends on using suitable "dropping" resistances, of correct ohmic values for the currents they have to carry; while the third requirement can be met by arranging the resistances properly and shunting them by decoupling condensers. The last condition simply requires good quality components, suitable casing over "live" parts, together with earthing

of exposed metallic surfaces liable to become "live" in event of leakage.

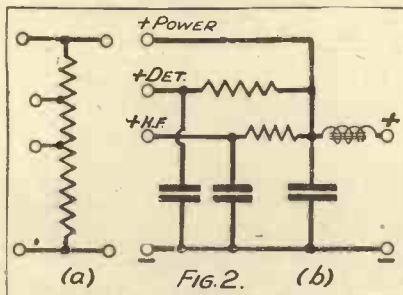
In the case of A.C., the supply must first be converted into a pulsating direct current before smoothing.

The two classes of rectifier used for this purpose are the "valve" and "metal" types respectively. The main requirement in each case is to get a rectifier to handle the necessary current. Overloading is particularly injurious with metal rectifiers, and care must be taken also not to exceed the maximum rated voltage. A trans-

wave" valve rectifier is cheaper, and the circuits slightly less complicated.

The "voltage-doubler" principle is a particularly useful arrangement for "full-wave" circuits employing Westinghouse rectifiers. Here, the rectifier is connected in such a way as to give a full-wave output, together with a "step-up" in transformer voltage. Thus, one type gives 135 volts output with only 80 volts off the transformer and a range of higher outputs are available.

## ALTERNATIVE METHODS



The potentiometer arrangement (a) is not so good as the alternative method (b) of obtaining the requisite voltage tappings, because it tends to cause "feed-back" effects.

former giving correct filament heating voltage is especially important with a valve rectifier.

## Choice of Rectifier

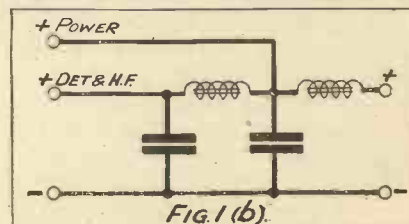
Both types are made for "half-wave" or "full-wave" rectification, and the question often arises which of these methods is the better. Actually, there is little to choose between them, except perhaps that less smoothing may suffice for a "full-wave" output owing to the doubled frequency of ripple. On the other hand, a "half-

## Removing Hum

The choke and condenser method, illustrated in Fig. 1 (a) still holds the field as a ripple eliminator. The higher the values of inductance and capacity the better will be the smoothing, but it will seldom be necessary to exceed, say, 50 henries and 4 mfd. The actual degree of smoothing necessary depends on the nature of the ripple; owing to its lower amplitude, D.C. ripple can often be eliminated with far less equipment than A.C., but that must not be taken as a general rule.

An excellent eliminator can be made

## ADDITIONAL SMOOTHING

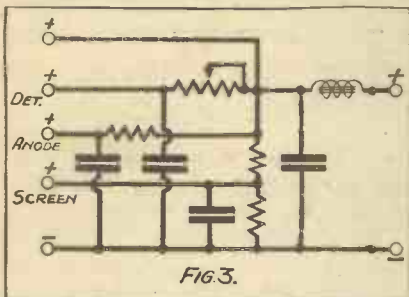


It is sometimes an advantage to add a further smoothing choke in series with the common lead to the detector and H.F. stages. The current in this part of the circuit is comparatively small, and the choke can therefore be of an inexpensive type.

## Mains Unit Design—continued

with only one smoothing choke and condenser as shown, but it will not necessarily be the most economical design where heavy currents are concerned. A large inductance, heavy current choke is apt to prove expensive, and it should always be remembered that the inductance must be high at the maximum current, e.g. a 30-henry, 20-milliamp. choke

### SEPARATE TAPPINGS



In this circuit the detector voltage is adjustable, while a simple potentiometer tapping provides the correct potential for the screening grid. It will be observed that each tapping is shunted by a large condenser.

will not give anything like that inductance at 40 or 50 milliamps.

For this reason, it may be advantageous to put in a lower value main choke (where, for example, a super-power stage takes the bulk of current), and add further smoothing in the common lead to the detector and H.F. stages where any ripple present is liable to get greatly amplified by succeeding stages. This is shown in Fig. 1 (b), and since the current is comparatively small at this point, the choke can be quite an inexpensive type.

### Avoiding Feed-Back

After smoothing has been effected, the output tappings must be so arranged as to stop the "feed-back" of once amplified energy into preceding stages. An eliminator not properly decoupled would give rise to howling or "motor-boating," or set up bad distortion, but it may happen, of course, that a receiver already incorporates thorough decoupling in its circuits.

### Separating Circuits.

An early method of arranging output tappings was to use one resistance in potentiometer fashion, as in Fig. 2 (a). This is the worst possible circuit for causing "feed-back," for the

resistance is obviously "common" to all the valves. It is still used for grid-bias units, but all modern eliminators have the anode-feeds well separated by resistances and condensers in each, as in Fig. 2 (b).

Incidentally, these resistances also serve for voltage "dropping," as discussed later. In fact, their ohmic values are limited by the permissible "drop"; where the resistance itself is low, decoupling can be increased by using a larger shunting condenser. A more practical and satisfactory method, however, would be to divert the heavy current impulses of the power stage by means of a choke-filter.

### Choosing Resistances

Knowing the maximum available voltage from the mains or rectifier, the anode-feed resistances must be of such values as to give the required "drop" for a particular anode current.

Thus, if the available volts are 150, and we require, say, 60 volts for the detector, the resistance in that feed tapping must drop  $150 - 60 = 90$  volts. Taking the normal plate current as 2 milliamps., or .002 ampere, the ohmic value is given at once by the Ohm's

Law relation:  $90$  divided by  $.002 = 45,000$  ohms.

Evidently, the above sets the limit to the maximum value of resistance, irrespective of decoupling, although it may be noted that the higher the input volts the greater the resistance. For example, to give the above plate voltage off D.C. mains at 250 volts, the resistance must absorb  $250 - 60 = 190$  volts, and its value, therefore, is  $190$  divided by  $.002 = 95,000$  ohms.

### Use of Variable Tap

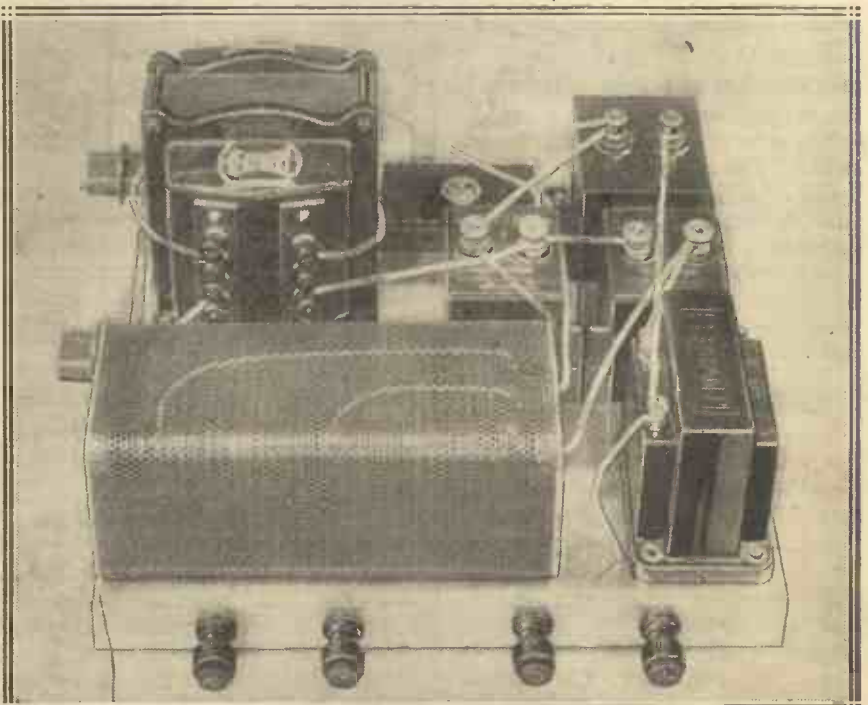
It is seldom advisable to put resistances of "fixed" values in detector and H.F. stages. For best results the plate voltages are somewhat critical, and as we assumed an average figure for the current, the results may vary considerably with different valves. The objection is overcome by using a "variable" resistance of about the calculated maximum value, or slightly higher. This can afterwards be lowered to any value desired, and the current suitably adjusted with a milliammeter.

### Obtaining Screen Volts

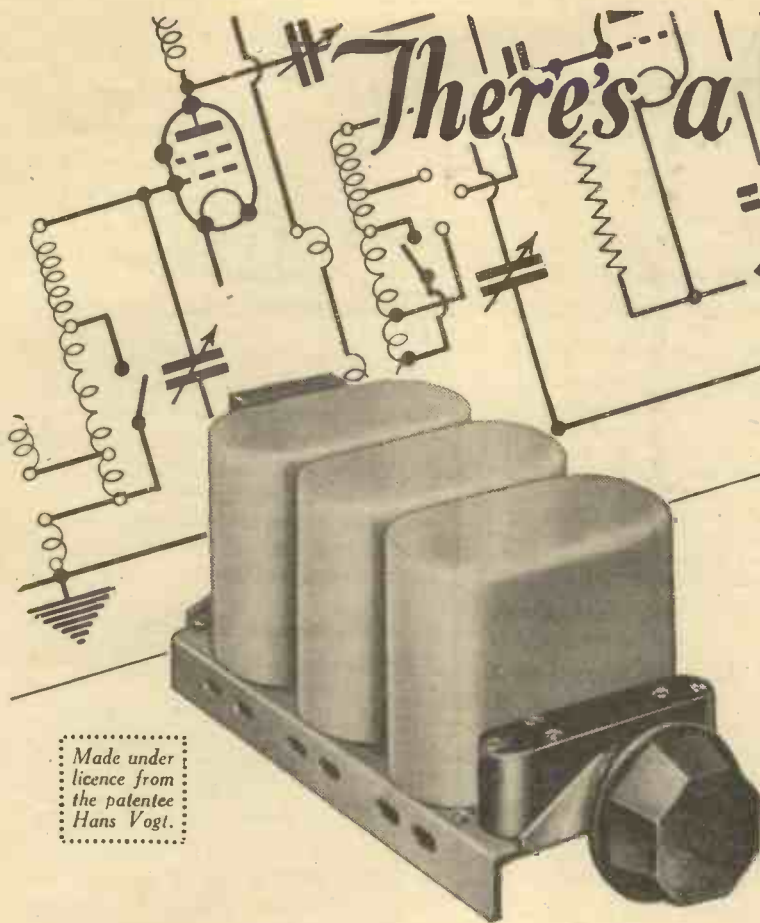
The anode voltage for an S.G. stage is adjusted by a series resistance, calculated as above, but the screen

(Please turn to page 320)

## MAINS UNIT DESIGN IN PRACTICE



A typical home-constructor A.C. mains unit. A metal rectifier can be seen in the left foreground, and next to it the smoothing choke. Behind these two components are the mains transformer and the necessary reservoir and smoothing condenser.



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# IN LIGHTER VEIN

"WHAT," I asked the Professor, "are these new ferro-concrete coils?"

"Ferrocort, you ass."

"Oh, well. I knew it was ferro-something; but what are they, anyway?"

"Don't you ever read your wireless papers?"

"My dear fellow," I said, with an air of superiority, "I write for them. As one of the leading authorities on wireless—"

The Professor guffawed rudely.

## MAKING A START



"Being pukka sahibs, we did not remove the entire bedstead. We merely took the bit at the lower end and then thoughtfully propped up the foot with volumes of the Encyclopedia Britannica."

"And yet you don't know what an iron-cored coil is," he remarked rather nastily.

"Of course I do," I replied; "I was merely seeing whether you did. And, what's more, I don't believe that you know the first thing about them. Fire away, and we will see."

Strictly between ourselves, dear reader, if you are a little shaky in any particular subject, take my tip and get the other fellow to do the talking. It is usually quite easy if you egg him on by casting doubts upon the extent of his knowledge.

## A Common Fault

The Professor was by now well away and I just lay back in my chair, making appropriate noises at intervals. Ferrocort coils, I gathered, have cores made up of paper strips to which little particles of iron are glued.

Nucleon cores, on the other hand, consist of iron dust embedded in insulating material. Either system

"The Goop-Wayfarer Ferrogrease coil will be one of the sensations of the season," said the Professor as he set to work on his first home-constructor model. The results, however, were somewhat unfortunate for both the Professor and Wireless Wayfarer, as you will quickly gather when you read Wayfarer's own story.

gives you a highly efficient coil, as you can prove by cosines and half the letters of the Greek alphabet.

"Both ideas seem to me to be excellent," I remarked, but "there is one trouble that sticks right out with regard to both of them. Your ferro-concrete—"

"Ferrocort."

"Ferrocort coils need magnets and combs and things to put their particles in place when they are being made. And as for Nucleon, the pressure, during manufacture, of a hundred tons to the square inch rather places the construction of such cores outside the scope of the home constructor. Now could not you and I devise an easily made iron-cored inductance?"

"Might be done," mused the Professor, "but where are we going to get the iron dust from, first of all?"

## Thinking It Out

"Let's try draining the gearbox of your car," I suggested hopefully. "Judging by the noises that you make when changing gear, you must have ground off most of the rough edges by this time."

The Professor looked daggers.

"We might grind down some soft iron with Poddleby's emery wheel," he said presently; "but how are we going to manage the separate insulation of each particle?"

"If we stirred them well up with some good grease, don't you think that each would acquire a useful little insulating envelope?"

"That's an idea, certainly, and then how are we going to make our cores?"

"Well, we just melt up some ebomite or something of that kind, and stir our greased particles into it, and then we mould the mixture into the required shape. Why, man, it's absolutely plain sailing. The Goop-Wayfarer Ferrogrease coil will be one of the sensations of the season! Let us get to work at once."

## Fortunate Discovery

Really soft iron is not so easy to find as you might think. It took us a long while to discover any adequate source of supply in the Professor's house. By great good fortune we discovered that Mrs. Goop's somewhat ornate bedstead was not brass all through, for all its appearances. A thin covering of the yellow material concealed beneath it solid iron which, after tests, we felt sure would be exactly what we needed.

Being pukka sahibs, we did not remove the entire bedstead. We merely took the bit at the lower end and then thoughtfully propped up the foot with volumes of the Encyclopedia Britannica.

## Promise of Reward

In return for the promise of a one-eighth share in the proceeds of our world-shaking invention, Poddleby was only too glad not only to lend his emery wheel, but also to supply the motive power. The exercise, I

## "SIMPLICITY ITSELF"



"The Professor would, of course, upset the bucket before ice had really started operations. This, however, made matters really easier."

am sure, did him a world of good, and he must have lost at least a stone in weight before we had filled a bucket half full of iron dust.



## In Lighter Vein—continued

It is, of course, of the utmost importance that the iron in Ferrogrease and other coils should be free from impurities and we felt little doubt that a certain amount of emery particles and also possibly some of the stone that Poddleby had lost had become mingled with our iron. The obvious way to extract iron alone from such a mixture is to make use of a magnet, and we were fortunate in obtaining a very powerful one from the works of Goshburton Crump's moving-coil loudspeaker in the absence of its owner.

### THE UNHAPPY AWAKENING



"The whole hearth was thus a lake of burning ebonite from which arose thick and rich blue smoke."

As the Professor's laboratory was being used by the gardener for the potting of chrysanthemum cuttings, or something of that kind, we had to fall back upon the drawing-room of the "Microfarads" as our workroom. This, as I pointed out, was all to the good, for the average constructor—for whom we were designing the coils—would probably not possess a laboratory. If we could produce coils in the drawing-room, so could he.

### Making Things Easier

The Professor would, of course, upset the bucket on the carpet before we had really started operations. This, however, made matters really easier, for by spreading its contents about a little it was simplicity itself to run the magnet to and fro amongst the dust and to sift out the iron from the impurities.

I must say that there seemed to be a surprising lot of impurities. It took us actually all our time to collect half a teacupful of iron particles, but we felt that this would be ample for our first core.

"And now," I said, "for some first-rate grease."

Following the Professor's directions, I glided from the room and returned presently with a whole armful of little ornamental pots. "That ought to be

good stuff," he said; "my wife spends enough on it."

And good stuff I found it to be when I scooped out the contents of the first pot with a teaspoon. "Debaggo" for baggy eyelids, I saw it was called on the label. "Rejuveno" for tired skins, "Osos-muthine" for crows' feet, and Tonic Cream for Sagging Cheeks seemed to be every bit as good.

### A Well-Earned Rest

Their purity, anyhow, was guaranteed on the labels. And I could not think any of them dear at the guinea a pot at which they appeared to be priced.

They mixed well with iron dust, and I had little doubt on examining the mixture after careful stirring that every particle was insulated in the most satisfactory manner.

Whilst I was finishing the insulating process the Professor had rummaged out a large saucepan from the kitchen. This he placed upon the fire and proceeded to fill it with bits of old panels and other scraps of ebonite.

We then sank into chairs for a short easy whilst the ebonite melted. So exhausted were we by our labours that we must both of us have dropped off to sleep. We were awakened simultaneously by a feeling of undue warmth round our legs and the father of all smells.

The watched pot, we know, never boils. In this case the unwatched pot had boiled over. The worst of ebonite is that when liquified by heat it catches fire with great ease. The whole hearth was thus a lake of burning ebonite, from which arose a thick and rich blue smoke.

### Presence of Mind

Having been well instructed in fire-fighting in my youth, I knew that the only thing in such a conflagration was to stifle it. Without a moment's hesitation I seized the hearthrug, flung it upon the blaze and stamped it down. Thanks to my presence of mind the flames were subdued in an instant.

"Well, there goes our ebonite, I'm afraid," sighed the Professor.

"Not a bit of it. All we have to do is to remove the hearthrug from its present position, turn it upside down, and scrape the melted ebonite from its underside. We must then put it

back into the saucepan, mix in our greased iron filings, and then, if necessary, boil up the mixture again before casting two or three formers."

I seized one end of the hearthrug and pulled. It came away with a noise like an elephant removing its foot from a swamp.

"Here," I cried, "get hold of the other end and tug. My hands are both stuck to this one."

The Professor seized his end and the next moment he was stuck too.

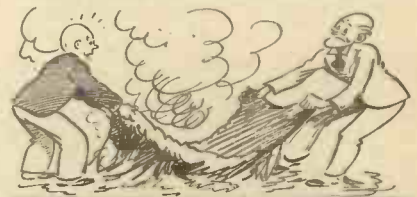
### The Wrong Turning

Great strings of semi-molten ebonite pulled out as we conveyed the rug across the floor. When we got to the sofa something went wrong. Instead of turning outwards we both turned inwards, and in the twinkling of an eye we were side by side with the rug firmly wrapped round us.

At this juncture Mrs. Goop, alarmed both by the smoke and by our shouts, came rushing in. She seized the first bit of the rug which she saw and pulled hard. In no time all three of us were completely immobilised.

Luckily some passer-by had seen the smoke issuing from the drawing-room window of the "Microfarads" and hastened to give the alarm to the Mudbury Wallow fire brigade.

### KEEPING THEIR HEADS



"Here," I cried, "get hold of the other end and tug" . . . The Professor seized his end and the next moment he was stuck, too."

Though the front door was not locked, they smashed it down with axes and came in prepared to do or die.

Finding that there was no fire to put out, they set themselves the task of freeing the Professor, Mrs. Goop and myself by turning their combined hoses upon us. The only result of this was to set the ebonite hard. Finally they freed us with the aid of hacksaws.

Though our results were distinctly promising, as the reader will admit, I do not feel that the time has yet come for the home-constructor to make his own Ferrogrease coils.

# GERMANY'S RADIO PROGRESS



An account of the outstanding features displayed at the recent Berlin Radio Exhibition.

By A. A. GULLILAND.

THIS year's German Radio Exhibition showed slow but sure progress on that of 1932. All firms had produced new models, but on looking at these more closely, one was surprised to find that they were merely improved designs of last year's sets.

In spite of this, there are one or two entirely new features. Automatic volume control has become more universal, and is simplified by the use of the double-diode-triode valve, called a "Binode" in Germany.

Prices are generally down a little. The five-valve superhets, which in Hitler's own country are more or less de-luxe sets, are all fitted with some kind of optical device which exactly shows when a station is properly tuned. This is a very valuable feature in a superhet.

In some cases, a milliammeter is used, in others some kind of a shadow device.

### Adjustable Sensitivity

Another feature of these five-valvers is the adjustable sensitivity of the set. By turning a knob, very distant stations and, incidentally, atmospherics, etc., can be eliminated.

The four-valve "straight" sets, with three tuned circuits, remain in favour. In one case, they are also fitted with automatic volume control, but this is less extensive than in the case of the superhet with its greater power reserve.

The price of the cheapest one-tuned circuit two-valver is fixed by joint contract, at not less than 120 marks (about £9). This measure was

thought necessary to improve the chances for the "people's set," the "Volksempfänger." Further to mark the difference between this ultra-cheap good quality receiver, built at the "wish" of the Government, these 120-mark sets all have short-wave reception as well as long and medium.

The "Volksempfänger" is a one-tuned circuit, two-valve receiver with reaction on aerial (!), which is manufactured jointly by all twenty-eight German radio firms, each having its quota. The receiver is made in three models: A.C. mains, D.C. mains, and battery. For this latter, a special battery-saving circuit was to be used, designed by Mr. Nestel, of the R.R.G., but the licensing firms seemingly did not agree, and it has been dropped in the meantime.

### Cheaper Valves

The "Volksempfänger" is sold complete with valves, which, contained in the set, cost considerably less than if bought loose for renewal. Plugs

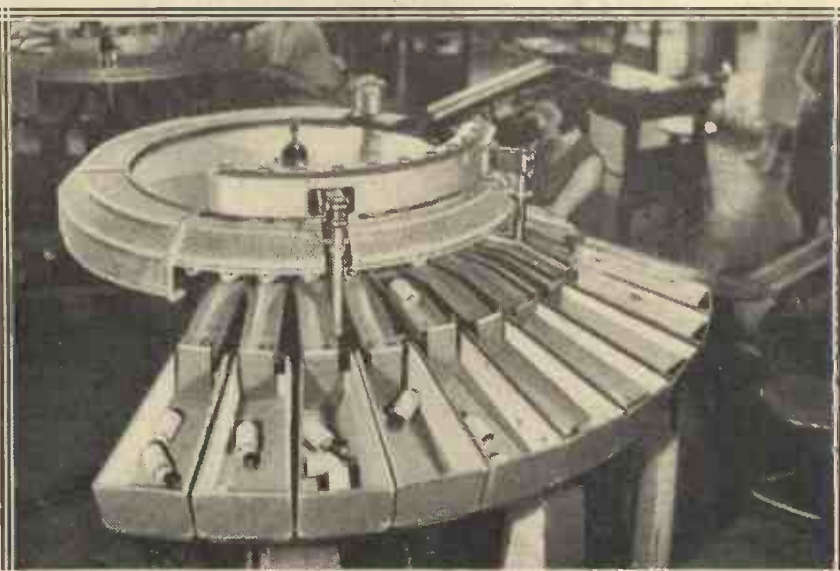
for a gramophone pick-up and dial illumination have been omitted, so as not to spoil the market for sets whose prices are calculated on normal lines. Each receiver is of the all-in type with a floating magnet loudspeaker incorporated.

### Very Small Profit

The price of the "Volksempfänger" is 76 marks (a little over £5) for the A.C. and D.C. mains models, complete with valves, and 65 marks (less than £5) for the battery model, with valves, but without battery. This price could only be arrived at after general sacrifices on all sides.

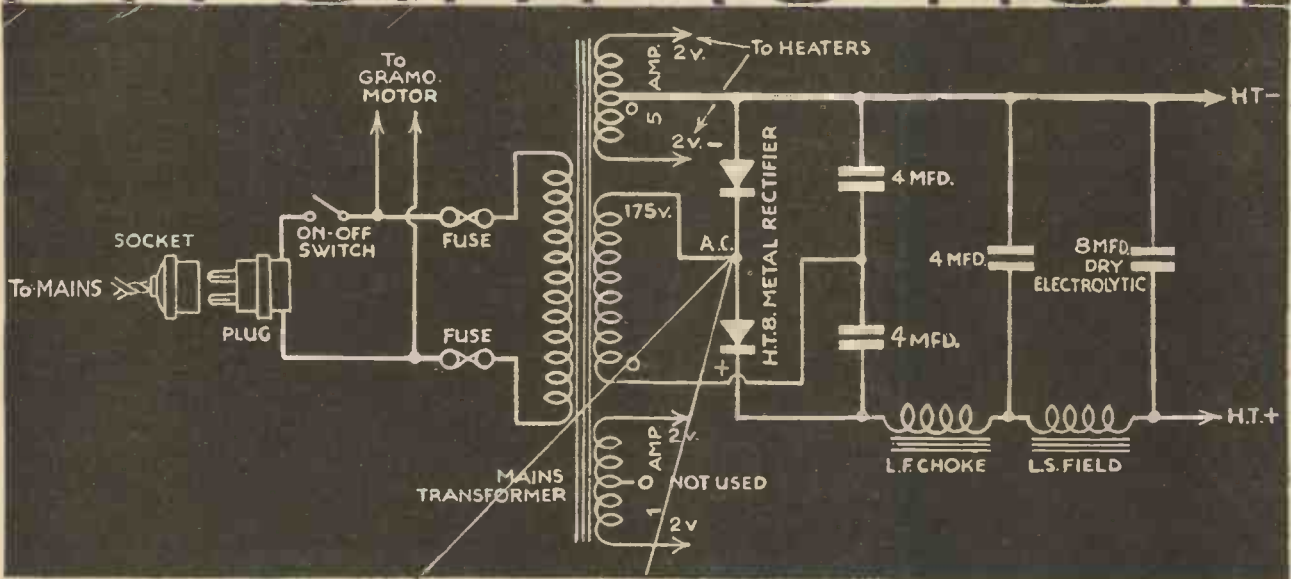
Television was very prominent at the German Show; the new standard German picture contains 180 lines and has 25 frames per second. The Germans are now satisfied that the quality of this picture will be sufficiently satisfactory to the public, and intend introducing ultra-short wave television broadcasting within the next year.

## AUTOMATIC TESTING AND REJECTING



In this testing machine, faulty valves pass into one of the ten boxes according to the fault they may exhibit. Only perfect specimens pass through into the packing machines.

# A POINT TO NOTE



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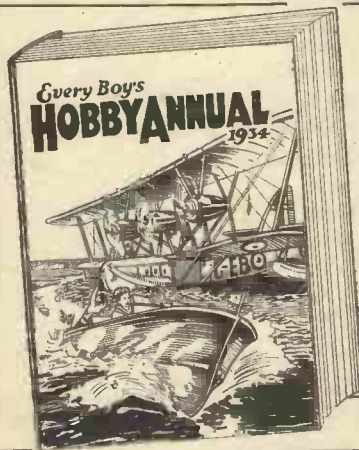
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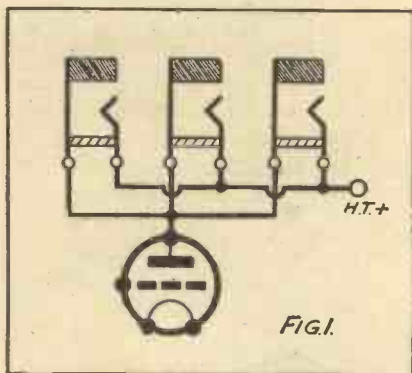
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# Switching with PLUGS and JACKS

FOR some curious reason the telephone plug and jack are very much neglected by radio enthusiasts in this country. It is not quite clear why these components should be so slighted unless it is

## LOUDSPEAKERS IN PARALLEL



When loudspeakers incorporate their own transformers, or can be joined direct in the plate circuit, this is a handy method of connection.

because they are somewhat more expensive than a simple pair of terminals.

The pair of terminals, however, will only perform the most elementary of the many functions of which a jack is capable, that of connecting a loudspeaker or pair of telephones in a circuit, and even in so simple an application as this the jack is very much more satisfactory, since the speaker can be connected or disconnected by merely pushing or pulling the plug without unscrewing more or less inaccessible terminals.

## Testing Receivers

The value of this point will be appreciated most readily by experimenters and constructors who have, say, two or more receivers or amplifiers which they wish to compare or change over rapidly from one to another. This is a minor advantage,

however, compared with some of the other possibilities; for example, with a suitable jack the same movement that disconnects the loudspeaker can be made to switch off the receiver (if it employs battery valves), and in the same way the second receiver is switched on when the loudspeaker is plugged in.

## Balancing Costs

Thus a filament switch becomes unnecessary, and its price may be put towards the extra cost of the jack over that of a couple of terminals.

Single-circuit jacks may be used to connect several loudspeakers or headphones in parallel, as shown in Fig. 1. If loudspeaker points are

By K. E. B. JAY.

Many constructors who still have plugs and jacks to spare will welcome the suggestions for using them which are outlined here. It will be seen that these handy accessories lend themselves to a wide variety of purposes making for simpler radio.

wanted in several rooms, this is the usual method of wiring them, but special wall jacks are obtainable that are more convenient for mounting on walls than the simple panel-mounting jack.

## Adding Contacts

Another use for the jack is in voltage measurements. Should it be necessary to be able to measure a certain voltage often, say, that of the H.T. battery, and at the same time the voltmeter is needed for other purposes, a single circuit jack can be connected across the battery whose voltage is required and mounted on the panel of the receiver or battery box; a plug is connected by twin flex to the voltmeter so that it can be plugged in whenever the voltage reading is wanted.

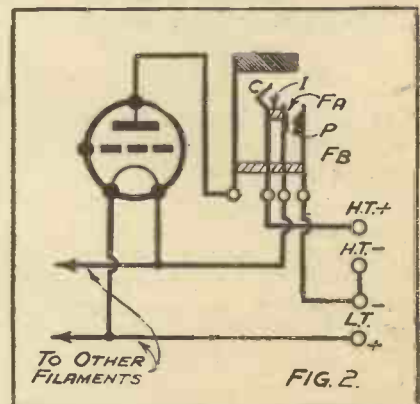
The next and more complicated kind of jack, shown diagrammatically in Fig. 2, is called the single circuit filament control jack. Two extra contacts ( $F_a$ ,  $F_b$ ) are provided.  $F_a$  is mechanically fixed to the ordinary contact  $C$  by an insulating block ( $I$ ); when the plug is inserted  $C$  is pushed outwards and with it  $F_a$ , so that it presses against the little tungsten contact point  $P$  on  $F_b$ , and so completes any circuit connected to the two contacts,  $F_a$ ,  $F_b$ .

## Automatic Switching

Fig. 2 shows this jack connected as an output jack in the usual way, the two extra contacts being connected in the L.T.—circuit. With the plug out the L.T. circuit is broken and the set switched off; push the plug in and the circuit is completed and the set ready for use.

Next to the single circuit jack in order of complexity, apart from the

## FILAMENT AND OUTPUT SWITCHING



With this arrangement plugging-in the loudspeaker switches on the set.

single circuit filament control jack, is the single closed circuit jack. This is arranged so that an inner contact ( $D$ ) (Fig. 3) connects with the main contact  $C$  when the plug is withdrawn. If  $D$  and the frame  $F$  are connected

## Switching with Plugs and Jacks—continued

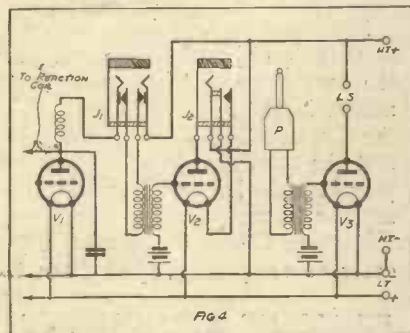
together the jack will be short-circuited with the plug out.

### Series Connections

When the plug is pushed in, C is pressed away from D, the circuit opened and the apparatus connected to the plug put in circuit. Two or more of these jacks arranged in series, as in Fig. 3, permit two or more pairs of headphones to be used in series, any of them being removed without disturbing the others. Another use for the jack is in measuring currents. A single closed circuit jack is placed in the circuit whose current is required; normally the jack is short-circuited, but when a plug, connected to a milliammeter, is inserted the meter is placed in circuit and the current can be read off.

To cut out the intermediate valve in a det. and 2 L.F. set an extra plug

### CUTTING OUT A VALVE



This diagram shows how a whole low-frequency stage can be removed by the use of the plug marked P.

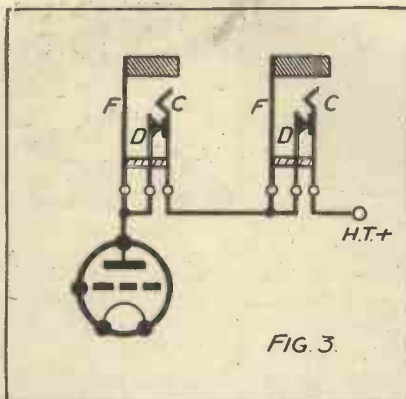
will be needed, connected by a twin flex to the second transformer primary, the flex being brought out through a hole in the panel so that the plug can be plugged into jacks mounted on the panel.

P in Fig. 4 is this plug. J<sub>1</sub> a double closed circuit jack, J<sub>2</sub> a single filament control jack in the anode circuit of the first L.F. valve V<sub>2</sub>. With P in J<sub>2</sub> both L.F. valves are in use. Transferring P to J<sub>1</sub> puts the output valve directly after the detector and cuts out the intermediate valve, switching off its filament.

### Parallel-Fed Transformers

In cases where the transformers are resistance-capacity fed the circuit must be modified to that of Fig. 5. It will not be necessary to take two connections to the extra plug, only

### FOR PHONES OR METERS



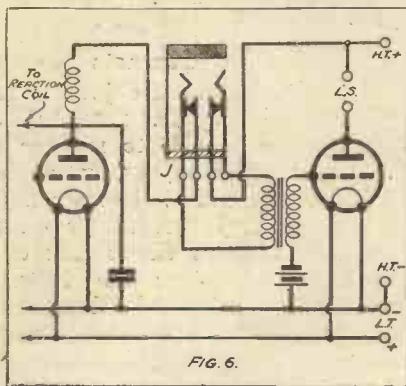
The single closed circuit jack is invaluable for quickly inserting a milliammeter or pair of phones.

one side of the transformer primary going to the tip of the plug. J<sub>2</sub> is, as before, a single circuit filament control jack, and J<sub>1</sub> could be a single closed circuit jack instead of a double circuit component, if it happened to be available.

It often happens that the constructor wishes to try out a new detector or H.F. amplifier arrangement, and at the same time does not want the expense of an L.F. stage: or perhaps a short-wave receiver is built that will give good signals on headphones, but not on a loudspeaker.

In either of these cases the output stage of the usual broadcast receiver can be used separately from the other valves in it with the aid of a double circuit jack. The connections are given in Fig. 6. The phone terminals of the short-waver are connected by a flex to a plug, and when this is plugged into J the receiver is connected to the L.F. amplifier, whose

### THE OUTPUT STAGE



The output stage can be used separately from other valves by the aid of a double circuit jack.

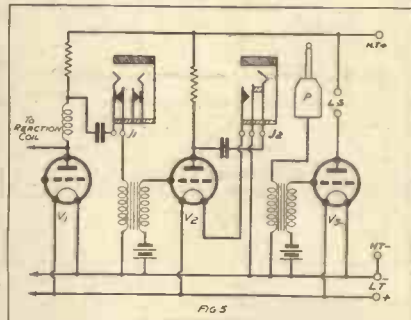
loudspeaker then reproduces the short-wave signals.

### Unsuitable for H.F.

If this circuit is adopted a spare filament switch must be provided to switch off all the earlier valves in the broadcast receiver, although it could be done automatically if a double closed circuit jack with double filament control is obtainable.

Plugs and jacks should never be used in the circuits of the H.F. or detector valves owing to their very high self-capacity. For the same reason jacks must be confined exclusively to circuits carrying L.F. or direct currents, but in such circuits they might very well be used more often than they are nowadays. Most of the usual methods of connecting them have been given here, but the ingenious can devise many other uses.

### FOR SHUNT-FED L.F.



In Fig. 4 we have transformer-coupling, and the above diagram shows how a similar stage-switching can be carried out when shunt-fed transformers are employed.

\*\*\*\*\*  
\* **DETECTING OSCILLATION** \*  
\*\*\*\*\*

**L**ARGE output valves connected in push-pull sometimes oscillate at a very high frequency and thus give rise to distortion for which an obvious cause cannot be found.

This condition may, however, be readily detected by a simply-made "gadget" consisting of a single loop of wire (about 3 in. diameter) tuned by a short-wave condenser. An ordinary flash-lamp bulb is wired across the condenser.

If this "oscillation indicator" is held near each of the valves in the push-pull stage in turn and the condenser "tuned" from zero to maximum, the lamp will glow if either valve is oscillating.

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# Better BAND-PASS Tuning

WHEN a receiver is designed primarily for quality reproduction, any failure to attain perfection is usually traceable to small faults or compromises in design. A designer who knows his job would very soon become aware of any inaccuracy in his calculations or the use of unsuitable components, by the performance of the set, and whilst he may be just as much alive to small faults, he often has to permit them to remain because their elimination would involve complications.

### Selectivity and Quality

Take the case of tuning, for instance. Any loss of quality in the earliest stage of the set will be amplified as it passes through successive stages. Tuning which is too sharp may cause the sidebands to be cut off, yet if tuning is made broader to overcome this trouble, interference may be experienced. If there were only one local station and no powerful foreigners, as in the earlier days of broadcasting, then tuning could be as broad as it liked and there would be no risk of attenuating the high notes or heterodyning.

Distance and quality do not go hand in hand. That is not to say that a receiver is not capable of giving good quality from distant stations, but such a receiver is not necessarily equally good for local reception. The degree of selectivity necessary nowadays for distant work is a bit too acute when dealing with a large input from a powerful local station.

### Dispensing With H.F.

When quality from the local is the first consideration, it is better to do without an H.F. stage if the detector can be sufficiently loaded without it. H.F. does have such a nasty habit of bringing in what isn't wanted.

If, then, we are so situated as to make a detector-L.F. circuit permissible, it becomes necessary to consider the method of tuning which will give sufficient selectivity without

*Many set-builders have found, like our contributor, that band-pass tuning fell far short of the hoped-for results. In this article an ingenious modification is suggested by means of which far better reception was obtained.*

By R. H. BRADLEY.

cutting sidebands more than can be helped.

Of course, band-pass! But band-pass tuning is not favoured as much as it probably deserves. Why? Largely because it is so seldom operated at its best, so that users either think it is not so selective as is reputed or that it gives less volume than a single circuit tuner. Both these all too common complaints are usually caused by incorrect adjustment of the tuner.

Band-pass tuning is not nearly so new as many readers probably think.

### IS ACCURACY WORTH WHILE?



*To get an exact trimming balance is admittedly no easy task, but our contributor is emphatically of the opinion that improved results more than justify the trouble.*

In fact, it was one of the earliest types of tuning used, consisting of two tuned circuits coupled together either inductively or capacitatively. Fig. 1 shows a band-pass circuit in which the coils are coupled by means of the small condenser C, the coils themselves

being screened from each other. It will be obvious that both circuits must be accurately tuned; the circuit as a whole is capable of being very selective so that the slightest discrepancy in either circuit will affect signal strength. Consequently the use of a ganged condenser can only be considered satisfactory if the ganging holds good at every tuning position—a condition that seldom obtains. A slight discrepancy will not be noticeable when amplification is considerable, but when there is no H.F. stage, care must be taken to avoid losses.

### Coupling Considerations

Then there is the coupling. If the condenser C is too large the coupling will be tight and selectivity will be poor; if too loose, selectivity will be high but the transfer of energy will be decreased and signal strength will fall. So that here again care must be taken to get matters just right.

And now the question arises—is such accuracy worth while? Will the trouble taken to avoid losses due to inaccuracies in tuning and coupling be repaid in terms of signal strength and quality? As a result of experiments, the writer is prepared to answer with a most emphatic "Yes."

First, as to tuning. The use of two separate condensers would be a nuisance if the set is intended for domestic use; the use of a ganged condenser is much to be preferred. Now, most ganged condensers have trimmers fitted, but these are not intended for constant adjustment and are consequently not too accessible.

### Differential Trimming

The writer, therefore, considered the use of separate trimmers, mounted in an accessible position, and a little study of Fig. 1 suggested that as one side of each trimmer is at earth potential it should be possible to use a ganged trimmer. This led on



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**BETTER BAND-PASS TUNING—continued**

to the idea of using a differential condenser as in Fig. 2 (simplified), with which capacity could be added to one circuit as it was subtracted from the other.

A brief test quickly proved what a vast improvement resulted.

Of course, the total capacity of the differential condenser was distributed between the two circuits, and in order to prevent this it was a very simple matter to cut the fixed plates in half so that, in the midway position, there was practically no capacity between the moving and fixed plates. The condenser was then as shown diagrammatically in Fig. 3.

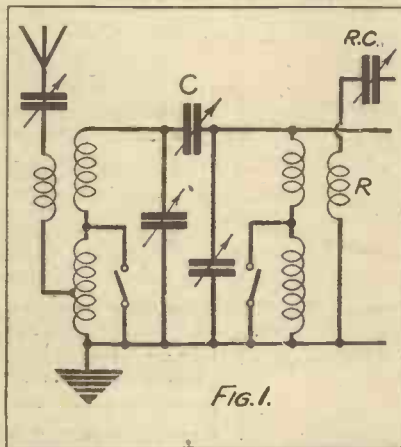
**Variable Coupling Condenser**

The next consideration was the coupling condenser. This is usually specified as about .00004 mfd., but the writer, being of an inquiring frame of mind, decided to try different values. A small condenser of the neutrodyne type was consequently fitted and gave a complete control of selectivity. Screwed up tight to the maximum capacity, tuning was broad. As it was unscrewed selectivity increased and, beyond a certain point, signal strength declined. A few tests showed that there was one setting

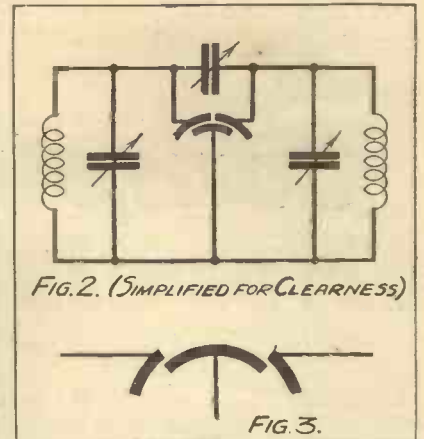
which gave high selectivity, good signal strength and no noticeable loss of high notes.

It may, at first thought, appear that such refinements are going a step too far. But it should be remembered that nothing has actually been added to the circuit. Some form of coupling condenser is essential, so that a neutrodyne type is no extravagance in this position. The only real luxury therefore boils down to the use of a differential condenser instead of the usual trimmers. The writer suggests that its cheapness and the very real improvement it brings is its justification. The adjustment of the coupling condenser does not

**HOW IT IS DONE**



The usual arrangement, Fig. 1, suggested that gauged trimming might be tried, as in Fig. 2.



By means of a differential condenser, modified as in Fig. 3, the trimming capacity is added to one circuit as it is subtracted from the other, which results in a vast improvement in tuning efficiency.

need constant attention, so that it can be mounted inside the receiver, but it is an advantage to have the differential on the panel.

It is a fact that the writer tried band-pass tuning, as generally used, and had to discard it because the input to the detector was not sufficient. An H.F. stage was then added to give the little extra boost necessary. Then this revised version of band-pass tuning was tried (using standard canned coils of well-known make) and proved so successful that it was possible to dispense with the H.F. stage. The new arrangement gave ample input for local work.

WE have read quite a lot about the need of brighter radio programmes, but what about brighter radio receivers?

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**BRIGHTER RECEIVERS**  
A Reader's Suggestion.

Unfortunately they can give only a very poor idea because the beautiful colours cannot be reproduced.

The discs on the panel are in five colours—red, blue, green, yellow, and purple. There are five sizes.

**Pleasing Ear and Eye**

The discs on the 30-in. baffle are in three sizes and four colours—red, yellow, green, and blue.

The pictures are a blaze of colour, especially the lower one, which shows the beautiful hues of a lovely sunset. This picture is removable, so that during an evening's entertainment of my friends I can put others there in turn, one of which is the well-known "Sunset on the Grand Canal at Venice." So what with my amazing W.B. Mansfield Senior

speaker, driven by the finest receiver one could wish for, my friends and myself not only have radio of an almost unbelievable quality and volume to listen to, but there is also something fine to look at, and often the songs or music blend very splendidly with the pictures.

W. H. W.

**A PICTORIAL BAFFLE**



The pictures referred to by W. H. W.

\*\*\*\*\*  
**WHERE DO THEY GO TO?**  
 Radio is "revolutionised" almost every day according to some sources of information.  
 \*\*\*\*\*

THE wireless enthusiast, looking at the world through the eyes of an illustrated daily paper during the past year, must have felt his pulse quicken, as one after another epoch-making discoveries swam into his ken.

A meagre three lines headed "Good-bye Atmospherics" proclaimed what promised to be the coming of a new era for radio in the tropics. At a conservative estimate the value of the invention ran well into six figures. "Lucky fellow," we murmured, a little enviously. Then silence. Well, hardly that, for the crackling of the atmospheric, a hint of mockery in its voice, is in our ears as we write.

Next, an oscillating crystal abolishing H.T., L.T., and all the attendant bother and expense, demanded notice. An old friend in new attire. Like a giant refreshed, he boldly hurled a challenge to the world, "Is the valve doomed?" Then, perhaps scared at his own temerity in challenging so doughty an opponent, he, too, took refuge in oblivion.

**Arousing Suspicions**

Originating with our American cousins came rumours of an ultra-sensitive loudspeaker which rendered valve-amplification virtually unnecessary.

Most tantalising of all was a photograph of a real super valve and its inventor. What a vision it conjured up, sounding as it did, the death-knell of the multi-valve set with its inevitable losses and complications. One or at most two of these little tubes relegated your seven-valve superhet to the scrap-heap. Visions of accumulator firms in hysterics. Dry battery manufacturers fished out of Hampstead Pond by the dozen. The whole electrical industry in a panic. Alas, vision it was! We continue to twiddle the knobs of our five-valve portables, filling their greedy jaws with H.T. at a guinea a box.

A frantic search through the back numbers of our favourite wireless journals failed to unearth any advance news of a single item. What could have happened to them? Then an unworthy suspicion crossed our mind. We brushed it hastily aside, leaving the problem unsolved. "Where do they go to?" Well, I leave it to you.

J. L.

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# UNCANNY RADIO

*Queer things happen in this game of radio! That a wireless receiver is not always necessary for reproducing broadcast programmes is evinced from this highly interesting account of unusual "happenings."*

By J. C. JEVONS.

**I**N spite of all the text-books that have been written on and around wireless, there are more things still to learn about it than we have perhaps yet dreamt of.

The nature of electricity is, in itself, one of the most profound mysteries in the world of science. What goes to make a wireless wave, the medium that carries it, and the nature of the Heaviside layer which forces it to follow the curvature of the earth are all matters more of speculation than of precise knowledge.

## The Crystal Mystery

Strange as it may appear, we know more about the thermionic valve than we do about the outwardly simple crystal. Exactly why and how the latter is able to rectify a carrier wave, so as to separate out the low-frequency signal, cannot yet be told in simple language. Nor is it thoroughly understood even by the experts—at least, not in a form on which they are all agreed.

We have, it is true, formed a fairly complete picture of how "the wheels go round" in the case of the valve. So much so, that we can modify its "characteristic" pretty well as we please, as witness the introduction of the variable- $\mu$  type. But when all is said, the valve depends for its action upon the nimble electron, and of that we know so little that we are not yet certain whether it is matter or not. It may have the nature of a material particle, or it may be merely a form of wave energy. Sometimes, it appears to act as a corpuscle, and at other times as a wave.

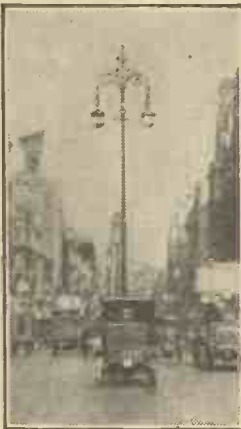
This being the case with what may be called the "fundamentals" of the

subject, it is scarcely surprising that from time to time one hears of radio "happenings" which, to say the least of it, are difficult to explain.

## A Human Aerial

One of the commonest concerns the mysterious occurrence of speech and music in places or in circumstances in which there is no apparent means for picking-up or rectifying the broadcast waves which are their undoubted cause.

Of course, such statements have sometimes to be discounted, as in the case, for instance, of a correspondent who claimed that he was the



## THE "SINGING ARC"

*Have you ever known a street lamp to burst into song? Probably you haven't, yet some years ago a lamp in one of the London streets caused a sensation by suddenly reproducing the London programme.*

perfect "human aerial," and could tune himself to all the B.B.C. stations and hear their programmes directly, without requiring even a pair of headphones, to say nothing of crystal, valve, or other impedimenta!

## Loudspeaker Deputies

But sticking to the realm of fact—as distinct from fancy—a listener is often puzzled to find that he can get speech and music from his set even when the loudspeaker is disconnected.

Usually, the set is of a somewhat ancient vintage, and the explanation is to be found in, or around, the low-

frequency transformer. If there are any loose parts—for instance, the laminated plates in the core—the passage of the low-frequency current will set up vibrations which vary with its own fluctuating amplitude.

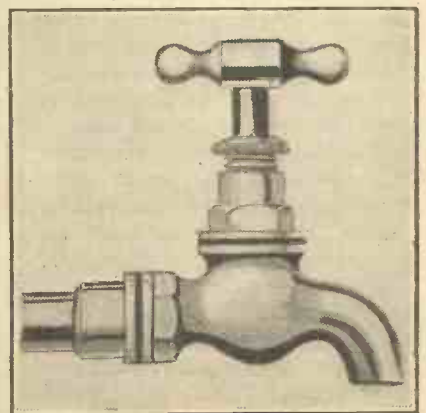
In short, the loose parts perform the rôle of the diaphragm of the missing loudspeaker, and faint music—of a sort—will then be heard in the immediate neighbourhood.

## "Street-Singing"

Sometimes the cause is not so obvious. A few years ago quite a sensation was caused by one of the lamp-posts in a London street, which suddenly burst forth into a reproduction of the programme from what was then commonly known as 2 L O.

Unfortunately, though the occurrence appeared to be well authenticated, it lasted for only a very short period, so that the precise cause was never definitely ascertained. A possible explanation is that the energy from the near-by transmitter

## RADIO ON TAP



*You may have difficulty in believing this, but there is a case where the turning-on of a water tap was sufficient to reproduce the local programme at good strength. To stop the programme, you simply turned the tap off!*

**"UNCANNY" RADIO**

—continued

was rectified by some high-resistance contact in the circuit of the arc lamp, and was then reproduced in amplified form by the well-known action of the Duddell "singing arc."

**Music "On Tap"**

Many other instances of "phantom" speech and music have been recorded from time to time. In one case the turning-on of a water tap was sufficient to reproduce the local broadcast programme at quite considerable strength. If the programme was not up to the mark, one could, quite literally, dry it up by turning off the tap!

**Water-Pipe Aerial**

The water pipe no doubt served to collect the radiated energy, and the flow of water may have acted as a loudspeaker. Pulsating-air speakers are actually in use for handling heavy volume—more or less on the principle of the siren—and a variable gush of water might easily act in the same way. But exactly how the H.F. currents were rectified, or how they acted to vary the pressure of the water coming from the tap so as to produce sound waves, are mysteries still waiting to be solved.

**Programmes from Hot Water**

The radiator of a hot-water system has also been known to reproduce a broadcast programme. In fact, wherever one has a metallic conductor which can act as a pick-up, a high-resistance contact between different substances to serve as a detector, and some free-moving part to play the rôle of a diaphragm, it is always possible that the combination may function after the fashion of a wireless receiver.

**An Early Listener**

After ten years of broadcasting one accepts the projection of a disembodied "voice" from the loudspeaker in the most matter-of-fact way. But in the early days of the war an Irish operator, who was keeping watch for the usual Morse signals, got the fright of his life when, for the first time, he heard his headphones suddenly break out with harsh speech.

It came, in fact, from an aeroplane telephony set overhead; but from the operator's yelp of amazement he had evidently formed the opinion that it came straight from the nether regions.

**PILOT AUTHOR KIT**

**CLASS "B" CONSOLETTA**

as described in this issue

**KIT "A"** Author's kit of first specified parts including Peto-Scott **METAPLEX** Baseboard, less Speaker, Valves and Cabinet. Cash or C.O.D. Carriage paid **£4-5-0**. Balance in 11 monthly payments of 7/9.

**KIT "B"** As Kit "A" with valves, less speaker and cabinet. Cash or C.O.D. **£5-14-9**, or 12 monthly payments of 10/6.

**KIT "C"** As Kit "A" with valves and cabinet, but less speaker. Cash or C.O.D. Carriage Paid, **£7-9-9**, or 12 monthly payments of 13/9.

**SPECIFIED for the CLASS "B" CONSOLETTA**



SEND FOR OUR 1934 CABINET CATALOGUE

**KIT-BITS**

You pay the postman. We pay post charges on orders value over 10/-

	£	s.	d.
1 Set 3 Specified Valves	1	9	9
1 Peto-Scott Consolette Cabinet as specified	1	15	0
1 Colvern Ferrocart Coil type F.5.	12	6	6
1 Varley D.P.21 L.F. Transformer	7	6	6
1 R.I. D.Y.39 Class B Input Transformer	12	6	6
1 Ferranti O.P.M.17C Class "B" Output Transformer	15	0	0
1 Peto-Scott specified METAPLEX Baseboard 14" x 10"	1	9	0

**PETO-SCOTT CLASS "B" WALNUT CONSOLETTA**

In beautiful hand french-polished figured Walnut. With detachable Speaker Compartment. Front ready-drilled to take the new Victor King "Class B" Receiver. Sizes: Panel 14" x 10"; Baseboard 14" x 12" deep. Speaker Compartment 13 1/2" x 11" x 9" high. Complete as illustrated **35/-**. Cash or C.O.D. Carriage Paid; or separately, Receiver portion £1, Speaker portion 17/6.



**THE NEW METALISED BASEBOARD**

Specified by all the leading experts. Automatic screening prevents pick-up, cuts out interference, easily soldered, non-tarnishing, easily drilled with simple woodworking tools.

14" x 10"	1/9
16" x 10"	2/-
18" x 10"	2/3

In Sealed Envelope.

**SPECIFIED as alternative for CLASS "B" CONSOLETTA** Cash or C.O.D.

**PETO-SCOTT CLASS "B" PERMANENT MAGNET SPEAKER** **22/6** Carriage Paid

or by 4 monthly payments of 6/3.

**S.T. A.C. RADIOGRAM**

**KIT "A"** Author's Kit of First Specified Parts, including 2 METAPLEX Baseboards, 16" x 10", 12" x 10", and ready drilled terminal strip, less valves, cabinet, speaker and gramophone equipment. Cash or C.O.D. Carriage Paid **£11-1-6**. Balance in 11 monthly payments of 20/4.

**KIT "B"** As above but including 4 specified valves only. Cash or C.O.D. Carriage paid, **£14-3-6** or **£2-3-6** deposit and balance in 11 monthly payments of 24/-.

**S.T. 300**

**KIT "A"** Author's Kit of First Specified Components, including Ready Drilled Panel, but less Valves and Cabinet. Cash or C.O.D. Carriage Paid **£3-10-0**. Balance in 11 monthly payments of 6/6.

**STILL A FIRM FAVOURITE**

**S.T.400 BATTERY MODEL**

**KIT "A"** DELIVERED CARRIAGE PAID on First Payment of Author's Kit of specified parts, including FREE BLUEPRINT, ready-drilled panel and foil-covered baseboard, but less valves and cabinet. Balance in 11 monthly payments of 8/9 or CASH or C.O.D. **£4-15-0** Carriage Paid. **8/9**

**KIT "B"** As Kit "A" but with valves, less cabinet. 12 monthly payments of **12/3**. Cash or C.O.D. **£6-13-3** Carriage Paid.

**KIT "C"** As Kit "A" but with valves and cabinet. 12 monthly payments of **14/-**. Cash or C.O.D. **£7-12-3** Carriage Paid.

**S.T.400 CLASS "B" CONVERSION KIT**

Converts your present S.T.400 to Class "B" Amplification. Complete with all necessary components, Class "B" valve, wire and screws, etc. Full-size Blueprint, assembly instructions and diagrams. Cash or C.O.D. **37/6**. Balance in 7 monthly payments of 5/6.

**ALL CLASS "B" COMPONENTS SENT CASH OR C.O.D.** Orders over 10/- sent Post Paid. (Easy Terms available on orders over £2.) Quotations by return. No obligation. Strictest Privacy.

**5/- ONLY**

**IMPORTANT.** — Parts, Kits, Miscellaneous Components, Finished Receivers or Accessories for Cash, C.O.D., or H.P. on our own system of Easy Payments. Send us a list of your wants. We will quote you by return. C.O.D. orders value over 10/- sent carriage and post charges paid.

**PETO-SCOTT CO. LTD.** 77, City Road, London, E.C.1. Tel.: Clerkenwell 3406/77. West End Showrooms: 62, High Holborn, London, W.C.2. Tel.: Holborn 3248. Dear Sirs,—Please send me CASH/C.O.D./H.P.

.....for which I enclose £.....s.....d. CASH/H.P. Deposit.

NAME.....

ADDRESS.....

T.W.C. 10.33.

**CASH, C.O.D. or EASIWAY**



devoted to this type of entertainment; and it is interesting to note that no songs of the crooning type will be included in the programme.

**T**HERE'S a good time coming for the wireless listener, for the B.B.C. has now definitely decided to "go gay" this autumn; and "Back to the Music Hall" is to be the motto of the B.B.C.'s Variety Entertainment Department.

All manner of schemes are under discussion for the autumn variety season, and include programmes run by such famous theatrical magnates as Mr. C. B. Cochran, Mr. Andre Charlot, and Mr. Julian Wylie. There is also to be a "Crazy Gang"; a troupe of eight beautiful dancing girls; and mammoth music hall shows twice a month.

Sixteen hours each week will be

**Well-Known Stars**

It is to be hoped that by the time this issue of THE WIRELESS CONSTRUCTOR is on sale, the fight between the B.B.C. and the theatrical managers will have reached a satisfactory and lasting conclusion, for the plans on hand include many well-known stage stars. We understand, however, that even if Mr. George Black refuses to allow his stars to broadcast, the B.B.C. will be undaunted, as they are quite prepared to continue to develop talent of their own.

**A Great Success**

The success of this year's Radio Exhibition at Olympia has certainly

proved beyond the shadow of a doubt that interest in radio—far from reaching saturation point, as many pessimistic critics were inclined to assert—is gaining an ever-growing hold on people, not only in this country, but throughout the whole world.

Just after the Radio Show came to its triumphant conclusion, one important radio manufacturer stated that he had done record business in this country, and had also received orders and inquiries from almost every part of the globe.

**All Records Broken**

The total value of business done during the Exhibition broke all records, and we understand that factories and factory staffs will have to be considerably supplemented in the near future to cope with the overwhelming number of orders taken.

It is estimated that during the ensuing season it will be necessary for radio manufacturers to turn out 1,250,000 receivers, 13,000,000 batteries, 3,800,000 valves, and 7,400,000 other components and accessories—the total value of which amounts to £26,200,000.

The attendance at Radiolympia this year was also a record one, i.e.

(Continued on page 313)

**Scott-Taggart's  
Choice**

from **RADIOPHONE'S  
"MATCHED PERFECTION"  
Series**

**YOU MUST** use ganged condensers matched to the nth degree when tuning Iron-Cored Coils. That is why Mr. John Scott-Taggart has chosen a Radiophone 3-gang condenser for his new Radiogram. Radiophone Condensers are guaranteed to be matched within  $\frac{1}{2}$  of 1%; each product passes sixteen different tests before despatch. The all-steel frame and girder construction ensures freedom from mechanical distortion and so gives you permanent matched performance.

You can use any Radiophone products with the greatest confidence. To be sure of satisfaction **INSIST** on British Radiophone.

BRITISH RADIOPHONE LTD., ALDWYCH HOUSE, ALDWYCH, W.C.2



Specified for the  
**S.T. OLYMPIA  
RADIOGRAM**

British Radiophone 3-gang condenser Type 344J complete with cover and disc drive (Type 374).

Price **33/-**

**INSIST ON "MATCHED PERFECTION"**

**OUR NEWS BULLETIN**

—continued from page 312

225,000—nearly 63,000 more than last year.

**Reducing Unemployment**

It is illuminating to note that four months ago the radio industry employed 566,000 workers directly, and another 800,000 indirectly; but that as a result of the Exhibition it is expected that the number directly employed will be increased to 750,000, with proportionate increases in indirect employment.

**Political Talks**

The B.B.C. announces that another series of political talks will be broadcast on Thursday evenings during this autumn, but that these talks will differ from the talks given last year in that they will be "straight" talks, and not of the debate type. Among the speakers chosen by the political organisations are: Mr. Stanley Baldwin, Mr. George Lansbury, Mr. J. H. Thomas, Mr. Arthur Greenwood, Major Oliver Stanley, Sir Herbert Samuel, Mr. Walter Runciman, Sir Stafford Cripps and Mr. Ramsay MacDonald.

Each speaker will be fifteen unfettered minutes at the microphone; and the talks will commence on October 12th.

**Still Increasing**

The number of wireless licences issued in Australia up to the end of June, 1933, was 469,477—an increase of 99,532 over that of the previous year.

**Automatic Tone Compensation**

Readers will be interested to learn that the A.T.B. patent rights have now been acquired for a substantial sum by Marconi's Wireless Telegraph Co., Ltd., and will in due course be included in the British licensing "pools" schedule.

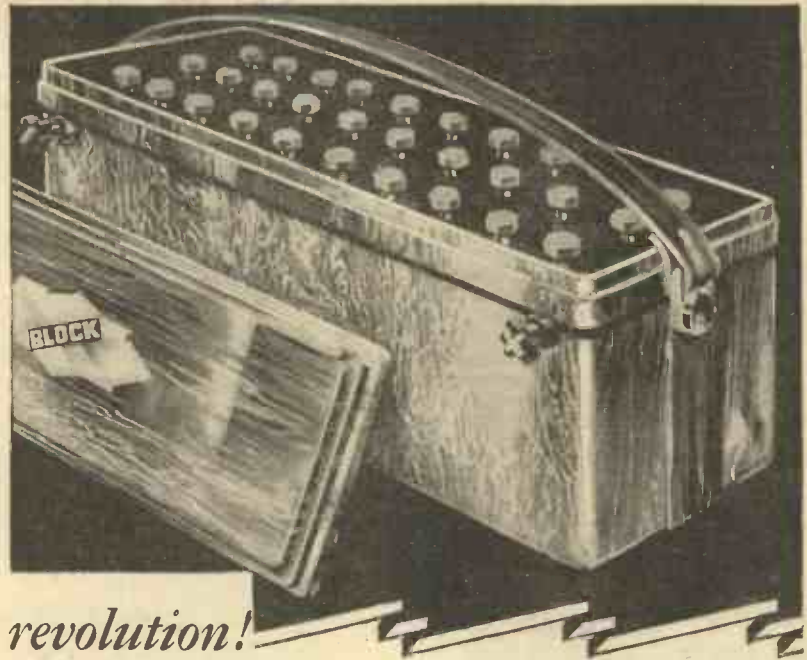
This novel and efficient method of automatic tone compensation will thus be available for use by at least one hundred British radio manufacturers.

**Effect of Reaction**

When reaction is applied to a tuned circuit there is a definite loss of high notes with a correspondingly detrimental effect on reproduction.

Anyone can test the truth of this statement by tuning in to a weak

(Continued on page 314)



revolution!

Now★

**You CAN GIVE UP**  
*dry battery*

MANCHESTER  
STAND  
**54**

**EXPENSE**



PLATE-LESS-NESS REMOVES ALL OBJECTIONS TO H.T. ACCUMULATORS



**1.** You endured the constant expense of dry batteries — because H.T. accumulators were so unwieldy. Or perhaps you put up with the existing type of accumulator?

**2.** To-day there is no need for either. The invention of the Block plate-less cell, with its double capacity, permits a H.T. accumulator that is half the usual bulk—60 v., 5,000 m.a.h. from a coloured bakelite casket hardly bigger than a dry battery!

**3.** Give up the old expense, the old nuisance. Give yourself the economy (and comfort) of H.T. in its modern, most perfect, cheapest form.

*This Block L.T. accumulator is no bigger than an ordinary 40 a.h. type, yet lasts twice as long per charge! As in all Block cells, its cylindrical negative is also the cell's container, the positive being a central column. No grids needed, therefore more "active material" and less weight; also its circular form ensures far more thorough action.*

**60** v. 5000 m.a.h. 14 1/2" x 4 3/8" x 5 1/2" lid. **37/6**  
Weight 16 lbs.  
**30** v. 5000 m.a.h. 8-3/16" x 4 3/8" x 5 1/2" lid. **21/=**  
Weight 8 lbs.



**Double capacity**  
**L.T. 80** a.h. **11/6**  
2 v.

Block Batteries Ltd., Abbey Rd., Barking, Essex. Tel: Grangewood 334617



## Here's the NEW 1934 Handbook!

New blue-prints and circuits for the construction of Mains Units, Battery Chargers, and Units for energising low voltage M.C. speakers. Helpful hints and technical data for those interested in mains working. Complete details of the wide range of mains units, transformers, chokes, battery chargers, amplifiers and condensers manufactured by Heyberd—the Mains Specialists! All completely revised and up-to-date. Fill in the coupon below and send with 3d. stamps for your copy **NOW!**

Mr. ....  
Address .....  
..... W. Co.



MONARCH OF THE MAINS.

10, FINSBURY STREET, LONDON, E.C.2.  
One minute from Moorgate Und. Stn.

## HAVE YOU SEEN?

the report on the "Magnum" 2-Gang Condenser on page 294 of this issue?  
Write for full particulars of this and many other famous "Magnum" Components to:

**BURNE-JONES & CO., LTD.**  
296, Borough High St., London, S.E.1

Write for Illustrated Catalogue of **RADIO-CRAPHIC CABINETS** of exclusive modern design, made by craftsmen in highly figured Oak, Walnut, or Mahogany, post free. **REMARKABLE VALUE** Cabinets made to order a speciality. Maker, under licence, of the **HOWE BOX BAFFLE** Recommended by the B.B.C. Full details on request. **GILBERT SWINDON** Cabinet Maker. Estimates Free. Estd. 1865

## ADVERTISEMENTS

As far as possible all advertisements appearing in "Wireless Constructor" are subject to careful scrutiny before publication, but should any reader experience delay or difficulty in getting orders fulfilled, or should the goods supplied not be as advertised, information should be sent to the Advertisement Manager, "Wireless Constructor," 4, Ludgate Circus, London, E.C.4.

## OUR NEWS BULLETIN

—continued from page 313

distant transmission and then adjusting the reaction until maximum volume is obtained. The loss of high notes will at once be apparent from the general woolliness characterising both music and speech.

### Maintaining Good Quality

Of the various methods of tone compensation, only one can justly claim to overcome this disadvantage by giving truly automatic frequency correction for each increase or decrease in the reaction adjustment.

The device in question, which is simple and effective, is known as Automatic Tone Balance, or in its abbreviated form "A.T.B.," and is the invention of Mr. G. V. Dowding, Associate I.E.E., who will be well known to our readers.

### "Man-Made Static"

Every year the Post Office deals with some 10,000 complaints re "man-made static"—as the Americans have named the interference by electrical apparatus; and it is hoped that one of the incidental results of the Radio Exhibition at Olympia will be the establishment of some sort of agreement between the Post Office and the manufacturers of electrical equipment, which will result in a general policy of fitting proper and permanent suppressors and eliminators to all such apparatus.

### Charlotte Dislikes Radio

In these days of controversy and indecision, it is gratifying to hear of one definitely unwavering mind—and a lady's at that!

Charlotte, the King's parrot, is most emphatic in her dislike of radio, and no sooner does the King switch on his wireless set than Charlotte raises her voice in loud protest. So loud, indeed, is her protest that invariably she has to be covered up.

### Television in Germany

Germany is taking a very keen interest in television these days. At the recent Radio Exhibition in Berlin one entire hall was set aside for demonstrations of the latest television sets, and this hall was crammed with interested listeners and spectators from the time the exhibition was opened in the morning until late at night.

### Government Support

Dr. Goebbels, Minister of Propaganda, is reported to have said that

the German Government is prepared to support this great scientific advance in every possible way; and German experts are of the opinion that a stage has been reached in television development which indicates that within a year it will be possible for current events to be televised to every picture theatre within range of the transmitting station.

## THE EDITOR'S CHAT

—continued from page 271

oscillator are applied to these coils, the beam of electrons can be controlled so that it sweeps backwards and forwards over the surface of the mica plate, covering every portion of it twenty-four times during each second of the operation.

Now, this plate—as has already been mentioned—has on one surface three million light-sensitive units, and on the other surface a plate of silver. Each of the units, in conjunction with this silver plate, forms a tiny condenser which stores up current in exact proportions to the amount of light that reaches the unit, and this condenser is discharged as the electron beam sweeps over it, therefore adding its quota of current to the picture signal which is being built up for transmission.

It is reported that in the present stage of development of Dr. Zworykin's system, the beam of electrons is of such size and close section that it touches three of the light-sensitive units at a time, and consequently one million picture elements are possible on the four-inch square.

### For Ordinary Lighting

Dr. Zworykin has stated that his new system will operate at a speed definitely comparable to that of the motion picture camera film, and it will therefore be possible to televise objects in ordinary light and to dispense with the intensive lighting now required for television transmission in the studio.

It is also reported that the detail of the pictures reproduced has been greatly improved, this being due to the tremendous increase in the number of picture elements which it is possible to obtain.

In an early future issue of THE WIRELESS CONSTRUCTOR we hope it will be possible to give further details of this interesting new development in television technique, together with photographs and diagrams illustrating the new type of cathode ray tube which is apparently the basis of Dr. Zworykin's invention.



**FROM MY ARMCHAIR**

—continued from page 282

Since ties came to the fore in these columns, I have studied the ties of several keen readers with whom I have come into contact lately. Other readers may care to see whether there is some connection between technical opinions and neckwear; I therefore publish some sketches this month.

\* \* \*

**This Month in the Wireless Den:—**

This is the season when condenser vanes should be carefully weeded. Green fly in aerial couplers may be removed by spraying acid from the accumulators.

Some of the young grid leaks should now be in a condition for transplanting; a good loamy soil will be found best for most varieties.

Spiders' webs should be removed from control knobs. The recent hot spell (probably a cold spell by the time you read this) makes it necessary to water the L.T.'s frequently. Only distilled water should be used.

Baseboards should be hoed thoroughly, keeping a sharp look-out for pests of every kind. Plant out your hardy annual H.T.'s, preferably on some wireless beginner. Valve anodes and grids should be kept under glass.

Many readers complain that swarms of experts are ravaging the wireless den. A good syringing with triple-duplex-variable-mu-hexode-centodes is advised.

\* \* \*

I am in the thick of designing new receivers, and there is every chance of developing something really good\*—even in this temporarily terribly hot weather. *Dum perspiro spero.*

\* \* \*

Occasionally, I get a letter from a reader who imagines that I will lend anything up to £10,000 on note of hand alone, no security. A reader in Stafford thinks I am a building society.

I wish to make it quite clear that I think it thoroughly demoralising to the borrower to lend him money. It is much better to help people to help themselves. (It is also very much cheaper.)

\* \* \*

Later: Marconi's, I see, have lost their case with Philips. The judge held that the reaction patent was valid, but not infringed. When one defends a suit for infringement one

\* This has since been accomplished, so look out for it.

nearly always states that the patent is (a) invalid and (b) not infringed. The reason is usually to protect oneself against a wide interpretation of the claims.

It is a poor consolation for Marconi's to know their patent is valid if they fail on the infringement issue.

In my opinion the loss of this case is the severest blow wireless patents have yet received. The reaction patent was generally considered the big stick in the armoury of Marconi's. It was regarded almost as holy and inviolable.

Those who feel that patent monopolies have been harshly exercised in the past will be pleased at the result. The inventor of the patent, C. S. Franklin, will be less concerned than anyone. He is the quietest and least publicity-seeking person in the world. He seems to think of nothing but getting on with his job,\* and some day his great work on short waves will receive generally the recognition it now receives in narrower circles.

Meanwhile, whatever the finer legal points may be, Franklin remains in this country the real pioneer of reaction.

J. S.-T.

\* Head of Independent Research of Marconi Co.

\*\*\*\*\*  
 \* **CONVERTING TO** \*  
 \* **"ALL MAINS"** \*  
 \*\*\*\*\*

THE conversion of a battery-operated set to all mains working is usually not a very practical proposition. This is because the mains operated valves have a much greater amplification than battery valves, and thus any tendency towards instability or distortion is bound to be accentuated. The considerations which affect the design of a battery and a mains operated set are also naturally quite different. Thus if complete mains operation is wished for, the best solution lies in building a completely new set.

One compromise is to employ an eliminator for supplying the H.T. and to operate a trickle-charger in conjunction with the ordinary L.T. accumulator. Of course, a grid-bias battery is required. In this way, however, apart from an infrequent renewal of the grid-bias battery, replacement of H.T. batteries and accumulator recharging are obviated, and the battery set is indirectly but effectively "worked from the mains."

H. C.

**acknowledged  
 THE WORLD'S  
 BEST**



The most popular and efficient type of fixed resistance for all general purposes. "Better than wire wound." All values, 50 ohms to 5 megohms.

100° F. Temperature rise.

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

Heavy Duty type, approximately double the above ratings.

**OHMITE  
 RESISTANCES**

**1/6**

**HEAVY DUTY TYPE 2/3**

Ensure a safe and efficient Aerial and Earth. The **AEROFICIENT KIT** provides all you need. 6/6 complete.

Send for copy of new Catalogue ready shortly.

**GRAHAM  
 FARISH  
 PRODUCTS**

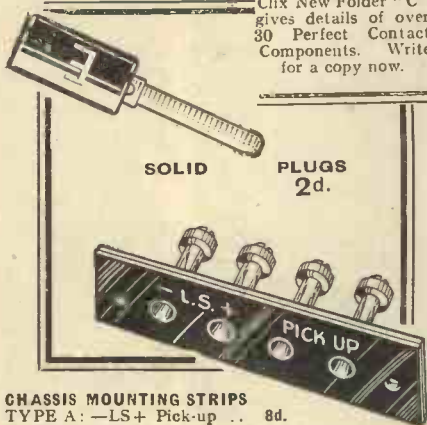
Advertisement of Graham Farish Ltd.,  
 Masons Hill, Bromley, Kent.

## Efficiency depends on Perfect Contact

To ensure perfect, reliable contact and the highest possible efficiency from any receiver, follow experienced designers—always use Clix.

**"A Matter of Connection."**

Clix New Folder "C" gives details of over 30 Perfect Contact Components. Write for a copy now.



**CHASSIS MOUNTING STRIPS**  
 TYPE A: —LS+ Pick-up .. 8d.  
 TYPE B: A1, A2, E. .... 7d.  
 TYPE C: Mains Aerial, In-out 6d.  
 Shorting Plug .. 3d.



**LECTRO LINX LTD., 79a, Rochester Row, S.W.1.**  
**CONVERT YOUR S.T.400 TO "B" AMPLIFICATION** and reduce consumptions: don't add and increase them. Full-size conversion print, 1/- P.O. Kit and valve, 40/-; Suits any battery set. S.T.400 "B" Kit, 120/-; with valves, 165/-; with valves and cabinet, 185/-; all wired up, 190/-—**Dicore Radio, Silsden, Keighley, Yorks.**

Famous Maker's Offer!

**PIANO-TONE CABINETS**  
**7 DAYS' FREE TRIAL** (or 10/- Monthly)  
 Piano built (Pat. 8123). The acoustic Tone brings a fine thrill.  
 (Radio-Press. B.B.C. 3,000 clientele)  
 MAKER'S PRICES 35/- to £15  
 Photographs and List FREE.  
**PICKETTS** Piano-Tone Cabinets.  
 (C.W.) Albion Rd., Bexleyheath

**FOR "S.T.400" PICKETTS CABINETS**  
 As Recommended by John Scott-Taggart.

**WE invite readers to support our Advertisers—care being taken to accept only announcements of reputable firms!**

ALL APPLICATIONS for ADVERTISING SPACE in "WIRELESS CONSTRUCTOR" must be made to the Sole Advertising Agents, **JOHN H. LILE, LTD., 4, LUDGATE CIRCUS, LONDON, E.C.4.** Phone: City 7261.

## TESTING-INSTRUMENTS FOR NOTHING

—continued from page 290

The figure shows exactly how the connections are made.

Now you have the millivoltmeter calibrated and have made notes exactly what each reading on the instrument stands for. The accuracy will depend more on your skill and care than on the wire and the dry cell. The dry cell should, of course, be fresh, and not connected up for too long intervals.

We have now to find the resistance of the instrument, unless it is marked (as is frequently the case).

This is more difficult, as you have to find a resistance of known value of a similar order to the resistance of the millivoltmeter. (This may be anything between 30 and 500 ohms.)

If it is high, well, an old pair of telephones of good make will have four bobbins each marked, say, 1,000 ohms. Or perhaps you have a pair of 200-ohm resistance that is marked?

### Taking a Reading

At the worst some more of the iron wire—a measured length—can be pressed into service. A visit to the local reference library (or a letter to the editor) will tell you the specific resistance of iron, your local wireless dealer will tell you the gauge you are using, and Ohm's Law enables you to calculate the resistance of the piece.

To use it, set the copper wires some distance apart on the potentiometer and take the reading. Now cut the wire at the point marked A in the figure and insert the new resistance, be it telephone or other resistance.

The reading of the millivoltmeter will fall to a fresh reading. Again you need Ohm's Law, for I am certain the Editor will not give me room in this article to explain the calculation. In any case it is quite easy. If you have really followed this far you will not need to be told any more.

You will make a 1-ohm shunt of iron wire and you have a milliammeter. You can now get all your grid valve characteristics from the grid-bias battery and the high-tension battery with ease.

You will also see that if, for example your millivoltmeter has a resistance of 100 ohms, you can check a 100,000-ohm resistance by putting it in series with the instrument and a dry cell. The reading should be 1.5 millivolts.

\*\*\*\*\*  
**CHOOSING A FUSE**  
 Some hints on safeguarding the valves.  
 \*\*\*\*\*

It is fairly common practice nowadays to fit a fuse to the receiving set in order to safeguard the valves, but I have frequently found that the actual fuse used is chosen without any very clear notion as to what its size ought to be. If the fuse is too large, of course, it does not constitute an effective preventive method in the event of a large surge of current from the H.T. source through the filament. If it is too small there may be a tendency for it to blow at frequent intervals due to H.T. current surges.

Obviously, if we want a fuse to ensure safety for the valves, it must be designed to blow before it passes more than the valves will normally carry themselves. Suppose the total filament consumption is .25 amp. or 250 ma. Then a 120-ma. fuse would blow before the current reached anything like the maximum safe current. A 200-ma. fuse would, in this case, be about the largest that should be used.

### Suitable Values

Since the fuse under normal working conditions has only to carry the total anode current of the valves employed, it can, in practice, be reduced in size without reducing its effectiveness. On the contrary, the smaller the fuse the more certain it is to blow before the danger point in current flow is reached.

However, the fuse cannot be designed to carry less than the total anode current of the set, as it would blow immediately the set was switched on. Also, in cases where there are large fixed condensers across the H.T. source there may be a surge current when switching on the set, and the fuse must be large enough to carry this.

Thus the choice must be guided by these two considerations. In most cases a 60 or a 100 would be suitable.

M. H. C.

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[EST. 1924]

**A PRACTICAL MAN'S CORNER**

—continued from page 288

For most home-constructors sheet steel is too hard to be worked readily. Copper is good, but it has the disadvantage of being rather expensive.

One of the best metals is sheet aluminium, but care must be taken to see that it is of sufficiently stout gauge or the chassis may be too flimsy to be satisfactory. A material which very few people seem to have thought of is the perforated sheet zinc which can be purchased from most ironmongers. This is quite easy to work, it is inexpensive, and one of its great advantages is that little or no drilling is required, either for mounting components or for passing leads from the upper to the under side.

**Metal Bending Obviated**

It is possible to build a good, solid chassis from sheet metal without any bending at all, in the way illustrated in Fig. 6. Pieces of any suitable sheet metal are cut out to the sizes required for the vertical and horizontal portions of the chassis. These are then joined up by means of angle strips and 4B.A. bolts. Angle brass may be used, but all the trouble of drilling the holes for the bolts may be saved if Meccano angle strips are employed.

These are obtainable from most toy shops, and come in handy for a variety of wireless constructional purposes. Still another method, illustrated in Fig. 7, is to build up the chassis on a wooden frame consisting of two endpieces with cross battens at the top at both back and front. Sheet metal plates of the right size are fixed to this frame by means of wood screws. This makes a light but very strong job, and the construction is so easy that even a beginner with only the most rudimentary knowledge of workshop practice can produce a neat and thoroughly serviceable chassis in this way.



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?

## AS WE FIND THEM

—continued from page 294

of screened H.F. chokes suitable for the broadcast and short wavebands.

In the broadcast types there are two models, viz. the "All-Wave" binocular type, having an effective wave range extending from 10-2,000 metres; and the "Standard" pattern, which covers wavelengths from 100-2,000 metres. The last named does not employ a binocular winding.

Then there is a special short-wave choke with a wave range of 10-100 metres.

These chokes are particularly well made, having sectionalised windings to give the necessary low-distributed capacity, generous inductance values, and adequately spaced screens provided with earthing terminals. Our tests proved the efficiency of the chokes under working conditions to be fully in keeping with their workmanlike appearance.

The "All-Wave" model is specially suited to parallel-feed S.G. H.F. circuits, in which the use of any other than a first-class choke invariably causes loss of volume and general inefficiency.

We can recommend these Telsen chokes to discriminating constructors, the prices, which are extremely moderate, being as follows: "All-Wave" binocular, 4s. 6d.; "Standard," 2s. 6d.; "Short Wave," 3s.

The makers are The Telsen Electric Co., Ltd., Aston, Birmingham.

### Ferranti Speaker-Amplifier

The popularity of "Class B" amplification is reflected in the number of special "Class B" components and units which are being marketed by the leading radio manufacturers.

The name of Ferranti is synonymous with progress, and among this firm's products for the new season is a most attractive component called the "Class B" speaker-amplifier.

The unit comprises a permanent magnet moving-coil loudspeaker fitted with special "Class B" driver and output transformers, as well as a "Class B" valve holder, the whole forming a complete "Class B" output stage and speaker combined.

Hence the listener who wishes to enjoy the advantages of this latest method of amplification is not called upon to make a new set. An existing receiver is simply coupled up to the speaker-amplifier. No modifications are necessary, the unit requiring only five connecting wires, viz. two going

to L.T., one to H.T.+, and two to the loudspeaker terminals on the set.

This Ferranti unit should achieve considerable success, since it provides a compact and simple means of vastly increasing the power output, combined with the economy in H.T. current consumption, which is such a valuable feature of "Class B."

The price of the unit is £4 4s. (with valve), or without valve 70s.

Those who desire to purchase the loudspeaker separately may do so. The model in question is available with or without the appropriate output transformer, the prices being 37s. 6d. and 30s. respectively. The output transformer supplied is of the multi-range type, and is suitable for power, super-power, pentode, or "Class B" valves. Both the sensitivity and frequency response reach that high order of excellence which one associates with the products of this famous firm.

## RADIO DISPLAYS

—continued from page 289

walked up full of optimism and asked for Cape Town. The real surprise came when he got it, and that is a perfectly true story, for I heard it myself.

Another good psychological sales aid, and one, incidentally, which was of instant appeal to the fair sex, was provided by Ekeo in connection with their new model "74" receiver. One of the features of this new set is that you can change the colour of the silk behind the speaker fret to match that of the room in which the receiver happens to be located.

There was almost always a crowd watching the small page-boy demonstrating this particular feature, and curiously enough the male folk were usually in the majority! Hardly surprising, really, for it is certainly a brilliant idea.

### Those Precious Ingots

We may be off the gold standard; all the same, there is something subtly fascinating about seeing a large ingot of the precious metal. The Gramophone Company, alive as usual, apparently realised that, and since they use an alloy of gold and silver in the construction of their switches, it was appropriate that their exhibit should have included ingots of the precious metals valued at £2,000; the amount that is used annually in the construction of their sets.

(Continued on page 319)

## RADIO DISPLAYS

—continued from page 318

Naturally, the ingots were carefully guarded from the possibility of "smash-and-grab" activities, but in any case the light-fingered gentlemen would have had something of a job in getting out of the crowd which daily was to be seen round this fascinating exhibit.

Belling & Lee were one of the few firms who made full use of a cathode ray tube in the staging of what was an instructive demonstration. By means of the tube they were able to give a visual indication of the merits of their pick-up at all sorts of different frequencies.

### A Constant Stream

On our own stand it was quite unnecessary to introduce any subtle method of attracting the crowd. The trouble in our case was to accommodate all those people who did turn up, for from morning until night throughout the run of the Exhibition, we were favoured with a constant stream of visitors.

That was just what we wanted, for it is the golden opportunity of the year for us to meet our readers, and from that point of view we were sincerely regretful when the Exhibition was over!

One of the difficulties of trying to hear a particular speaker when under the roof of Olympia is the fact that there are so many others all round, and all reproducing the same music. Magnavox, to overcome this difficulty, hit upon the bright idea of enclosing one of their models in a sound-proof box, into the side of which you could place your head. Elementary, perhaps—but definitely effective.

### Kit Construction

The Lissen stand drew a constant stream of visitors by a demonstration featuring the construction of their famous "Skyscraper" kit. Everyone must have been impressed with the deft way in which the Lissen young lady was assembling the kit; it all looked so very easy. As a matter of fact a child could tackle successfully the construction of that kit.

We have only touched upon the fringe of a subject that would easily fill a complete issue of THE WIRELESS CONSTRUCTOR. All the same, it is interesting to review the progress that is made year by year in these psychological sales aids.

## SOME NOVEL LOUD-SPEAKER DEVELOPMENTS

—continued from page 286

Merely by operating two switches you can match the speaker with anything from a pentode to quiescent push-pull.

But to get back to the speaker itself. I have spoken of the revival of the energised type, but this has hardly been at the expense of the permanent magnet variety, which itself has advanced by leaps and bounds.

### Permanent Magnetic Power

Metallurgy has played no small part in this. Take, for instance, the magnet on an R. & A. "Challenger." Cunningly forged of special cobalt steel, it develops a flux density of no less than 7,200 lines per square centimetre in the gap in which the moving coil moves. That is some magnetic power, you can take it from me, and it gives the speaker a marvellous sensitivity.

Do you recollect the trouble we used to have centring the coil of a moving-coil speaker? The darn thing was always developing a scrape.

### Concerning Diaphragms

I believe it was Marconiphone who were the first, or who were among the very first, to introduce a centring spider that really did hold the coil central without the gap having to be over-sized.

Anyway, I have still a fairly early model of Marconiphone make which has never in its life developed out-of-centre-itis.

Which logically brings me to the diaphragm. Many and varied have been the patent cones and diaphragms; some good, some not so good.

### Perfection for All

Atlas have done good work on cones, and I believe their latest is a keen approach to perfection.

A lot lies behind that apparently simple cone. It must be light, it must be stiff; its angle is a vital factor in its functioning.

Oh, yes, a speaker may seem to be a simple enough kind of thing, but it is really a mass of interesting problems, most of which are now solved—by those who specialise in their manufacture. And with output systems like "Class B" available, everyone can now take full advantage of modern speaker perfection.

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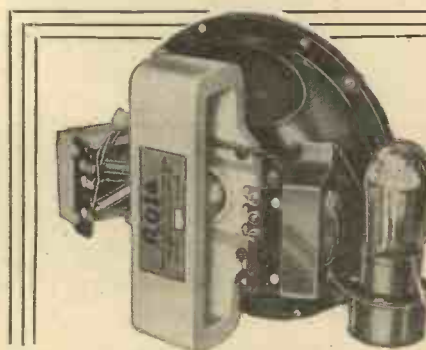
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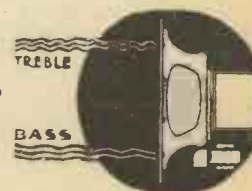
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**MAINS UNIT DESIGN**

*—continued from page 296*

volts are usually taken off a potentiometer. Much of the calculation with regard to this can be entirely avoided by again adopting a *variable* type instead of two separate resistances coupled together.

In order that the screen voltage may not vary excessively, the total current through the potentiometer must be four or five times the screen current. Since the latter is usually given by the valve makers, it remains only to determine the total potentiometer value. Thus, if the screen current is 1 ma., the whole potentiometer must take approximately  $5 \times 1$ , or 5 ma. If it is coupled across a rectifier output of 150, as before, the total value should not exceed  $150/005 = 30,000$  ohms.

Having obtained this figure, the best screen voltage can easily be found by adjustment in the usual way. It should be noted that the potentiometer tappings are also shunted by decoupling condensers.

We will now discuss the design of an A.C. eliminator for a modern receiver employing an S.G., detector and output. For the S.G. we will assume a working plate voltage of 120 at 2 ma., and about 80 v. at 1 ma. for the screen; detector, 60 v. at 2 ma.; power, 150 v. 5 ma.

**Making Allowances**

Making the total potentiometer current five times the screen current,

the total for the H.F. stage will be  $5+2+1=8$  ma. The other currents are straightforward, so the total capacity of the mains unit must be  $(8+2+5)=15$  ma. We will, however allow a margin of 5 ma. against overloading, so our eliminator will be of maximum capacity 20 ma.

**Dropping Volts**

The maximum voltage necessary is 150 v., and allowing 30 volts for "drop" in transformer, rectifier, and smoothing choke, the secondary of the

previous two stages, no saving can be effected by using additional smoothing, so we will put in a single 50-henry choke shunted by 4 mfd. (see Fig. 3).

It remains to find the values of the dropping resistances (Fig. 3). Starting with the S.G. stage, the potentiometer will have a value of  $150/005=30,000$  ohms, while the anode resistance must drop  $150-120=30$  volts at 2 ma., which gives us  $30/002=15,000$  ohms. Instead of the 60 volts specified, we will allow the detector *variable* resist-

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transformer must give approximately 180 volts. Note, though, that if a Westinghouse "voltage-doubler" is to be used, one type of rectifier for this purpose gives 180 volts with a secondary of something like 135 volts.

Since the current to the output stage is in this case smaller than for the

ance to reduce down to 50 volts, i.e. a maximum drop of  $150-50=100$  volts at 2 ma., which gives a maximum of  $100/002=50,000$  ohms for this resistance. Finally, no voltage reduction is required for the output stage.

Note that all the tappings are shunted by 2-mfd. decoupling condensers.

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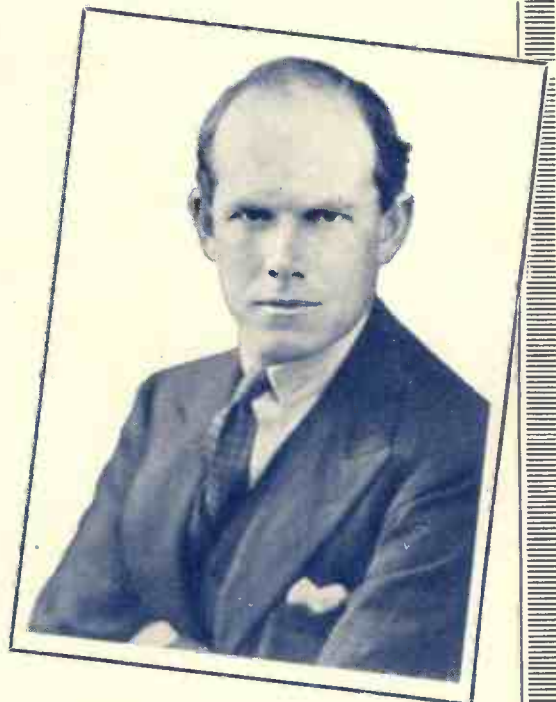
## ALEC WAUGH

The famous author of "The Loom of Youth," "Kept," "Wheels Within Wheels," etc., contributes a new short story to the October Story-Teller. Entitled "Let the Truth Speak for You," it is a penetrating study of modern marriage, and tells of a middle-aged woman whose husband did not know that "Youth is Youth and Time will have it so."

This is only one of the many outstanding features in the October issue of the magazine that *always* publishes the *Best New Fiction*. Other contributors to this number include:

G. K. CHESTERTON  
CHRISTINE JOPE-SLADE  
DOROTHY BLACK

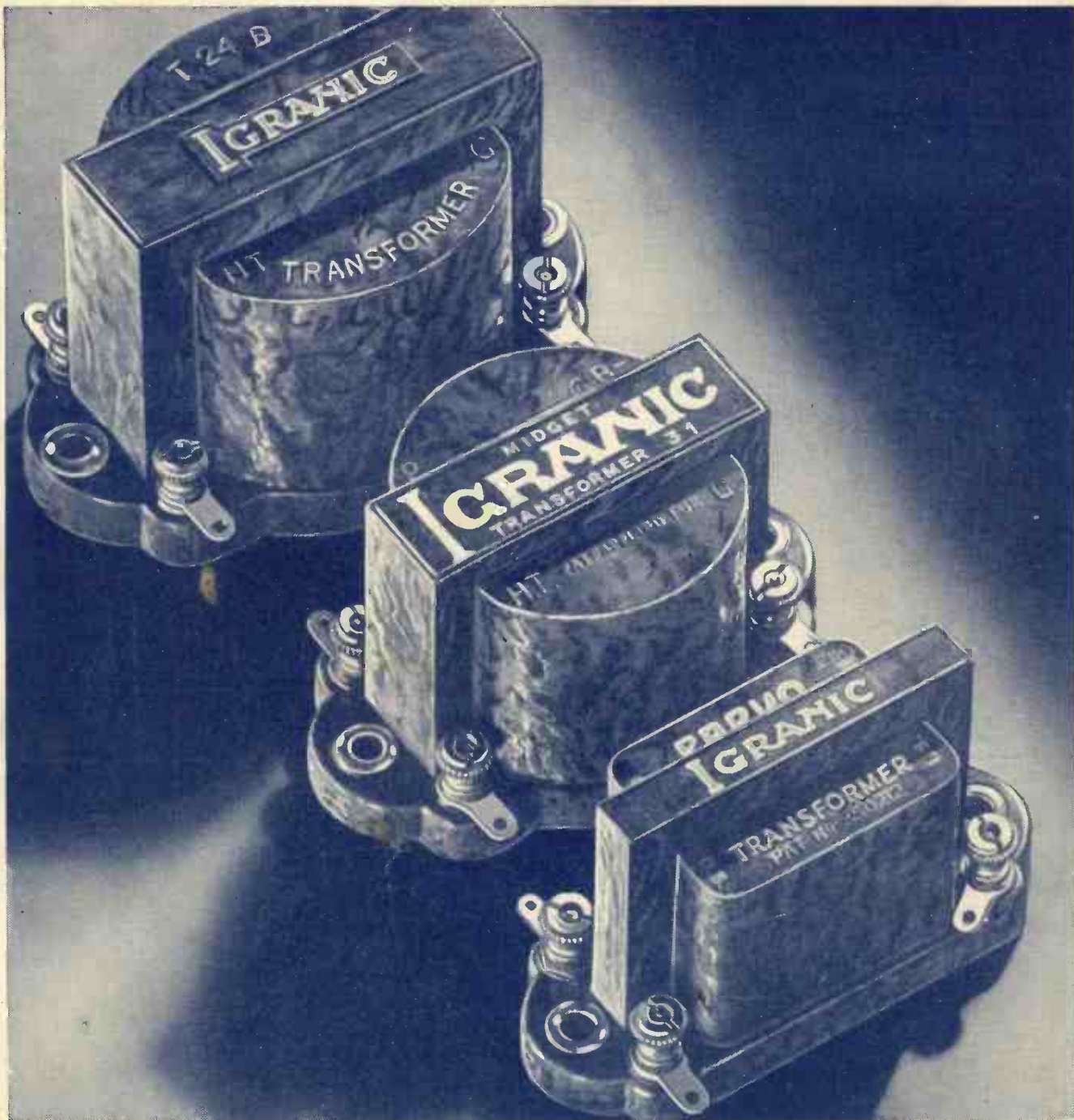
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