POPULAR WIRELESS, September 2nd, 1933. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

HOW TO CONSTRUCT YOUR OWN COILS

Eckersley Explains "Man-Made Static"

Popular Wireless

AN OLYMPIAN CRITIQUE

No. 587. Vol. XXIII. September 2nd, 1933.

EVERY WEDNESDAY PRICE 3D

The CALEDONIAN THREE

In this Issue

A Complete Review of THE RADIO EXHIBITION

Progress Epitomised

Modern Tendencies Outlined

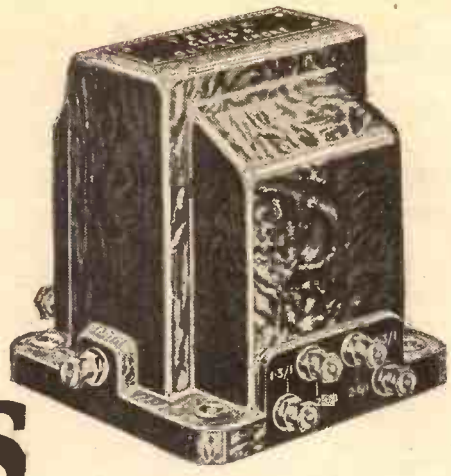
Also This Week:

Details of Some Very Interesting Experiments ON FIVE METRES

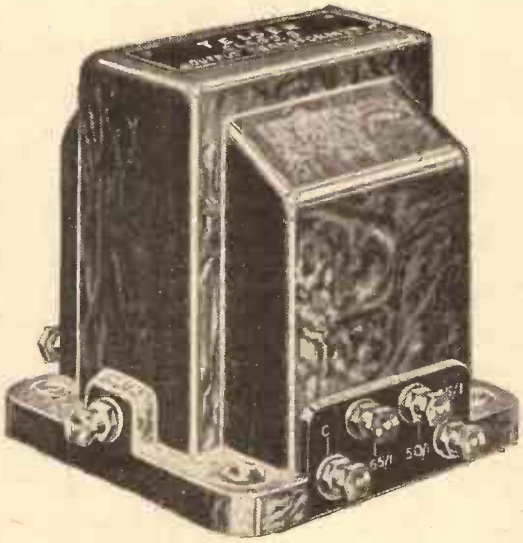
TURNING OUT THE TALKS
(The B.B.C.'s Director of Talks tells how it is done.)

PRACTICAL HINTS AND TIPS FOR LISTENERS

TELSEN 'Class B' COMPONENTS



THE use of the correct "Class B" valves alone is not enough to ensure perfect "Class B" amplification. You must also use the correct "Class B" components of whose perfect matching, and lasting efficiency you can be assured. That is why you should use Telsen "Class B" components. They are the outcome of long research and experiment by Telsen Technicians, representing the most enduringly perfect "Class B" components it is possible to produce. Be sure—and insist on Telsen.

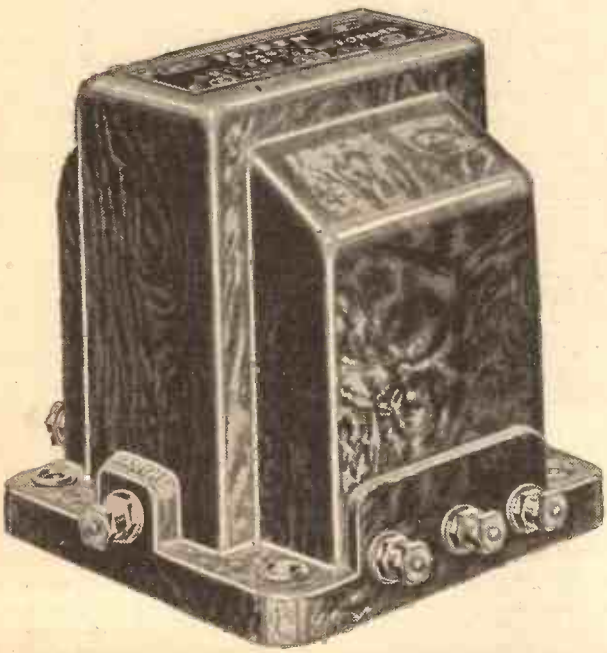


TELSEN "CLASS B" OUTPUT CHOKE

Provides ratios of 1–1, 1·3–1, 1·2–1, 2·6–1, for matching to any Moving Coil speaker having either a high resistance speech coil or a low resistance coil and input transformer. The low D.C. resistance of 220 ohms per half winding, and generous core section prevent distortion. The total inductance is 18 henries. **8/6**

TELSEN "CLASS B" OUTPUT TRANSFORMER

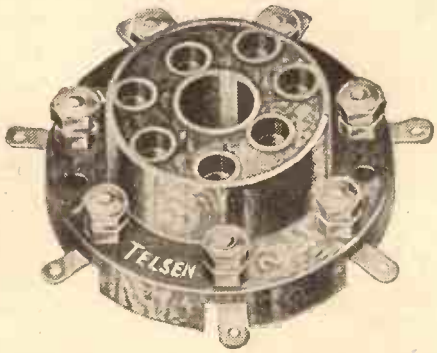
Provides ratios of 35–1, 50–1 and 65–1, ensuring correct matching to Moving Coil speakers having low resistance speech coils. Low primary resistance (200 ohms per half winding) and large core section. **8/6**



TELSEN "CLASS B" DRIVER TRANSFORMERS

Made in two ratios covering the requirements of all the "Class B" valves available at present. Supplied with comprehensive instructions.

RATIO (Overall)	*(Primary to half-secondary)*	Price
1–1	*2–1*	**8/6**
1.5–1	*3–1*	



TELSEN 7-PIN VALVE HOLDERS

Specially constructed to accommodate "Class B" valves. The contact sockets are extended in one piece to form the soldering tags, thus ensuring perfect connection. The terminals are numbered according to the standard R.M.A. system.

7-pin Solid Type - - - **1/6**
7-pin Anti-Microphonic Type - **1/9**

TELSEN FOR EVERYTHING IN RADIO

ANNOUNCEMENT OF THE TELSEN ELECTRIC CO., LTD., ASTON, BIRMINGHAM

POPULAR WIRELESS

The Paper that Made Wireless Popular

THE FIRST AND FOREMOST RADIO WEEKLY.
Scientific Adviser: SIR OLIVER LODGE, F.R.S. Chief Radio Consultant: P. P. ECKERSLEY, M.I.E.E.
Editor: N. F. EDWARDS.
Technical Editor: G. V. DOWDING, Associate, I.E.E.
Assistant Editors: P. R. BIRD and A. JOHNSON-RANDALL.
Chief of Research Department: K. D. ROGERS.

AID FOR AIRMEN
LISTENING FOREIGN
HOTEL SPEAKERS
S.W. COMPETITION

RADIO NOTES & NEWS

ONE MAN'S MEAT
RADIO MARRIAGE
CRY FROM THE BLUE
RACKETEERING

New Radio Aid for Airmen.

I UNDERSTAND that one of Marconi's latest strokes of genius is the adaptation of his Echometer—the radio device for measuring the depth of the sea—to the use of airmen, so that they can ascertain their height above ground.

The advantage of being able to do this when the earth is obscured from the aeroplane by clouds or fog is obvious. The precise method which will be employed has not, I believe, yet been determined, but it is only a matter of research and will no doubt be settled at top speed.

Personal Note.

HIS admirers all over the world will be highly interested to learn that Sir Ambrose Fleming, F.R.S., was married in July. At the age of eighty-three this doughty man of science is as mentally acute as a man might wish to be.

There seems to be something suspiciously like the Elixir of Youth in the pursuit of science, and Sir Ambrose, like Sir Oliver Lodge and many others, is evidence that a life of intensive brainwork does not wear out either mind or body. Peace and happiness to him!

Listening "Foreign."

J. E. W. (Battersea) has most cruelly misjudged his poor Ariel, whom he describes as a "conceited mortal" because I showed some slight relief that the "sponsored" programmes from France were likely to cease. He deduces that I deprecate "listening foreign."

Gently but firmly I would ask him to realise that "P.W." exists to encourage and help its readers to become skilled in radio reception generally; distance is not solely our concern, and good quality is one of our aims, whether reception be from London or Melbourne.

There is plenty of popular music and other matter broadcast by the B.B.C., and no reasonable being, like J. E. W., need burst himself to "listen foreign" except perhaps on Sundays, and even then advertisers' programmes are not the only ones available.

Hotel Loudspeakers.

IT is reported that during the Michaelmas term there will be heard an appeal against the decision that the reproduction by loudspeakers in hotels of B.B.C. broadcasts is a public performance, entitling the Performing Rights Society to charge royalties for musical items whose copyright they control. Many thousands of public-houses, hotels, restaurants, etc., are affected, and I hear that the P.R.S. is prepared to take the case, if necessary, to the Lords.

The Home Constructor in Switzerland.

WELL, I am positively danged! In Switzerland the fight against interference with reception has been taken into the listeners' own territory; and whilst I agree that the oscillation pest should be routed out, I think that the Swiss regulations go a little too far.

A Post Office licence is necessary if a Swiss "fan" makes a set or fixes an aerial and "earth." The official examination of each set is done at the cost of the listener. I'm afraid that here, where some fellows rig up a different set every week, such a law would be unworkable. And in Switzerland it must be cramping the style of many a would be radio enthusiast.

"Love of the Four Walls."

I ASKED a distinguished professor why, in his opinion, broadcasting was so much more popular in some countries than others, not taking into account the relative wealth of the nations or the individuals.

He said that he thought that the reason was very obvious. Some nations, notably the British and Americans, are fundamentally lovers of the four walls—that is to say, real home lovers—and, as such, they welcome home amusements.

On the other hand, other nationals prefer the life of the streets, cafés, theatres, etc., which is partly accounted for by climate and partly by the racial attitude towards woman and the family. I don't agree entirely—but, then, I am not a professor.

THOSE RADIO MANŒUVRES

The Army's autumn manœuvres will soon be in full swing, with radio playing a star part in communications. These two men are members of the German Army experimenting with camouflaged field wireless.

Great Short-Wave Competition.

IF you think that you are the world's champion short-wave listener here is your chance to prove it and place a feather in the cap of British radio. The International D.X. Contest for the Clifford E. Denton Trophy, which is open to all listeners, opened on August 1st, and will close on February 1st, 1934. It is sponsored by the International Short-Wave Club, Klondyke, Ohio, for the creation of goodwill and further interest in s.-w. reception.

In addition to the Trophy, two medals will be awarded to the second and third competitors and "Honourable Mention" scrolls to the next hundred. No expense or obligation is incurred by entrants except postage.

A Few Details.

THE awards will be made to the competitors who send in the greatest number of verifications from short-wave stations transmitting broadcast speech and music for entertainment. Ties will be decided by the mileage, computed by adding up the airline distances between the receiver and all the transmitters.

The judges will decide on this matter, and the award will go to the competitor with the largest mileage. All verifications must be submitted by April 15th, 1934, and the date of the awards will be announced in the Press.

(Continued on next page.)

ARIEL CONTINUES HIS RUNNING COMMENTARY ON RADIO

The conditions governing the manner in which entries must be submitted are important, but cannot be reproduced here; so intending competitors should write at once for details to Mr. A. E. Bear, 10, St. Mary's Place, Rotherhithe, London, S.E.16, England. Good luck—and may Britain win!

U.S.A. Local Stations Slump.

PROPRIETORS of broadcasting stations other than those in New York and Chicago are experiencing hard times because they cannot sell more than 5 per cent of their time to local advertisers. One weighty reason for the reluctance of local firms to spend money on radio advertising is their inability to meet the competition—"competish," as my informant says—of the great concerns which carry on nation-wide radio publicity and are able to provide the cream of American talent. It's no good their trying to attract listeners from Will Rogers and Amos 'n Andy by putting high-school glee-singers and promising young undergraduate saxophonists before the microphone.

One Man's Meat, etc.

JUST to demonstrate to you what popular events are the Queen's Hall "proms," I will reveal that on August 8th I went to book three seats at the last concert, which takes place on October 7th. I got the *last three* available. That'll show you!

The clerk told me that although he had been selling the seats ever since the "proms" began, he had never attended a performance. No, he was a radio "fan," and had listened-in to stations all over the world. He had just finished his holidays, during which he had not left his radio tinkering for more than twenty minutes at a time.

And I, who have been professionally connected with radio for so long, generally call in an expert when I want a bit of wiring done! It's a rummy world!

Marriage by Radio.

A WELL-KNOWN English film actress, now in Hollywood, has suggested that she should be married to her fiancé, now in England, by means of the wireless telephone. I am far from being a stickler for forms and ceremonies, but somehow this suggestion seems to me to exceed in frivolity the idea of being married in a balloon or a swimming-bath. There are certain occasions when a little solemnity is appropriate, and a wedding is one of these. If all sense of fitness is to be abandoned, why not exchange the vows on picture-postcards and be done with it!

Fifty Kw. from the Mormons.

THAT "little bird" which supplies so much news to Aunt Priscilla's Corner advises me that a new 50 kw. transmitter has been installed for K S L at Salt Lake City. It is located in a flat valley which was once a mighty lake. Owing to the alkaline moisture of the soil, it is believed that the efficiency of the transmission will be 100 per cent American. The earth system consists of some thirteen miles of copper wire buried some two feet deep.

SHORT WAVES

INFORMATION WE REFUSE TO ACCEPT.

"The woman announcer will be quite new to B.B.C. work, and her voice probably will not be heard for some days."—Daily Paper.—"Punch."

* * *

"Wireless announcers are not very different from other human beings," we read in a contemporary.

There are many people who will resent this.

* * *

An American wireless journal recently published details of a transformer which, it was stated, "furnished current supply for A.C. VALES only."

Surely some provision should be made for the poor hill-side dwellers, too.

* * *

THE OTHER RAG.

Wireless Announcer: "The race was won by the favourite, ridden by A. Wragg."

Willie: "Does that mean that someone has put his shirt on it, mummy?"—"Daily Mirror."

* * *

It is said that, since the installation of wireless in hospitals, the average length of a patient's stay has decreased by one week.

No wonder.

* * *

B.B.C. Official: "You know, I can't possibly eat this egg. It's anything but fresh."

Waitress: "I'm very sorry, sir."

B.B.C. Official: "Well, never mind. Just wrap it up, will you, and I'll take it along to the station to be relayed."

* * *

A LITTLE D X WORK.

As a D X experimenter, Shakespeare must have attained to some degree of local renown.

"Gent!emen, take up some other station!"—Coriolanus, IV, v.

Is Bournemouth Really Backward?

ACCORDING to A. E. N. (Bournemouth), that delightsome haven contains "many thousands" of crystal sets in constant use, a fact which, he says, can be proved by inquiry from "any of the dealers." Now, I have no evidence for or against his assertion, but I confess that "many thousands" sounds a lot to me, and that I doubt the ability of any one dealer to prove the fact unless he has canvassed the whole town.

How does A. E. N. know, anyhow? I should hate to be thought unduly sceptical, but—*thousands!* Is Bournemouth really so behind the times? I feel sorry for the dealers if A. E. N. is right.

A Cry from the Blue.

"HIPPO" (S. Rhodesia), who writes on behalf of radio enthusiasts in the colonies, asks us to design a set suitable for the tropics, and he mentions some of the difficulties of out-dwellers in the King's dominions.

He suggests that, as wayside garages are more plentiful than radio dealers in the wilds, dry-battery eliminators are indicated. I have read his letter with care and sympathy, and shall refer it back to those of us who settle these matters.

It is not a simple matter to cater for the demands of many thousands of readers all over the world, but we try to do our best for the greatest number.

Latest Radio Racketeering

THE underworld demands one's admiration for its inventiveness. The very latest get-rich-quick game is the "faked fan mail." The aspiring broadcaster, or he who believes that he is about to be demiked, pays his fee to a "fan mail" bureau, which thereupon showers letters of appreciation upon him, while the recipient proudly exhibits them as proof of his popularity. Another bit of roguery is the fake audition. The poor aspirant separates himself from five dollars and is then allowed to perform before a "dead" microphone. I am sorry to note that these sins are reported from Canada.

A Wanderer Returns.

L. N. H. (Wakefield), in a letter which is really a well-written and amusing sketch, tells how he strayed from "P.W." and eventually returned, disillusioned and glad to be back once more amongst the "old gang," which is us.

His accumulation of copies of *us* is the cause of some delightful humour in which he and his wife share the honours.

I've a pile of 'em myself, and because I cannot part with them the house seems to be getting smaller!

L. N. H. has especially nice things to say about P. P. E. and Dr. Roberts; and with reference to the doctor he says that he has learned so much from him that each week he thinks there cannot be much more to learn—and then, bang comes another week's lot! Thank you for writing, L. N. H.

Scottish Lament.

J. W. (Aberdeen), who has a house full of "P.W.'s"—bless him!—tells me lots of his thoughts, including some which are not complimentary to his "local." So lightly does he regard Sir John Reith's gift to the "Granite City" that he avers that Aberdeen can be cut out by sneezing near the river.

Moreover, he does not like having to sit up from 10.30 till midnight to get his dance music, declaring that the highbrows would not do that for their own particular brand of poison. Sir, you are in the right of it, but have you no influence wi' a brither Scot—to wit Sir John?

ARIEL.

The CALEDONIAN THREE

This highly efficient "P.W." guaranteed design is a skilful blending of outstanding performance and low cost. Among the receiver's special features may be mentioned unusual constructional simplicity, multi-mu H.F. control, home-wound dual-range coils and automatic tone balance.

Designed and Described by H. A. R. BAXTER.

THIS set has been designed to give the utmost return in results for the money and time spent on it. But it is not necessarily because of that that it has been dedicated to Scotland!

In its design we have borne in mind the special conditions of listeners resident in the far north of the kingdom.

And these are that the majority of their distant programmes come to them over considerably greater distances than is the case with, for instance, listeners living in London.

It was, therefore, quite inevitable that "P.W.'s" own contribution to more and better distant programmes should be used in the "Caledonian" Three.

We refer to automatic tone balance, which can give an inexpensive receiver an almost uncanny power over foreign programmes.

For the benefit of new readers we will briefly describe this invaluable feature.

Automatic Tone Balance.

Automatic tone balance operates in conjunction with reaction. As everyone will know, skilfully applied reaction brings a properly designed set to an extremely sensitive condition and enables very weak stations to be heard.

But reaction always causes distortion by cutting off the higher notes, so that the distant stations are muffled and muzzy, and the speech especially is hard to follow on that account.

In automatic tone balance the high notes are restored by using what is known as a compensating transformer.

But this alone is not enough, because on the local and other powerful transmissions the compensation is undesirable, and would result in an over-emphasis of the high notes.

Quality Perfectly Compensated.

So the reaction condenser is made to control the effect. When no reaction is used the quality is balanced to perfection by the automatic switching-in of a ·01-mfd. balancing condenser. The moment reaction is applied the influence of this condenser is removed and the compensating transformer is allowed to do its work.

The result is perfect quality under all conditions, and the distant programmes attain a marvellous fidelity. Indeed, they literally sound like so many local stations, such is their clearness and freedom from reaction distortion.

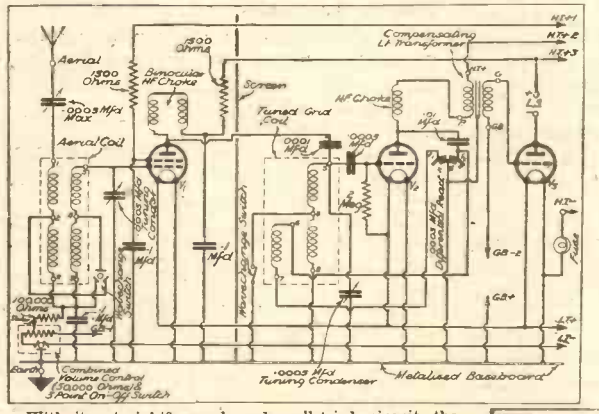
And A.T.B. requires no adjustment: it really is automatic. Also it costs practically nothing. Truly it is a magnificent feature.

A multi-mu S.G. valve also figures in this notable set. This places the volume controlling in the ideal position in the circuit, right at the front door, where it operates to the greatest advantage.

You make your own coils for the "Caledonian" Three, and full details of these are given on another page in this issue.

(Continued on next page.)

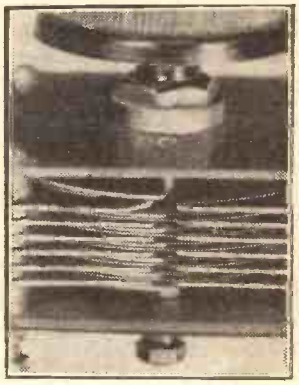
MULTI-MU CONTROL AND A.T.B.



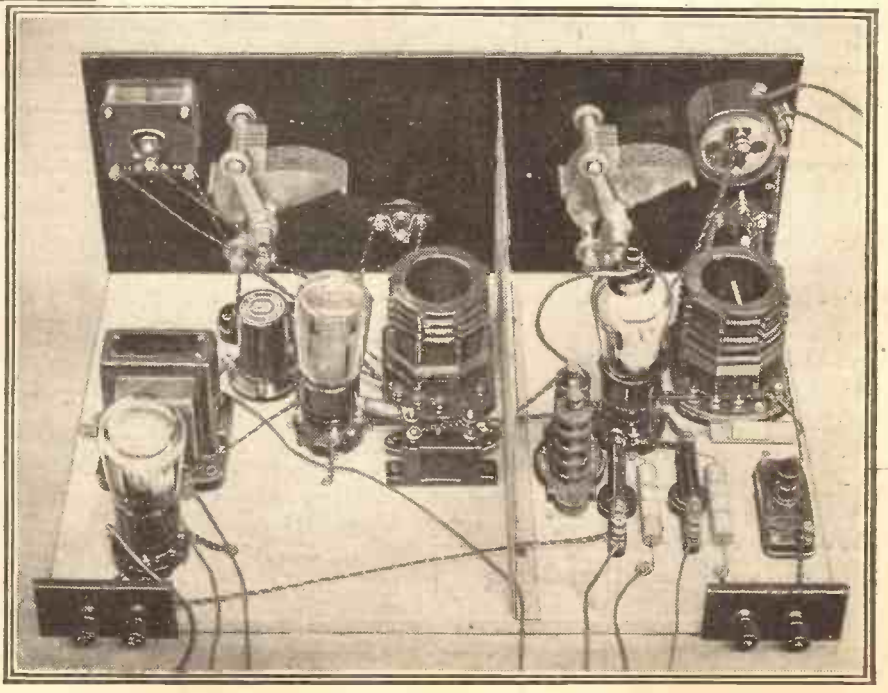
With its straightforward and well-tried circuit the "Caledonian" Three forms an ideal all-purpose receiver. In addition to such features as multi-mu H.F. control and home-wound coils, the design also incorporates automatic tone balance, thus enabling distant transmissions to be received with a quality comparable with that of the local. The simple construction can be seen from the photograph on the right.

QUITE EASY

There is no difficulty in adapting an ordinary differential reaction condenser to A.T.B., and the conversion, which is explained in the text, can easily be carried out by the constructor.



AN IDEAL CONSTRUCTOR'S SET



THE "CALEDONIAN" THREE

(Continued from previous page.)

The circuit employed is that well-tried and tested S.G.-H.F.-leaky-grid detector and power arrangement that is now so deservedly popular.

An interesting and useful refinement is the provision of a combined volume control and on-off switch.

Yes, the "Caledonian" Three is a very fine proposition, and we consider it unapproachable in its performance/price ratio.

On either medium or long waves it possesses adequate selectivity, and it should be noted that break-through has been successfully dealt with. Its variable aerial selectivity enables it to be adjusted for all areas.

And because reaction can be used to the utmost without interference with quality, many stations can be received which ordinarily would have to be missed on a three-valve battery set.

The controls are few in number and are very easy to handle.

The construction of the set, too, is such that anyone can tackle it with complete confidence.

A metallised baseboard, supplemented by a vertical screen, provides ample shielding, and an unusual stability for so sensitive a receiver is attained.

All the parts are of an inexpensive and widely obtainable character. One of the most important items is the compensating L.F. transformer, and there are three makes of this from which to choose.

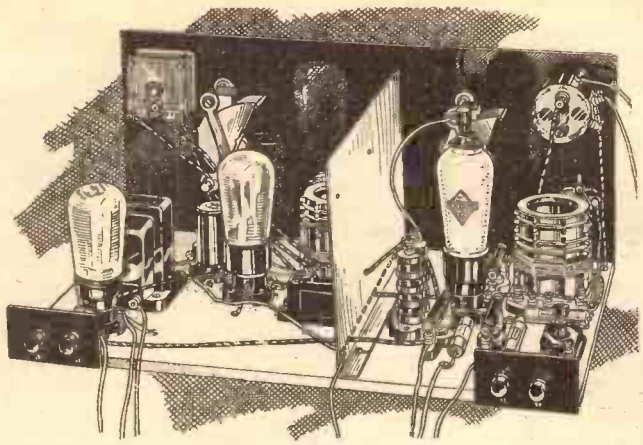
But do not try to use an ordinary L.F. transformer.

As before mentioned, the coils can be made at home.

The reaction condenser needs a slight modification, for when it is at minimum setting the F2 fixed vanes must short circuit with the moving vanes. But this is a simple modification and one that needs no special skill to carry out.

The accompanying photo very clearly shows what has to be done. With the small blade of a penknife, or a sharp-pointed instrument such as a bradawl, a small section of the insulation between the top moving and top F2 fixed vanes is cut away.

Then the corner of the fixed vane is bent up so that the moving vane scrapes against it. You must make sure you treat the right vane; but if you hold the component with its knob fully turned anti-clockwise so that you see it as in the photograph, you can hardly go wrong.



The completed set ready for connecting up to batteries, aerial and earth, and loudspeaker.

VALVES TO USE FOR BEST RESULTS

Make	S.G. (multi-mu)	Detector.	Power.
Mullard	P.M.12M.	P.M.1H.L.	P.M.2A.
Cossor	220V.S.G.	210H.L.	220P.A.
Mazda	S.215V.M.	H.L.2	P.220
Marconi	V.S.2	H.L.2	L.P.2
Osram	V.S.2	H.L.2	L.P.2
Eta	—	B.Y.1814	B.X.604
Hivac	V.S.210	H.210	P.220

Straightforward Panel Drilling.

There are several other makes of differential which can be modified for A.T.B. in one way or another, but this J.B. is one of the easiest to handle.

The panel drilling is perfectly straightforward, and only ordinary holes have to be bored, for there are no escutcheon or other difficult apertures to be made.

Ample space is allowed on the baseboard for all the parts, and no compacting tricks have to be played. But constructors should keep as close to our original layout as they can.

They will be helped in this by the scale which is supplied on the wiring diagram.

The metallised baseboard saves an enormous amount of wiring. Connection is made to it merely by means of wood screws and washers. The end of the lead to be dealt with is made into a loop. Then the screw (and washer) are driven down so that it is held tightly against the metallised surface. That is all.

Reaction Connections.

Make sure you get the differential condenser joined up the right way round. No damage will be done if a mistake is made, but the set wouldn't work properly. You would hardly expect it to!

A number of flexible leads will be needed, one for the anode terminal of the S.G. valve and the others for the batteries.

Naturally, the lengths of these latter will depend upon the position of the batteries, but it is advisable to keep them reasonably short.

Grid bias—1 is for the variable-mu S.G. valve, and this should be given the maximum grid bias; while that given to grid bias—2 depends upon the output valve employed, and for this we must refer you to the valve makers' instructions.

The H.T.'s, similarly, will vary somewhat

(Continued on next page.)

THESE COMPONENTS ARE REQUIRED TO BUILD THE "CALEDONIAN" THREE

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 Panel, 16 in. x 7 in.	Goltone	—	1 3-point on/off switch	Lissen LN5070	Telsen, W.B., Bulgin, Goltone, Sovereign
1 Baseboard, 16 in. x 10 in. Metaplex	Peto Scott	—	1 2-point on/off switch	Lissen LN5071	W.B., Telsen, Sovereign, Goltone, Bulgin
1 Cabinet to suit above	Peto Scott	—	3 Four-pin valve holders	W.B.	Benjamin, Telsen
2 ·0005-mfd. tuning condensers	Graham Farish Zelos	Ormond, Telsen, Polar, J.B.	1 Compensating L.F. transformer	Telsen Audioformer	Varley, Lewcos
1 ·0003-mfd. differential reaction condenser	J.B. (see text)	—	1 Wander fuse	Belling & Lee	—
1 ·0003-mfd. max. pre-set condenser	Telsen	Goltone, Sovereign	2 Terminal strips, 2½ in. x 1½ in.	Peto Scott	—
3 ·1-mfd. fixed condensers	T.C.C. tubular	Telsen, Dubilier	4 terminals	Belling & Lee, type R	—
1 ·01-mfd. fixed condenser	Dubilier 610	T.C.C.	2 Accumulator tags	Clix	Belling & Lee, Eelex
1 ·0003-mfd. fixed condenser	Lissen	Dubilier, T.C.C., Telsen	6 Wander plugs	Belling & Lee	Clix, Goltone, Eelex
1 ·0001-mfd. fixed condenser	Dubilier 620	Telsen, Ferranti, T.C.C.	1 10-ft. length insulated wire	Radiophone "Pull-back"	—
1 50,000-ohm volume control and 3-point on/off switch	Lewcos	—	1 Vertical screen, 10 in. x 6 in.	Magnum	—
1 2-megohm grid leak with wire ends	Lissen	—	2 Vernier dials	Igranic 2296/24 Indigraph	—
1 100,000-ohm resistance and horizontal holder	Graham Farish "Ohmite"	Dubilier 1 watt and Dumetone holder	1 Anode connector	Belling & Lee	—
2 1,500-ohm resistances and horizontal holders	Graham Farish "Ohmite"	Dubilier 1 watt and Dumetone holder	2 Coil formers	British Radiogram, type 12, with terminals and soldering tags	—
1 H.F. choke	Igranic 2265/3	Telsen, Lissen		—	
1 H.F. choke	R.I. Quad Astatic	Telsen, Bulgin, Wearite	1 oz. 38-gauge enamelled wire flex, screws, etc.		—

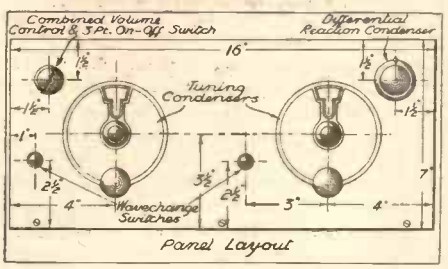
THE "CALEDONIAN" THREE

(Continued from previous page.)

as with different valves, but it should be remembered that H.T.+3 needs the maximum, say 120 volts; while H.T. + 1, which serves the screen of the S.G. valve, always requires less. Generally about 80 volts will be O.K.

The detector, H.T.+2, will probably operate best at approximately 66 volts. It is not a critical adjustment.

DRILLING DIMENSIONS



The operation of the set is simplified by the use of a combined multi-mu control and L.T. on-off switch. This switch, incidentally, is arranged so that it cuts the grid-bias battery out of circuit, thus preventing current wastage.

The "Caledonian" Three has a plain output, so, if the loudspeaker used with it incorporates a transformer, use the power tapping on this.

Needless to say, the better the aerial employed the better will be the results.

Scores of Programmes.

But as such good use can be made of reaction you will find that a fair indoor aerial will enable many stations to be tuned in.

With an efficient outdoor aerial, however, you will have scores of programmes at your command.

If possible, work the set with the series aerial condenser (the ·0003-mfd. compression type on the baseboard) at maximum capacity, i.e. with its adjusting knob screwed right down.

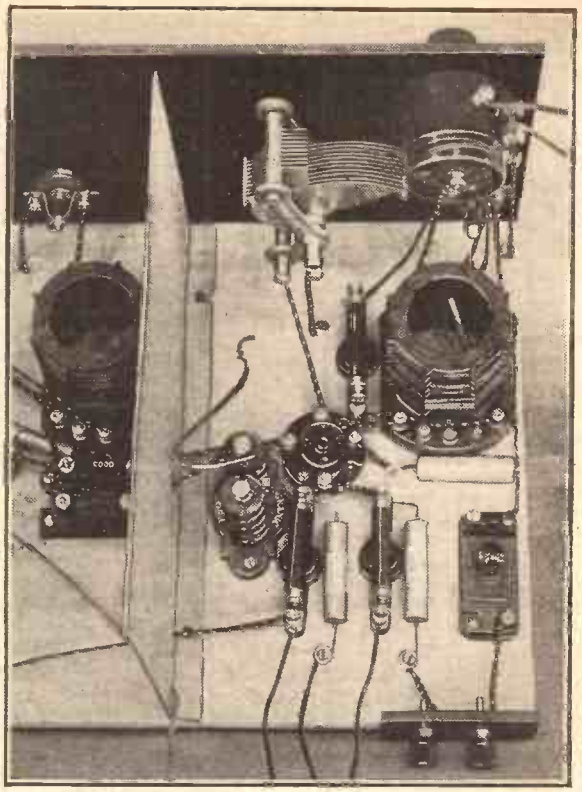
Greater selectivity, if desired, is obtained by reducing the capacity of this condenser.

But it is not advisable to work the set with a smaller capacity than is required to contribute the needed selectivity.

You see, there must always be some loss of power when very high degrees of selectivity are introduced.

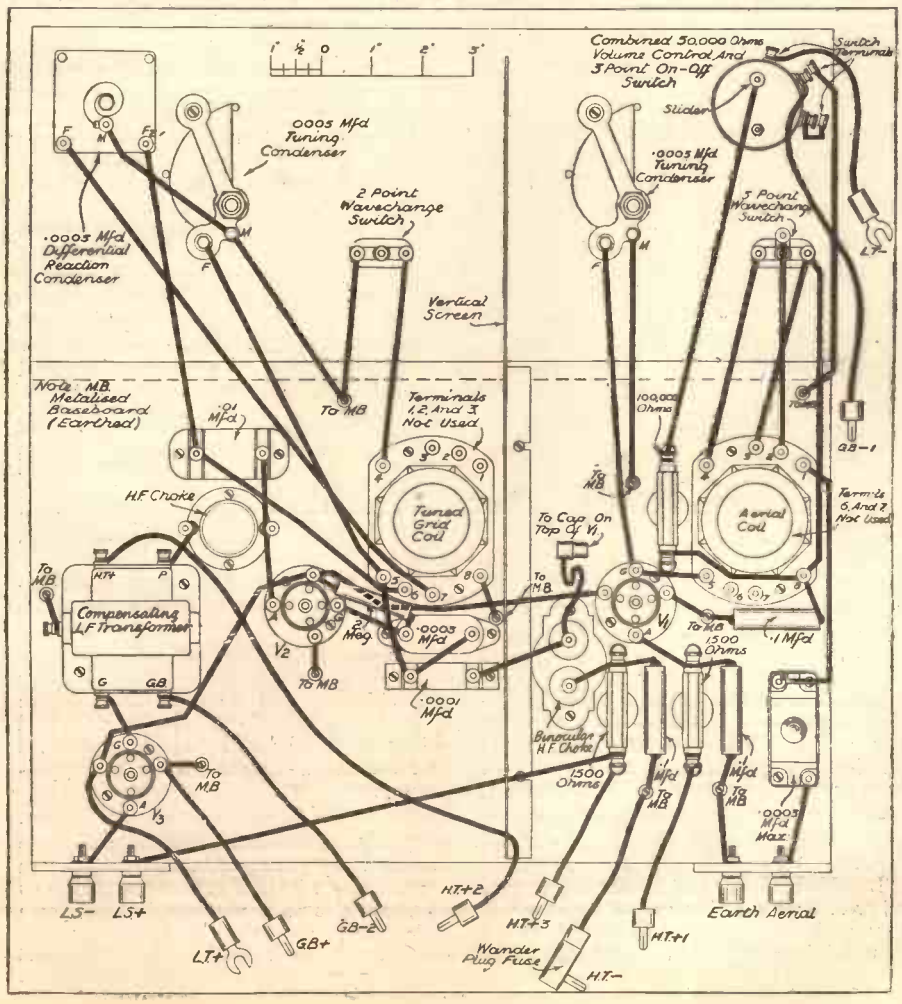
The "Caledonian" Three has excellent reserves of power, but, obviously, there is a limit to the amount which can be pared off without to some extent affecting its distant-programme powers.

We have already mentioned that the A.T.B. feature is absolutely automatic; but if you desire to employ the high-note compensation to overcome the disabilities of an inefficient loudspeaker or generally to brighten the reproduction of the local station, all you have to do is to advance the reaction control a trifle. That is, bring it just off the minimum, self-shorting position, but not far enough actually to give the reaction effect.



Although the coils shown are of the home-wound type, the holes for the wavechange switches are drilled so as to enable the constructor to employ "No-gap" coil units if he desires. No alteration to the layout is necessary.

THE WIRING IS SIMPLE AND STRAIGHTFORWARD



Many of the leads are taken direct to the metal covering on the baseboard, a feature which makes for ease of wiring and also efficiency. It will be observed that the fuse is included in the H.T.— wander plug.

ACCESSORIES

LOUDSPEAKER.—Atlas, R. and A., Rola, Marconiphone, W.B., Ferranti, Blue Spot, H.M.V., Celestion, Epoch, Ormond, B.T.-H., Magnavox.

BATTERIES.—H.T. 120 volts. Lissen, Marconiphone, Ever Ready, Ediswan, Siemens, Pertrix, Drydex, etc.
G.B. To suit S.G. valve. Lissen, Ever Ready, Siemens, Marconiphone, Pertrix, Ediswan, Drydex, etc.
L.T. 2 volts. Lissen, Oldham, Exide, Ediswan, Pertrix, Block, etc.

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

This RADIO LANGUAGE

There must be a great many short-wave listeners who have heard amateur transmitters using their seemingly meaningless abbreviations over the radio. Our short-wave expert, W. L. S., here gives descriptions and translations of those most often used.

EVERY new science is more or less responsible for several additions to the vocabulary of its devotees. By this I don't mean a mere collection of impolite words (although that certainly is the case with some!), but a series of technical and semi-technical terms that mean little or nothing to an outsider.

We all know that radio has done this, but, in addition, since it is a means of communication, some very strange abbreviations and codes are in general use.

These are just as puzzling to the newcomer as they are useful to the old-stager, and I have frequently been asked to explain some of the stranger jargon for the benefit of those to whom, as yet, it conveys nothing at all.

Signal Strength and "Readability."

Anyone who listens to the amateur transmitters at work knows that they use an R scale for signal-strength. Without wasting too much space on it, I may as well explain that this refers to sheer *strength* of signals. The scale ranges from R1 (Faint signals; just readable) to R9 (Extremely strong signals). The intermediate stages are perfectly logical, and one soon becomes used to the R scale, although it has its weaknesses.

Much more practical is the "Readability" scale, indicated by the prefix QSA and ranging from 1 to 5. QSA 1 means Hardly perceptible; unreadable. QSA 2: Weak, readable now and then. QSA 3: Fairly good; readable with difficulty. QSA 4: Good signals. QSA 5: Extremely good and perfectly readable.

You will appreciate that a signal may be only R3 and yet QSA5 if it is 100 per cent "copyable." On the other hand, when local interference is very severe, an R8 signal may only be QSA 3.

Saving Time and Power.

So when you hear one amateur telling another that his "sigs." are QSA5, R6, you will know that he means: 100 per cent readable and good strong signals.

The T code is a means of describing the type of note turned out by the other man if he is working on C.W. T1 is one of those unspeakable bubble-and-squeaky notes combined with raw A.C., and we go up through T4 (partly smoothed A.C.) to T8 (pure D.C.) and T9 (crystal-controlled pure D.C.).

Although I don't think an F code has been published, there is one that relates to 'phone (or, in amateur jargon, "fone"—hence the F) in much the same way as the T code relates to "tone."

F9 would imply B.B.C. quality; F8, very good telephony; and so on down to the pencil-sharpening noises known as F1.

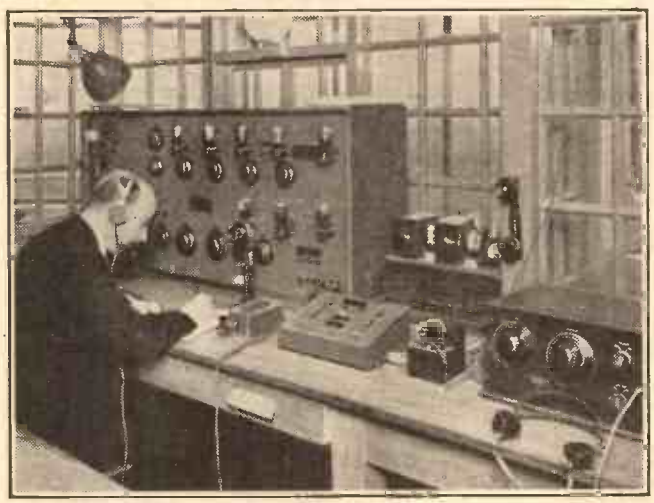
The amateur transmitter's time and watts are precious, so that it is natural that he should use a number of other abbreviations, some of which seem rather cryptic until they are understood. There is the ordinary commercial Q code, much too long to be quoted here in detail.

Q signals frequently used are: QRA—My location is——; QRK—I am receiving you well; QRM—Interference is bad; QRN—Atmospherics are bad; QRU—I have nothing more for you; QSB—Fading; QSC—Signals disappearing altogether.

A Typical Translation.

In addition, the amateur has interpreted a few of them for his own particular meanings, with the result that QSL refers to the acknowledgement cards exchanged by stations after a QSO, which is a two-way contact.

MANCHESTER'S DIRECTION FINDER



The Manchester municipal airport is equipped with the very latest apparatus for aircraft communication. Here we see the Marconi direction-finding receiver which provides aeroplanes with a ready means of obtaining their bearing.

The full list of Q signals may be found in the Amateur Call-Book and in most other radio handbooks.

Probably someone is thinking by now that all this has not helped him to understand "GA OM UR SIGS GD TODAY HWS DX?" and the similar phrases sometimes heard on the air. That particular one is almost self-explanatory, as you will agree after reading the translation "Good afternoon, old man. Your signals good to-day. How's DX?" And lest anyone should not understand DX, it refers to long-distance work generally.

Common Abbreviations.

Some amateurs have a distressing habit of using the first letter of a word followed by X to indicate almost any word they think of! But the common ones are DX—distance; WX—weather; and CONDX—conditions, and, of course, TX and RX for transmitter and receiver.

I think, myself, that there is every justification for the use, by amateur and commercial alike, of these abbreviations "on the air," but when we see them in print or in letters they strike us as merely childish. I heard of a man who wrote to the effect that he had "appld fer mi AA tkt bt nd" in a letter. He meant that he had "applied for his A.A. (artificial aerial) ticket (licence) but nothing doing." I'm not surprised if he wrote in that language.

A Changed Meaning.

Perhaps one or two of the less obvious, but more common, "shorts" need explanation. "73" is an old telegraphic abbreviation meaning "Best wishes." "Ham" used to mean a bad operator, but now it means any amateur transmitter! There is no reflection on the "hams"—the meaning has simply changed round completely, and the bad operator is now called a "lid."

Omitting Valves.

"Cuagn" is a good one on which to try your skill. It means: "See you again." "Cul" means: "See you later."

If, in early practice in deciphering radio messages, you work on the principle that the abbreviation is merely the word with some letters, mostly vowels, left out, you will have little trouble. This method gives you "msg" for message; "tfc" for traffic; "svc" for service; and things like "gd" and "bd" for good and bad will soon make you an expert in cryptography.

The abbreviations used by the present-day amateur almost all derive from those invented by the commercial telegraph operator, who had, of course, to spell out all the words of a message in the Morse code and naturally made every endeavour to eliminate letters which could easily be "imagined" by the receiving telegraphist.

TURNING OUT THE TALKS

HAROLD A. ALBERT interviews the Talks Director of the B.B.C. and reveals the thought and care that go towards this much-maligned part of the programmes.

THERE are some people who, on being introduced to the serious-minded Talks Director of the B.B.C., might square their fists.

A question to those dissatisfied listeners! Have you at any time during the past four years listened to a talk? Or have you switched off at the mere announcement?

There was a time, admittedly, when the music-hall comedian's joke of "Professor Cauliflower will now lecture on 'Earwigs'" was amply justified. Many early talks in the pioneer days of the British Broadcasting *Company* were delivered in a dry-as-dust, stodgy, lecture style and we rightly grumbled.

As Bright as They Can Be.

But I put forward the humble opinion that British radio talks are now as bright as they can be. Those who sigh for the "vivacity" of American programmes should hear a few of the mournful addresses broadcast in the United States, and then they should tune in London at talking time—*and listen—intelligently.* I fancy they would cheer the rafters off.

We all know the arduous preparation that heralds any other broadcast programme such as variety or music, but few people give the Talks Department any credit for hard work. I hand it to them!

Having told the Talks Director that I had come to talk about talks, I sat back in a comfortably tilted chair in his ultra-modern room and prepared to be bored. To my surprise he inquired:

"What talks do you want to know about?

There are four kinds—news, adult educational, schools and general—to say nothing of discussions." Well, I had never known that!

We chose the general. Have you ever wondered how these speakers are secured? How they hunted out those contributors to the famous "Escape" series, for instance?

The Microphone Voice.

It is generally a tedious process. The B.B.C. receive many unsolicited talks, for most people want to be on the wireless, but few outside ideas are accepted.

The Talks Director having roughed out his forthcoming programme—and in this task he is aided by details of the response evoked from listeners to past items—he approaches his possible speakers. I say "possible," for the number of "potentials" who actually get to the broadcasting stage is only about one in ten.

Many are weeded out after the B.B.C. authorities have arranged an interview. Some have not sufficient material for an entertaining talk; others possess not even the rudiments of that first essential, the microphone voice.

The probables are asked to submit a manuscript—and are given not a few hints and tips at writing it. Much-praised authors themselves sometimes fail in this. They cannot get over the fact that their material must appear spontaneously *spoken*, and not *read*.

Amendments Often Suggested.

It is nothing unusual for a talk submitted to the B.B.C. to be returned to the writer with alterations and suggested amendments and for the writer to become vastly annoyed with the Talks Department's impudence. Not infrequently a talk may go backwards and forwards two or three times before it is perfected!

Even regular broadcasters must submit to this "censorship," in order that the

(*Continued on page* 845.)

A TRIO OF TALKERS

Christopher Stone, whom you see above, makes his "impromptu" remarks from prepared notes. He likes to smoke in the studio, but the B.B.C. won't let him. Sir Walford Davies (left) is soon to be heard again. He is aided in instructing "the ordinary listener" by scribbled remarks on the margin of his music. Vernon Bartlett's aim is for a good opening sentence so that listeners are too interested to switch off.

Short-Wave Notes By W.L.S.

I WONDER what all my fellow-short-wavers thought of the Show this year.

After my first wander round I came to the conclusion that it was more like the furniture section of the Ideal Home Exhibition than ever before; but further investigation dispelled that idea.

Superficially, the Show appears each year to contain more furniture and less radio than before, but that is only due to the fact that wireless sets *don't* look like wireless sets nowadays.

And why should they? Radio is quickly being accepted as an integral part of the modern home, and, providing that it works, it is as well that the set should look as becoming as the rest of the furniture. We crazy experimenters who still have a love for our untidy heaps of junk would do well to remember that, and to keep the junk well out of the way!

Catering for Overseas Listeners.

I was pleased to see well over a 100 per cent. increase in the number of "all-wave" sets this year. Quite a number of firms are beginning to realise that the listener has been educated up to the realisation that there is something in this short-wave business after all.

Overseas listeners, too, are being catered for to a much greater extent—the result of the smooth running of the Empire station, no doubt. I saw several very workmanlike short-wavers built to comply with overseas requirements—teak cases, brass condenser plates and so on.

Perhaps I may be pardoned for another digression from strictly short-wave topics while the Show fever is on us all. Everything that is possible, it seems, is being done to make life easier for the broadcast listener. Single-dial tuning is the exception rather than the rule; "full-vision" tuning scales are yawning like letter-boxes on practically every stand; selectivity is increasing; and more than one device exists by which any desired station is tuned in simply by pressing a button against the name of that station on a remote control board.

Making Short Waves Simple.

What is being done to ease the lot of the short-wave man who is *not* an experimenter? We have to face the fact that the popularisation of short-wave listening, although it may be taking place very slowly, is undoubtedly on the move.

Experimenters like you and me don't mind a "haywire" set with half a dozen knobs. But what of the man who frankly confesses that he looks on a short-wave set as pure entertainment and doesn't care two hoots what's inside it? I'm *rather* afraid he will have a thin time.

I am always talking about *the* problem on short-wave sets—the means of obtaining reasonably easy tuning and yet covering all the interesting bands. So long as short-wave sets attempt to cover the full range of 12 to 80 metres, real ease of operation, I am afraid, will not be there.

But when some enterprising person brings out a commercial short-wave set that just covers the relatively narrow short-wave broadcast bands—49, 32, 25, 19 and 16 metres—and leaves out all the spacious acres of Morse that come in between them, *then* I'll sit up and take notice.

We have got to face the facts, from now on, that there are two completely different classes of short-wave listener. Mr. A. wants to hear long-distance broadcast purely for the entertainment that he gets out of it. If a ready-made set at a reasonable price will give it to him, so much the better. If the worst comes to the worst he's prepared to build one himself.

Explaining the "R" Scale.

Mr. B. plays with short waves simply for the fun of the thing, or (to put it in a more dignified manner) for the love of experimenting. The *true* Mr. B., when he has made a set that completely refuses to work, will put on a happy smile, fill his pipe and prepare for an hour or so of real enjoyment, trying to find out *why* it won't work. The more half-hearted Mr. B. will bestow a subdued curse on the designer—and perhaps write him a rude letter—and probably scrap the set and try something else.

This week our short-wave expert gives his impressions of the Radio Show from a short-wave point of view, and also has some interesting suggestions and news to pass on about reception on the higher frequencies.

But Mr. B. is the man for whom these notes are really written, and there are lots of him. So let us get down to it once more.

G. E. C. (Swansea) wants to know just what "R6," etc., means. I have already written an article explaining most of the abbreviations used by amateurs, but I may as well mention the "R" scale here and now. It is a purely arbitrary scale of signal strength, and, unfortunately, no two people have the same idea of it.

Calibrating the Volume Control

"R1" is supposed to mean "just audible" and "R9" "terrific." "R6" would therefore mean "good average signals, quite strong." If you want a real means of keeping your "R" scale steady in your own mind, try calibrating the volume control on your receiver.

Pick on the strongest signal you have ever heard, and turn down the volume control until it just disappears. Label that point "R9." Then try again with your idea of an "R5" signal; find where this fades out and label that point "R5." "R1" will hardly need any turning down of the volume at all—it will be as nearly as possible zero, even with volume control right in. This is all very rough and ready, but then the whole principle of the "R" scale is somewhat shaky.

This same reader, G. E. C., reports a freak case of reception of Bowmanville, Canada (V E 9 G W), on 49·22 metres, at strength nearly equal to W 8 X K.

New 5-metre Achievement.

An interesting comment on my recent remarks on the difficulty of hearing 5-metre signals at Hindhead from Blackdown (three miles distant) arrives from W. G. F. (Bognor Regis). He reminds me that Hindhead is practically a solid mass of iron, and that before the coalfields were developed in the north the Hindhead district was worked quite a lot for iron. All the smelting was done with wood, which was responsible for stripping the neighbouring country—hence all the barren commons in that region.

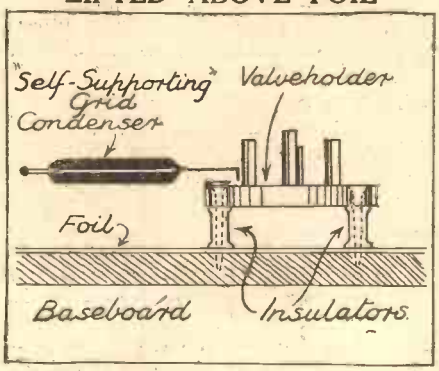
I have a letter from Mr. Chapman, G 2 I C, of Folkestone. He has established two-way contact with G 2 F X at North's Seat, just behind Hastings—about 30 miles.

RAISING VALVE HOLDERS

ALL the "live" parts in a short-wave detector circuit should have as low a capacity to earth as it is practicable to obtain. Where a baseboard is covered with foil it is usually preferable to coat the underside, so as to increase the distance between this "earth" and such parts as the grid condenser and the grid and anode terminals of the valve holder.

If the foil is on top, or if a metal baseboard is used, it is always worth one's while to raise the valve holder and grid condenser a quarter of an inch (or more) above it.

LIFTED ABOVE FOIL



Undesirable capacity to earth is avoided by the lifting of components.

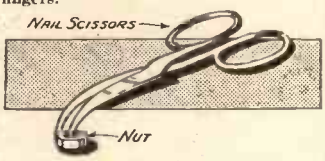
This can be done conveniently by means of the tiny insulators sold for indoor aerials. (See diagram.)

In the case of the grid condenser a better plan still is to use one of the "wiring-in" type, provided with tags and not screwed down at all.

RECOMMENDED WRINKLES

PICKING UP NUTS.

IT frequently happens when building or making adjustments to a set that a small nut or terminal drops on to the baseboard in such a position that it is not easily recovered with the fingers.



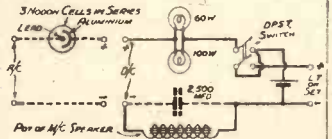
A new use for curved scissors.

A pair of nail scissors, of the thin-bladed variety, have been found most useful for this purpose, especially those with curved blades; they are also very useful for holding a nut in position while screwing it on to a terminal in an awkward place.

A USEFUL CIRCUIT.

I ENCLOSE herewith a circuit I have been using for some considerable time for energising a low-resistance (4–6-volt) M./C. speaker and for charging an accumulator at the same time. The accumulator is only on charge when the set is also switched on (i.e. eventually the energy taken by the valves as L.T. comes from the mains, while the accumulator remains constantly charged). I have had the same accumulator in use for over a year, and, apart from periodically "topping up," have not touched the whole of the apparatus, which is in a box well out of sight.

For alternating currents, the additional apparatus is shown in dotted lines. The condenser is 2,500-mfd. electrolytic, but it may not be found necessary in actual practice.



Charging and energising circuit.

The rectifier is of the well-known Nodon cell type, and consists of 3 cells in series. Each cell consists of a lead and aluminium plate, ½ in. apart, in a saturated solution of ammonium phosphate. It is important that the aluminium electrode should be joined to the + terminal on the D.C. part of the apparatus.

The switch must be of the D.P.S.T. Q.M.B. type.

For D.C., lamps totalling about 160 watts must be used, of the correct voltage for the supply: for A.C. the lamps should also total 160 watts, but with lamps of half the supply voltage.

USE FOR BROKEN-DOWN CONDENSERS.

WHEN a condenser of the Mansbridge type breaks down it becomes useless as far as wireless work is concerned. Here is a use for it, however, which you may care to try:

Carefully break open the case and extract the contents. This consists of two long strips of tinfoil, kept apart by waxed paper. Unroll these, and when you have done so you will have two strips, each about 50 ft. in length.

If run round the picture rail these will make an extraordinarily good indoor aerial, the end nearer the set being attached to the aerial terminal.

TO LOOSEN TERMINALS.

DOUBTLESS many readers have tried to disconnect their L.T. battery, only to find themselves baulked by a terminal that has become corroded. The common thing to do is to try to turn it with a pair of pliers. This, in most cases, results in the stem of the terminal snapping off and the battery has to be taken to be repaired.

A better way is to cut the wire as close to the terminal as possible and take the battery to the sink. Make sure that the stopper is in position, and then let the tap run gently on the terminal. After about half an hour it should be possible to unscrew the terminal with the fingers. A smear of "Vaseline" will prevent further trouble.

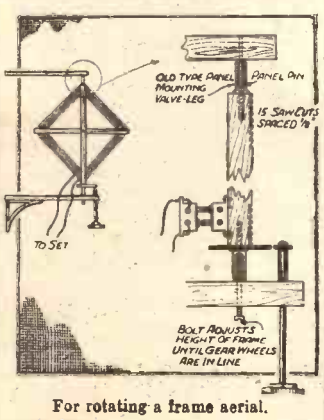
What to do when terminals stick.

A GEARED FRAME.

THE sketch shows an original idea which can be put into practice by the majority of amateurs at no expense whatever.

It is a geared control for a frame aerial. This obviates the necessity for having the frame stood on the radio set or sideboard, as it can be screwed to the window frame or any other convenient place, and the use of a long extension handle removes any liability to alter the tuning or to decrease volume when swinging the frame about.

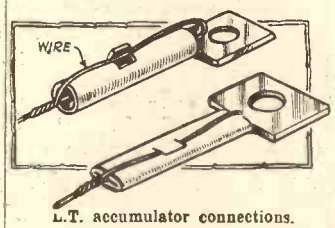
The sketch is self-explanatory without giving any further details.



For rotating a frame aerial.

ACCUMULATOR CONNECTIONS.

THE covering removed from lead-covered cable provides excellent non-corrosive connections for low-tension batteries.



L.T. accumulator connections.

Two pieces of the tubular covering are removed. These should be roughly 1¾ in. in length. Down one wall a split, about ¾ in. in length, is made, and, by careful cutting, this section is opened out into a square, through which is drilled a hole to suit the diameter of the battery terminal.

In the centre of the piece of tubing now left two crosscuts are made, to pierce the top wall of the tube and to form a strip about ¼ in. in width, which is raised above the rest of the tube. The wire is then inserted into the tube, and is bent back in a loop, threaded underneath the raised strip, and wound round the main stem of wire entering the tube. The tube, including the raised strip, is then hammered flat, thus tightly gripping the wire.

TESTING VALVE CURRENT.

THIS little gadget will enable those readers who possess a milliammeter to check their valve current quickly and safely. The necessary parts are a valve holder and an old valve base.

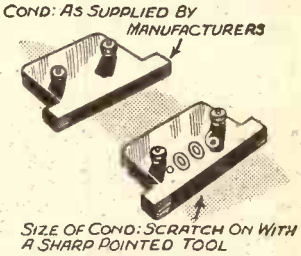
First file flat all the terminals—except the anode—on valve holder, cover these with a piece of insulating tape and varnish to harden. Drill small hole through centre of valve holder and valve base to take fine rod, which holds the two parts together.

Next insert small terminal in one of the wood screw holes in valve holder, connect this to valve base anode pin. Also connect filament and grid sockets to their respective pins on valve base.

To test, withdraw valve from set, place gadget in its place, insert valve into gadget, and connect milliammeter to the two terminals for reading.

VALUES AT A GLANCE.

I ANNEX sketch of a "Radio Wrinkle" which I have found very useful when checking a layout. It has saved me, on many an occasion, from unscrewing the component from the baseboard for verification. At a glance I can tell the size of every condenser in the sets I have built.



Putting the value on top.

Method: With sharp-pointed end of scissors or other tool scratch the size on the flat top of condenser or which ever side is visible looking down on the layout. Rub over with ordinary chalk and wipe over. Result: the size stands out in clear white figures.

SILENCING CHARGERS.

IF AN A.C. trickle charger, incorporating a metal rectifier, causes a hum whilst it is in operation, a piece of rubber sponge placed under the charger, sufficiently large to keep it off the floor, will render the noise practically inaudible.

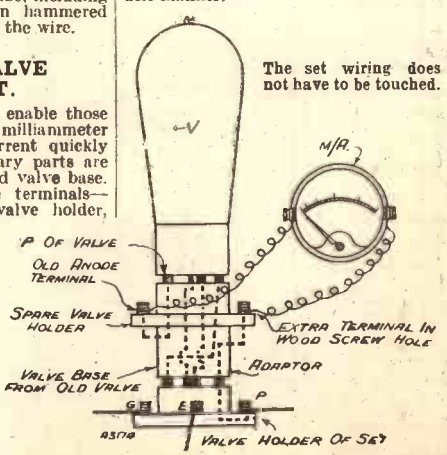
The hum, in my own case, was caused by the vibration of the rectifier being transmitted to the floor by contact.

THE VERSATILE PENTODE

IN ADDITION to working in the ordinary way, a pentode valve can also be tried as a three-electrode.

To do this it is only necessary to connect the loudspeaker in the lead going to the auxiliary grid, the anode being left unconnected. The valve then functions as a small-power valve.

Of course, you do not get the step-up in signal strength that you would if the valve were connected in the orthodox manner.



ONE GUINEA FOR THE BEST WRINKLE!

Readers are invited to send a short description, with sketch, of any original and practical radio idea. Each week £1 1s. will be paid for the best Wrinkle from a reader, and others will be paid for at our usual rates.

Each hint must be on a separate sheet of paper, written on one side of the page only. Address your hints to the Technical Editor, "Popular Wireless," Tallis House, Tallis Street, E.C.4, marking the envelope "Recommended Wrinkles."

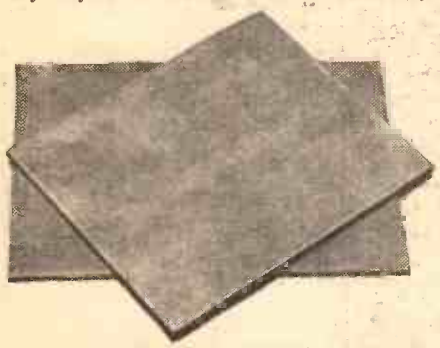
Will readers please note that the Editor cannot, in any circumstances, guarantee to return rejected Wrinkles, and that payment for published hints is not made until ten days after they appear.

The best Wrinkle last week was sent by Mr. A. R. Jones, 22, Brockhurst Road, Chesham, Bucks, to whom a guinea is being awarded.

"METAPLEX" METALLISED BASEBOARDS

MODERN circuits demand much more screening than the earlier ones, and, although this is largely offset by the fact that screening is widely applied to individual components, such additional measures as the metal covering of baseboards are often essential.

As a matter of fact, this, the overlaying of the baseboard, can be applied with advantage to practically every set. It would have been even more widely



Two of the Peto Scott Metaplex metallised baseboards.

used if it were not for the fact that the operation is a somewhat troublesome one. However, this present age is not likely to overlook anything that can possibly be simplified and made inexpensive, and in this case it is that enterprising concern, Messrs. Peto Scott, Ltd., who have filled the breach.

And in view of their long-established and successful service for the home constructor it was both appropriate and inevitable that it should have been Peto Scott.

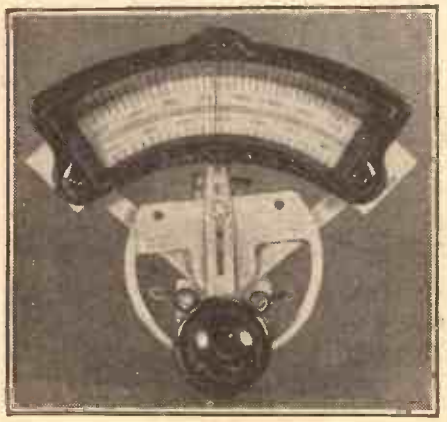
Their complete and most acceptable solution takes the form of a metallised wooden baseboard known as "Metaplex." This is a high-class multi-ply upon the surface of which metal has been sprayed by a secret process.

So good is the spraying that the result is every bit as good as a solid metal plate; but there is the great practical advantage that the metal coating in no way impedes boring or screwing operations.

Also, it is extremely simple to make a perfect contact with this ingenious shielding—it can be done merely by means of wood screws and washers.

Finally, Metaplex costs little more than ordinary high-grade plywood. For example, a piece 12 in. by 10 in. costs only 1s. 6d.

We congratulate Peto Scott, Ltd., on the design and production of this valuable material, and the constructor on being so fortunate as to have it available for his use.



The Polar "Arcuate" condenser drive.

NEW POLAR CONDENSER DRIVE

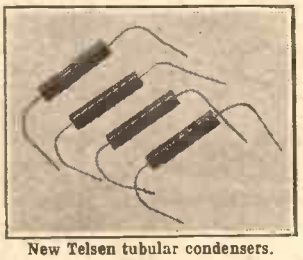
Some time ago I contributed to "P.W." what a reader styled "a most interesting essay" (shades of Emerson and Carlyle!) on the subject of the importance of small things in radio. But I omitted to refer to one thing, and that is the irritating difficulty of reading many of the vertically placed condenser dials and scales which are still to be found gracing (or disgracing!) our sets.

You know the kind of thing; maybe you suffer from it with your own set. The vertical panel casts a shadow, and this shadow may be deepened to an almost impenetrable blackness by an overhanging cabinet top.

Somewhere buried in that shadow are the condenser dials, which it is impossible to see, especially at night, unless you crane your neck painfully or strike a match!

However, one need not suffer in this way now, for the Polar "Arcuate" Condenser Drive provides for easy visibility in all conditions.

In the first place, it has an inclined scale—inclined backwards, that is, so that you can look down at it and plainly see its markings. Then, if that is not enough, there is a light to provide well-distributed artificial lighting.



New Telsen tubular condensers.

The scale is marked in wavelengths as well as in degrees, although the latter are not, in my opinion, easy to interpret. However, they are subsidiary to the plain wavelength marking.

The slow-motion action of this Polar "Arcuate" is, I venture to say, absolutely perfect. Slip is impossible, and the movement is velvety.

And the whole affair, complete with a fine panel escutcheon, costs 5s. 9d. There is another model which is fitted with an air-dielectric trimmer, controlled, according to the famous Uniknob principle, by a knob concentrically placed on the main drive. This retails at 7s. 9d.

MORE NEW TELSEN COMPONENTS

I don't suppose there is one single radio shop in the whole of the kingdom, however small, that does not carry a proportionately large stock of Telsen components.

There are, of course, definite reasons for that. Inexpensiveness? Decidedly. But inexpensiveness alone could not create such a widespread demand. Quality is another prime essential, and it is to be met in Telsen products, for they are both cheap *and* good.

A neatly enclosed differential reaction condenser.

Take, for example, one of the new Telsen lines, the Telsen small tubular condenser. In capacities from ·0001 mfd. to ·006 mfd. it costs but 1s., and the ·01 mfd. and ·1 mfd. list at a mere 1s. 3d. and 1s. 6d. respectively.

Yet each one is tested to 1,500 volts.

These tubular condensers are also extremely useful, for they are very compact, and with their easy-to-connect wire ends they can be suspended in wiring.

Every home constructor should possess a range of them. The samples I have tested were perfectly satisfactory in every way. I took four different values. Those were of exactly the capacities at which they were rated, and the fourth had an entirely negligible error of less than 2 per cent. And that is, I assure you, wonderful accuracy for such inexpensive condensers.

Another most attractive Telsen component is the differential condenser that lists at 2s., in capacities from ·0001 mfd. to ·0003 mfd.

I like it particularly because it is completely enclosed, and in a nice, small case, too. There is not much that can be said technically against the practice of having the vanes exposed, but all the same I vastly prefer them to be neatly encased in the Telsen way.

The Telsen "diff." also works very well. It has a smooth, unrestricted movement, and does not give one the feeling of plates being squeezed between bakelised sandwiches.

It has an efficient pigtail and conveniently placed terminals.

Weekly jottings of interest to buyers

WHAT must surely be one of the most remarkable unsolicited testimonials that has ever been written concerning a radio set was recently received by Messrs. Ferranti.

It read: "Dear Sirs,—I read in the daily newspaper that millions of listeners were disappointed when an attempt was made to relay a broadcast interview with Amy and Jim Mollison from New York on Friday evening, July 28th.

"It may interest you to know that I heard every word of the five minutes' broadcast with perfect clarity, and was astounded and greatly disappointed when the announcer apologised for the distorted conversation and complete fiasco.

"My set is a Ferranti 3-valve Console 1931 model.—Yours faithfully (signed), Mrs. ——"

As it so happened, I heard the beginning of that broadcast myself, and my own impression at the time was that I had never heard anything quite so bad! So this is indeed a remarkable testimonial.

I must be frank and admit that I always did have a high opinion of Ferranti instruments generally, but—well, I ask you! I am aware that in Eccles, from where this good lady hails, they have a happy knack of doing wonderful things with currants in cakes, but that they had a secret recipe for hotting-up currents of another kind is certainly news to me!

If this same set is capable of making something intelligent out of the so-called chamber music that is frequently broadcast I have a strong feeling that there is a fortune awaiting Ferranti.

The Joys (?) of Auto-Radio.

I am a great believer in moving with the times. Thus, when the oft-mooted question of car radio developed into something a little more concrete, I decided that,

(*Continued on page* 842.)

MULLARDS MAKE IT EASIER . . .

IT'S GOING TO MAKE SUCH A DIFFERENCE

It's going to bring Pentode Power into the H.F. stage of millions of receivers. That's the wonder of it. This new Mullard Screened Pentode will plug into everybody's A.C. set — into *your* set, into *any* and *every* A.C. set, whatever the circuit. It will bring old sets up-to-date, will make new sets the receivers of the future. Because Mullard Research, which first introduced Pentode Power into the speaker stage of receivers, now comes forward with new Power, Pentode Power, for the first stage.

Pentode - Detector - Pentode, that's the new idea. Ask your dealer about it. He'll show you what it means to you.

Ask T.S.D. Whenever you want advice about your set or about your valves—ask T.S.D.—Mullard Technical Service Department—always at your service. You're under no obligation whatsoever. We help ourselves by helping you. When writing, whether your problem is big or small, give every detail, and address your envelope to:—T.S.D., Ref. C.F.P.

Mullard

THE·MASTER·VALVE

The Mullard Wireless Service Co., Ltd., Mullard House, Charing Cross Road, London, W.C.2

THE MIRROR OF THE B.B.C. By O. H. M.

COLONEL DAWNAY TAKES OVER

The Latest Edict—Regional Independence—A Panel of Organists—B.B.C. Scottish Service.

COLONEL DAWNAY, of the War Office, has now taken over the duties of Controller of Output of the B.B.C. and relieved Sir John Reith of about two-thirds of his work. As I anticipated, although nominally Colonel Dawnay is of the same grade and rank as Sir Charles Carpendale, he is, in fact, senior because of the prior importance of his duties.

The gallant admiral retains a pleasant if shadowy official existence. Sir John Reith at last sits back with the Governors.

No Attention to Comment.

There is apparently a new spirit of independence and confidence at Broadcasting House, where the edict has gone forth that in future no attention is to be paid to outside comment or critical correspondence that does not originate from really important or influential persons. It is not clear what constitutes an important or influential person, but presumably members of the House of Lords are not excluded.

Future of Regional Directors.

Regional directors are at last discovering how they are to be affected by the new "output-input" regime of organisation. They find themselves with two chief assistants, one an organiser and the other an output man, each owing chief allegiance to either of the two super-controllers at headquarters.

The first effect, of course, is to relieve Regional directors of much work and responsibility. The second effect, not so welcome, is to make it much easier than it was formerly for purely "London" policies to be put across. Thus the new organisation definitely is a blow at Regional independence, because the staff in the regions are no longer under the control of the Regional director.

Is Parliament to Know?

The B.B.C. emerged triumphantly from the attempts last spring to have its affairs discussed in Parliament—too triumphantly, perhaps. The underlying discontent is unappeased—in fact, rather exacerbated.

I hesitate to prophesy how long the B.B.C. can manage this muzzling business; with the connivance of the Post Office; but I have no doubt that in the long run it is bad policy and one which will have a heavy boomerang effect not later than 1935.

Ban on Ex-Officials?

The alleged ban against ex-officials of the B.B.C. doing any work for broadcasting is hardly consistently applied if my information is correct. I hear, for instance, that Mr. Macdonell, the founder of the "Surprise Item," is now regularly engaged as a producer.

Then there is Mr. Howard Marshall, whose voice remains familiar in sporting commentaries. Both these gentlemen are believed to have left the B.B.C. partly at least as the result of disagreement.

It is, of course, a good thing that they should be used at the microphone; but my point is that it is a bad thing that listeners should be deprived of the voices of experts such as the following, to whom the ban seems to be strictly applied: Mr. Fryer, Mr. R. E. Jeffrey, Mr. Alan Howland, Mr. Eric Dunstan, Miss Hilda Matheson and Mr. Rex Palmer. Above all, P. P. Eckersley.

Heaven knows there is no surplus of quantity or variety of microphone voices. It may be argued that some of these ex-officials would not return to the microphone; that may be so, but it is no excuse for not giving them the chance.

Sir Charles Carpendale.

Admiral Sir Charles Carpendale, for ten years staff Controller of the B.B.C., recently reached the age limit of sixty years; but I understand that the Board of Governors have invited him to continue as joint Controller with Colonel Dawnay until December 31st, 1934.

Programme Correspondence.

What is the reason for the marked decline in the correspondence addressed by the public to the B.B.C. on programme subjects? I would say that there were several reasons, the first being the difficulty of influencing B.B.C. policy in this way. Patient and painstaking students of programmes have abandoned the effort.

Another reason is that broadcasting has become an accepted part of daily routine and no longer awakens such violent personal controversies as it once did. A third reason is that programme complaints and criticisms are being sent more and more to newspapers and journals, where they are more sympathetically received.

(*Continued on page* 842.)

WAX IMPRESSION OF CHRISTOPHER STONE

This is not the popular record broadcaster in person, but a wax model of him used for show purposes. The young ladies, however, are real.

THE LISTENER'S NOTEBOOK

Frank comments on recent programmes and on microphone personalities of the moment.

WHAT are the requirements of a good radio play? I ask this question because of the B.B.C.'s insistence on putting on plays of the "Robert E. Lee" type. This play, in my opinion, was too devoid of action to be a good radio play.

It was nothing but one summing-up after another of the several situations after the event. Or, alternatively, the consideration of a situation before an impending crisis. A historical play without action is nothing more than a historical reading, and a historical reading doesn't become a play by putting the verb in the present tense. Play writing isn't as easy as that.

* * *

A friend of mine liked "Robert E. Lee" because it was "all so true." I liked it, too, perhaps for the same reason. I'm fond of history, and particularly of historical characters. Robert E. Lee himself is a character worth studying, and Drinkwater has done his job well by some excellent character drawing. Despite this, however, "Robert E. Lee" isn't a good play, as it lacks the other essentials.

I would like an expression of opinion from the actors themselves on this point. Did "Robert E. Lee" offer them any tense moments, or did they feel the stilting effect of arguing in the grandiose style about an issue which they knew they weren't expected to put over?

To anyone who didn't know the play there must have been disappointment over the negativeness of the plot; but to anyone like myself, with a previous knowledge of the play and being fond of history, "Robert E. Lee" was not to be despised.

* * *

Apart from the Proms. (which, by the way, always start too early in the year for me), Christopher Stone's one or two efforts and variety from Olympia, there has been another period of orchestra, orchestra and orchestra. And, as if we hadn't had enough orchestra, the gramophone interlude after the news each evening has recently consisted largely of orchestral records.

At liberty (so I presume) to put on what they like, announcers ought to show better understanding. They ought to remember that 6.15 p.m. is a time when most working men have just knocked off. Give them something, then, that goes better with high-tea than "State Opera Music, under the direction of."

There's a forbidding sound about the phrase "under the direction of."

* * *

I was grateful to a couple of comedians from Blackpool for some cross-talk that made Blackpool folk roar with laughter. Say what you will about seen and unseen audiences, spontaneous laughter from a theatre audience is infectious, and tends to a better appreciation of the turn by the unseen listener.

That's why I look forward to coming relays from the Argyle Theatre, Birkenhead.

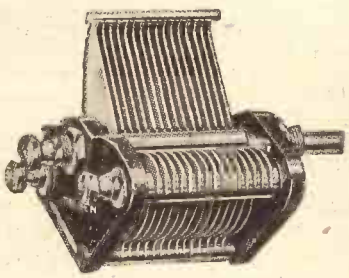
* * *

That's why the stars from Olympia seemed still higher in the ascendant. I shall never forget the riot of applause that greeted Henry Hall's first public theatre appearance. It was good to hear it.

I didn't grudge him one iota of it. Of course, I joined in. It was irresistible. Enthusiasm ran wild. Yes, there were catcalls and whistling galore. *But this didn't spoil the performance. It made it.*

(*Continued on page* 844.)

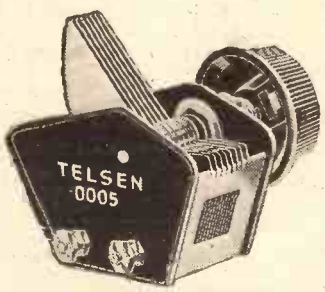
TELSEN TUNING CONDENSERS cover every requirement



TELSEN AIR-DIELECTRIC TUNING CONDENSERS

The precision and sturdy construction of this component ensure years of faithful service. Its frame is braced by three solid pillars, and the vanes clamped at three points, making distortion impossible. The rotor is also built into a rigid unit, generous bearings preventing backlash or end-play.

Capacity	*Price*
·00025 mfd. ..	2/6
·00035 „ ..	3/6
·0005 „ ..	3/6



TELSEN BAKELITE DIELECTRIC TUNING CONDENSERS

Represent really remarkable value at the new reduced prices.

Very rigid construction, with high grade dielectric, ensuring permanently accurate spacing with minimum losses. Exceptionally compact. Complete with knob.

Capacity	*Price*
·0003 mfd.	2/-
·0005 „	2/-

TELSEN DIFFERENTIAL CONDENSERS

Similar in design and construction to the reaction condensers. Supplied complete with knob.

Capacity	*Price*
·0003 mfd. W.351 ..	2/-
·00015 „ *W.352* ..	2/-
·0001 „ *W.353* ..	2/-

TELSEN GANGED CONDENSERS

The finest ganged condensers ever produced, and, at their new reduced prices, the finest value ever offered in their class.

For use where accurate and simultaneous tuning of two or three circuits is obtained by the rotation of one dial. A pressed steel frame of great rigidity eliminates distortion, the rotor and stator vanes being let into one-piece high pressure die castings to ensure accurate spacing. All sections are very carefully matched by means of split end vanes, and trimmers are provided. Complete with knob, pilot light escutcheon and two alternative tuning scales.

	Price
Single Unit	7/6
Twin Ganged	12/6
With dust cover 2/- extra	
Triple Ganged	17/6
With dust cover 2/6 extra	

TELSEN REACTION CONDENSERS

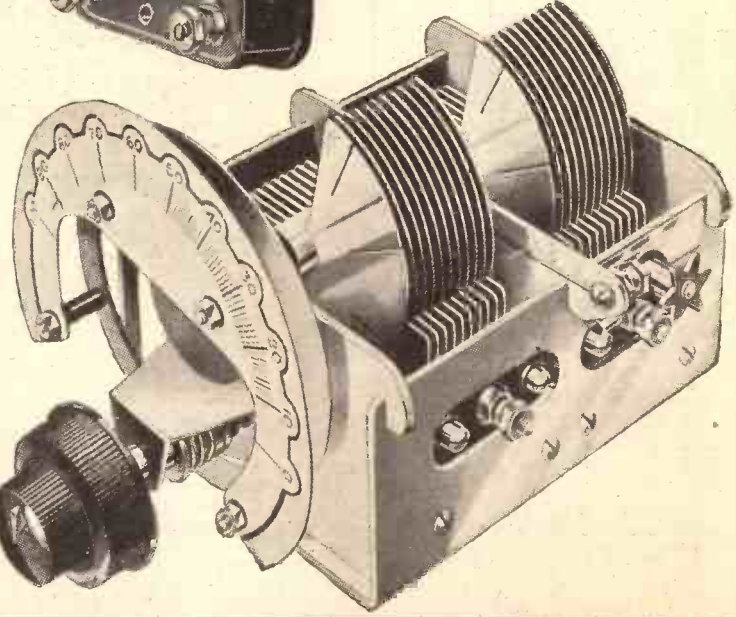
Entirely re-designed. Now incorporate several valuable improvements with no increase in price, the whole unit being also now enclosed in a strong dust-proof bakelite case. Supplied complete with knob.

Capacity	*Price*
·0003 mfd. W.354 ..	1/9
·00015 „ *W.355* ..	1/9
·0001 „ *W.356* ..	1/9
·00075 „ *W.357* ..	2/-
·0005 „ *W.358* ..	2/-

TELSEN AERIAL SERIES CONDENSER With Switch

Built on similar lines to the new reaction condensers, providing an ideal selectivity and volume control. Supplied complete with knob.

Max. Cap.	*Price*
·0003 mfd. No. W.350	2/-



TELSEN FOR EVERYTHING IN RADIO

ANNOUNCEMENT OF THE TELSEN ELECTRIC CO., LTD., ASTON, BIRMINGHAM

GETTING MORE FROM YOUR AERIAL

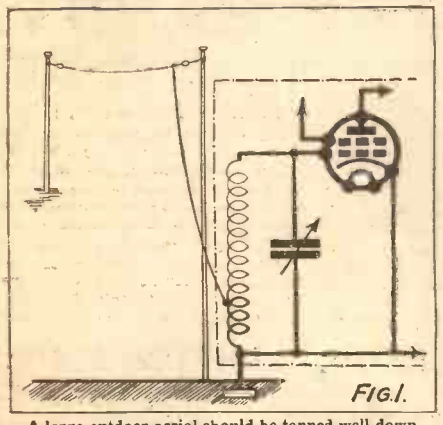
Are you absolutely satisfied that you are getting the best results from your set? If not, you should most certainly read these helpful and practical hints on "making your aerial fighting-fit."

By MARCUS G. SCROGGIE, B.Sc., A.M.I.E.E.

IF Æsop had lived in these wonderful days he might have used his fable about the donkeys to show that "One aerial's meat is another's poison." The tonic prescribed for the other fellow's aerial-earth system might send yours into a relapse, with only its deathbed whisper struggling out of the loudspeaker.

A glance at the house-tops will convince you that aerials are by no means rigidly standard in length, height, shape, or anything else; and if you could see right into the houses and take note of all the picture-rail aerials, frame aerials, mains aerials, and other types, the diversity would be even more apparent.

USING A TAPPED COIL



A large outdoor aerial should be tapped well down the aerial coil so that there are relatively few turns between the tapping and earth.

So it is quite easy to realise that the correct prescription for making an aerial fighting-fit depends on its individual needs. But it is possible to give the general rules of health for two main classes.

Most of the treatment that is right for aerials of one class is exactly opposite to that for the other, so it is really quite important to distinguish between them. We shall use the correct scientific names for them, not just to be very technical, but because they are convenient labels of identification—high impedance and low impedance.

What Is Your Aerial?

Indoor aerials, or very short outdoor wires kept well clear of everything, are high impedance. The regulation 100-foot wire, particularly if suspended within a few feet of a lead roof and brought down to the basement of a block of flats, is of low impedance. Frame aerials are quite different and are left out of account altogether.

If you can decide which class includes your aerial, you can now proceed to see if it is being treated in a way which will help it to give the best results. First to explain how the impedance of the aerial affects the performance of your receiver. If you don't understand the explanation, you can pass on to the tips that follow it.

Suppose that your tuning coil is arranged so that you can tap the aerial on to it at any point. Starting at the earthed end, if it is connected right at the foot, the aerial goes straight to earth without including any turns of the coil.

As there is no part of the coil obstructing the way, the tiny voltage generated in the aerial by the waves from the distant broadcasting station is able to produce quite a large current, relatively speaking. But the current is no good to you because it is not linked with your tuning coil. It is just running to waste.

Tapping Down the Coil.

Now move the aerial tap a few turns up from the earth end. The current, which is all the time darting to and fro between aerial and earth, now has to pass through a few turns of the coil, which tend to reduce it. But only very slightly, for there are so few turns. For the same reason the coupling between the aerial and the receiver is very weak, so the tuning circuit is unable to make the fullest possible use of the aerial current.

As the aerial tap is raised further, so the coupling between the aerial and the tuning circuit increases; likewise the strength of reception. Surely, then, it is best to connect right at the top, so that the whole of the tuning coil lies in the path of the aerial-to-earth stream? But in doing so you *may* be killing the goose that lays the golden——well, *voice!*

In fact, it tends to be a sort of two-edged killing; if the whole coil is in the aerial circuit, the aerial current is severely reduced by the obstruction; and the tuning circuit itself is pulled down badly by the whole load of the aerial hanging on to it. So there is a certain best tapping point, which may be somewhere between the grid and earth ends of the coil.

In the foregoing imaginary experiment the only thing we have been striving for is to get the greatest *amount* of reception. But in the days of so many high-power stations that is not the only object in life. It may be necessary to sacrifice some of the efficiency of reception in order to get *selectivity*.

"Reception from every station in Europe" is no recommendation of a set if they are all heard at once! While *strength* of reception increases as the aerial is moved up the coil, until it gets to the best point, and then decreases, it is fairly true to say that *selectivity* decreases all the time, so if there is much interference a rather lower point than the "best" is *really* the best.

What has all this got to do with the two classes of aerials? Well, the "best" point for the low-impedance aerials is *low* on the coil; and for high-impedance aerials, *high* up the coil—perhaps right at the top.

Greatest All-Round Benefit.

In fact, with small indoor aerials, such as are generally quite adequate nowadays, the best way to get the greatest all-round benefit may be to go beyond the top. That sounds absurd, but we can do so in effect by putting a small condenser between the aerial and the top end of the coil ("series condenser").

It has already been pointed out that the more of the tuning coil that lies in the path from aerial to earth, the more the aerial current is cut down. If the impedance of the aerial itself is low, this effect of the coil is relatively important, and therefore the advantage of coupling the coil closely by tapping high up is mainly offset by the reduction in aerial current.

But if the impedance of the aerial itself is high, the coil is a mere trifle in comparison; and so the current is largely independent of tapping point, and the more turns that are included the stronger the reception.

Unimportant Losses.

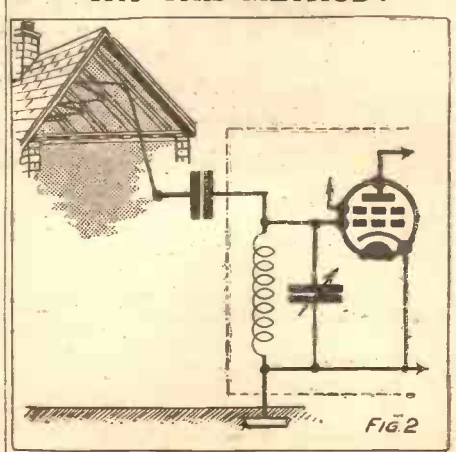
So here we have our two typical systems. Fig. 1 shows a large aerial; low impedance; tapped low down on the coil; dependent on maintaining a large aerial current, therefore high-resistance joints and dry earths are strictly forbidden. On the other hand, a bit of loss here and there due to poor insulation or to bringing the lead-in close up to walls is not very serious.

It is like a low-pressure water system, in which there is such a large *quantity* of water that a little leakage by the way is not very noticeable, but even a slight stoppage in the pipe is enough to resist the low pressure and reduce the power.

Such an aerial tapped within a few turns of earth can actually be grasped by the

(*Continued on page* 842.)

TRY THIS METHOD!

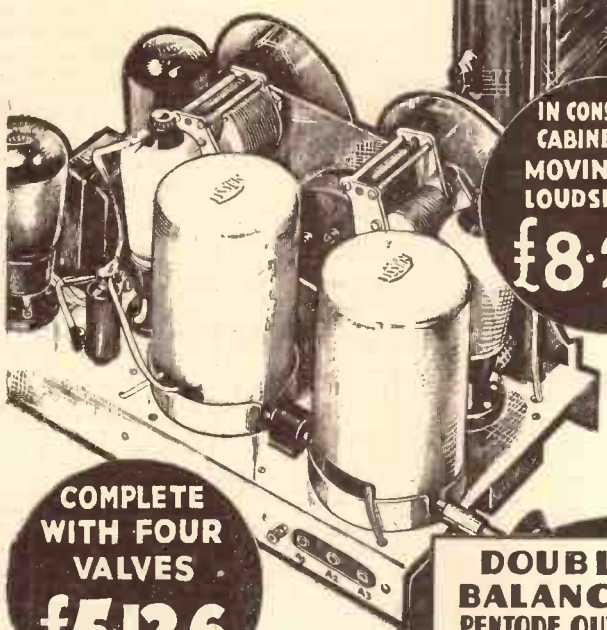


In the case of an indoor aerial, connection to the top end of the aerial coil via a series condenser often gives good results.

WORLD-WIDE RADIO RECEPTION · ENGLAND · EUROPE · AMERICA AUSTRALIA

for Home Constructors ONLY!

IN CONSOLETTE CABINET WITH MOVING COIL LOUDSPEAKER £8·2·6



COMPLETE WITH FOUR VALVES £5·12·6

SHORT WAVES THAT BRING AMERICA AND AUSTRALIA DIRECT TO YOUR LOUDSPEAKER

YOU MUST BUILD WITH YOUR OWN HANDS!

At last the day of All-World Radio has arrived, and you can build with your own hands the first receiver to give you not only England and Europe, but America and Australia direct. The Lissen All-Wave All-World "Skyscraper" 4 tunes from 12 to 2100 metres. It brings two complete new wavelength ranges within reach of the ordinary listener—stations and programmes which before he was never able to receive—Ultra-Short and Short-Wave transmissions from the ends of the earth. And remember you get these stations through Double-Balanced Pentode Output giving brilliant reproduction on a Moving-Coil Speaker—as much power as a Mains Set from ordinary high-tension batteries. Lissen have made this All-Wave All-World Radio available to Home Constructors first, because it brings back the thrill of conquest to hear America and Australia *direct* on a set you have built yourself, it makes you an enthusiast to realise what a wonderful thing you have created!

DOUBLE BALANCED PENTODE OUTPUT *AND* MOVING COIL SPEAKER

The output stage of the All-Wave All-World "Skyscraper" 4 is Quiescent Push-Pull output at its best, incorporating TWO BALANCED LISSEN POWER PENTODE VALVES and giving you brilliant reproduction on a Moving-Coil speaker. You get mains volume from this set, yet it works from ordinary high-tension batteries and is an economical set to run.

SAVE POUNDS—SUCCESS CERTAIN!

And when you see the Great Free Chart of the All-Wave All-World "Skyscraper" 4, which tells you how to build it and how to work it and why it gives such marvellous results, you will agree at once that it will be wise of you to build for yourself rather than buy a factory assembled receiver which cannot give you these new and intriguing short-wave stations. The FREE CHART simplifies everything; there are pictures of every part, with every wire numbered, every hole lettered, every terminal identified. YOU CAN'T GO WRONG! But get the Chart and see for yourself—then build the Lissen All-Wave All-World "Skyscraper" 4, the SET THAT SPANS THE WORLD!

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Publicity Dept., ISLEWORTH, MIDDLESEX.

Please send me FREE CHART of the All-Wave All-World "Skyscraper."

NAME .....

ADDRESS .....

.....POP. 334.

CHART FREE POST COUPON

"SKYSCRAPER"

CONSTRUCTING YOUR OWN COILS

By the "P.W." RESEARCH DEPARTMENT.

The dual-range tuning coils used in the "Caledonian" Three, described elsewhere in this number, are quite easy to construct and are also suitable for use in many other different circuits. Clear and detailed instructions for making them will be found in the diagrams and text on this page.

COIL winding is really most easy—even the winding of high-efficiency dual-range coils capable of dealing with the difficult ether conditions that exist to-day.

There is only one point that is likely to trip you up, and that is perfectly easy to guard against. It concerns the direction of winding.

It doesn't matter a tinker's cuss in which direction the turns of each section are wound so long as all the turns of all the sections are in the *same* direction.

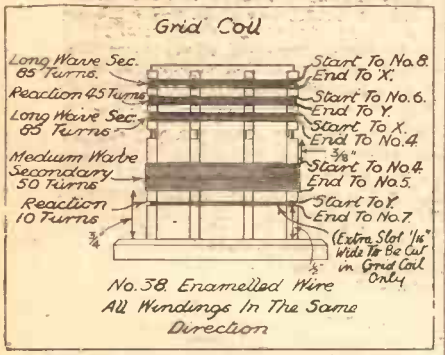
Take the case of the coils we are going to describe here, which are specially designed for the "Caledonian" Three, but which also form an ideal dual-range pair for any set with an H.F. stage. The two simple diagrams give all the information that is needed to wind them.

Directions of Turns.

You will see that each section is marked with the start and end. If, having secured the "start," you place the former on the table in its normal position, look down at the top of it and then wind on the turns in a clockwise direction, you are bound to get the wire on properly.

Actually it would not matter a bit if you wound in an anti-clockwise direction, so long as you did it throughout. But make sure you clearly mark which is the start. A good scheme is to tie a loose knot in the end of the wire with which you commence.

WITH REACTION WINDING



Details of the grid coil, which carries the reaction winding in a special narrow slot cut at the bottom of the former.

The aerial coil is, of course, quite different from the grid coil. Both have long- and medium-wave "secondaries," but the grid coil has a reaction winding in addition, while the aerial coil has a primary winding extra. The junctions between the long- and medium-wave windings form the points to which the wavechange switch contacts are joined.

The formers of both coils are similar, and are six-rib British Radiogram Company, Type No. 12, formers, which have four slots at the top. We will deal with the grid coil first, in which only the top three of these slots are used. But an extra slot has to be cut for the reaction winding.

This slot is ½ inch from the bottom of the former, and should be approximately 1/16 in. wide. If the cuts are made with a coarse hack-saw blade you will find that they will be about the correct width.

Having made this extra slot, the winding can be started. No. 38-gauge wire is used throughout for both coils, and 1 oz. should be purchased.

Commence with the top slot. The wire is secured by twisting in and out of two small holes in the former. Arrange for the end of the wire to be inside the former, and leave it about 6 in. long for connecting up later.

As the end of each winding will need two small holes for finishing off, it is as well to drill all of these first, using a really small drill for the purpose. Ten pairs will be required in all.

When finishing off the windings the ends should again come on the inside and be about 6 in. long.

Remember to see that you get all the sections in the same direction. There are 85 turns in the top slot, 45 in the second and another 85 in the third slot.

The Aerial Coil.

The medium-wave secondary winding is wound on top of the ribs in a single layer. Start winding it ⅜ in. from the bottom slot. You should find that this winding will end about ¾ in. from the bottom of the former and ¼ in. from the reaction slot.

This completes the coil, except for connecting up the sections. These connections are given in the diagram, but further reference will be made to them later.

So far as the winding and the securing of the ends of the wires are concerned, the construction of the aerial coil is exactly similar to that of the grid coil. The first, third and fourth slots are used in this case, and no extra one has to be cut.

In the first and third slots are the two parts of the long-wave secondary, consisting of 85 turns each. In the fourth slot is the long-wave primary, with 75 turns.

With this coil both the medium-wave primary and medium-wave secondary are wound in single layers on top of the ribs below the slots. The primary is the higher of the two windings, and is started 3/16 in. down from the fourth slot.

Connecting to Terminals.

At a distance of ¼ in. below the end of this winding comes the start of the medium-wave secondary.

These single-layer windings must be put on as tightly as possible, with the adjacent turns pulled closely together. With this coil, as in the case of the grid coil, the connections for the wires are given on the diagram.

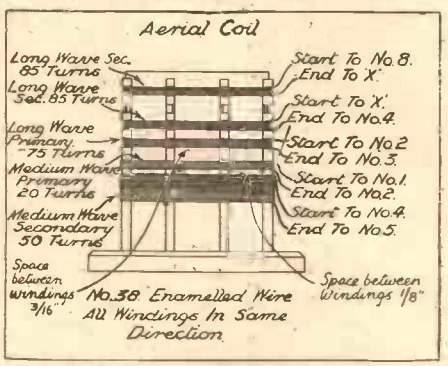
There are eight terminals on each former, but they are not all used. In the case of the grid coil, terminals Nos. 1, 2 and 3 are blanks; and in the case of the aerial coil Nos. 6 and 7.

The connections to the terminals are made under the base of the former, the ends, already inside the former, being cut down to a convenient length. Since the long-wave secondary on both coils and the reaction winding on the grid coil are in two sections, certain connections have to be made which are independent of terminal connections.

Joining the Sections.

In the grid coil the end of the winding in the top slot is joined to the start of the winding in the third slot. These two points are marked "To X" in the diagram, "X" representing the actual join in the two leads. This join is made inside the former by cutting short these two leads and twisting them securely together. The twist should then be soldered. If you wish to do without soldering use a small nut and bolt and two washers, but be careful the wire is not broken where it comes through the former.

FOR INPUT TUNING



Showing the windings on the aerial coil. Note that the second slot from the top of the former is left blank.

The two points "To Y" on the grid coil should be similarly joined, and also the two "X" points on the aerial coil. Your coils are now quite ready for wiring into the set.

Putting Them in Circuit.

The method of connecting the coils into other circuits can be ascertained from the circuit diagram of the "Caledonian" Three. First of all, the aerial coil: 1 would go to aerial, 2 to wavechange switch, 3 to earth, 4 to wavechange switch, 5 to grid and 8 to earth.

The connections will not always go direct to the points mentioned, but sometimes indirectly, as in the case of the "Caledonian" Three. On the grid coil, 4 would go to wavechange switch, 5 to grid, 6 to reaction, 7 to earth and 8 to earth.

Again, the connections will not always go absolutely directly to the points mentioned. For instance, No. 5 will usually go to the grid terminal via the grid condenser.

Finally, a few words about the types of coils you will be making.

The aerial-coil has a tuned secondary, the long-wave section of which is shorted out for medium-wave reception. Coupling to this coil is via a separate aerial winding, which also has a section shorted out when working on medium waves.

The grid coil has a similar tuned winding to the aerial coil, but no coupling coil, the input going direct to the grid end of the winding. This coil also carries the separate reaction winding.

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SE 2118	700	3·0	V/mu steep slope S.G.	14/6
S 2018	400	1·2	S.G.H.F.-Det.	14/6
SE 2018	400	1·4	V/mu S.G.H.F.	10/6
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ECKERSLEY EXPLAINS-

"Certain interferences can be minimised," says our Radio Consultant-in-Chief, and goes on to explain the ways and means available and to describe a special type of lead-in that is particularly effective in this direction.

IT is probably true that the greatest enemy to the extension of listening facility can be described by the all-embracing word "Interference." (Incidentally, the wrong kind of interferences deny us other liberties; the right kind might give us more!)

Interference detracts from the pleasure of listening; the staccato scratch of atmospherics, the paper-tearing noise of man-made static, the thin, headachy pressure of an almost inaudible heterodyne, the monkey chatter of side-band jamming, the crescendo click, click, click of an approaching tram or trolley bus are all too well known to need further graphic description.

Preventive Methods.

But certain interferences can be minimised.

Look at it this way. Look at Fig. 1, anyhow. I have drawn, diagrammatically, an aerial and a set. I have shown, as dark sort of explosions, a diagrammatic representation of three possible different locations of sources of interferences. "A" is a very local interference (an electric fan in the same room as the set, say), "B" a source of interference very near the aerial (a neon sign or a tramway conductor near the outside aerial, say), and "C" something which comes via ether (atmospherics, distant-station interference, etc.).

Now, there are two distinct ways of minimising these interferences, as either (1) we may kill some of them at their source, or (2) we may try to prevent the set picking them up and yet still allow the set to pick up the wanted programmes. This article deals only with (2) above.

Moving the Aerial.

Suppose we shield the set *completely*; then we should expect a diminution of noise from interference "A." But the aerial down lead will probably pick up some residual noise. So suppose we shield the down lead! Then we shall not pick up any noise from "A." So "A" noise is prevented by shielding both set and down lead. But the top hamper picks up the signal. We shall deal with how to shield the down lead and yet get good wanted station signals directly.

We obviously cannot shield all the aerial and yet pick up the wanted stations signals. But suppose we move the aerial well away from "B"; we shall then get rid of all "local" interference from "B." So, if we could think not only of a shielded but also very long down lead or lead-in for the aerial, so that the top hamper could be located hundreds of feet away from "B," we eliminate all interference from "B."

In any way, it is obviously impossible to deal with "C."

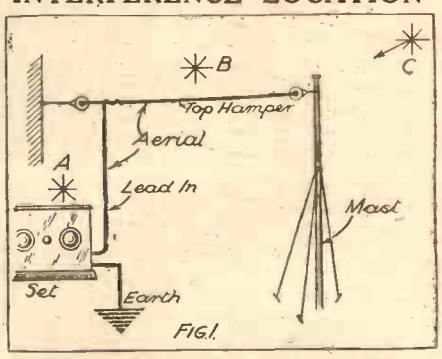
Problems of Long Down Lead.

We come, then, to the conclusion that local interference can be of two kinds: (a) local to set and down lead, (b) local to aerial. Both can be eliminated or minimised by using a long and shielded down lead and a shielded set, and by a proper placing of the top hamper of the aerial away from interference.

But it is rather difficult to conceive the carrying of the very high-frequency currents of radio signals through, say, a long lead-sheathed cable. It may be difficult to see how to do it, but directly you see how to do it it's easy to see how to, but not so easy to do it!

It is all a question of matching impedances If you have to transmit high-frequency currents through a high-capacity system you have to realise that such a system presents a very low impedance. But a valve, of several thousands of ohms, works into the very low-moving coil speaker. Transformers on public-supply mains look

INTERFERENCE LOCATION



Interference can come from different locations. "A," near the set, may be an electric fan; "B," near the aerial, some neon sign or tramway-conductor; and "C" a source of interference that comes from a distance via the ether.

into a load of one-tenth of an ohm. Provided you "match" properly, then 10,000,000-ohm impedance circuits may "look into" $\frac{1}{10,000,000}$ ohm circuits.

Shielded Aerial Conductors.

Thus your aerial which picks up—the upper part—can, in theory, be connected, through a "matching circuit," to feed efficiently into a lead-covered or shielded conductor, and this shielded conductor will carry the currents efficiently to the set where another matching circuit makes a happy union between the (low) impedance cable and the (high) impedance input circuits of the set.

So you *can* have a very long and entirely shielded down lead, and so you *can* eliminate or minimise interferences of "A" and "B" types in Fig. 1. This is so always provided you *can* design the proper matching circuits between aerial and shielded lead and shielded lead and set, and provided the set, too, is completely shielded.

A Job for Engineers.

It is not, however, so easy to design these matching circuits. Rather clever engineers are required to do this. They have before them as an equivalent research the design of the Franklin short-wave aerials, where *very*, VERY high frequencies are taken in shielded cables over hundreds and hundreds of yards from transmitters to aerials.

This year Messrs. Kolster-Brandes have adopted just this system of long and shielded down-lead, and are in a position to claim that their set does, in certain cases, eliminate, in other cases minimise, man-made static or local interferences.

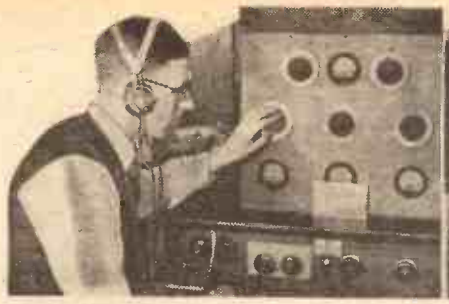
We were shown, the other day at Grosvenor House, after we'd been well entertained at lunch, some dramatic and convincing demonstrations of the efficiency of their device.

Convincing Practical Demonstration.

Thus we were able to compare old and new techniques. The aerial top hamper of the new-type aerial was placed 400 ft. above us on the roof of the building. The lead-in was shielded. In the room itself were fans, neon signs, electro-medical apparatus and what-not. (Grosvenor House is full of lifts and electrical machinery of all kinds.) With the new technique it was possible, even though fans and flashing signs, spark coils and the rest were doing their darndest, to get clear reception of foreign stations, whereas the air was hideous with awful sounds when the old-type sets were sensitised with old-type aerials.

I liked particularly the way in which Mr. Wilding Cole, the managing director of Kolster-Brandes, introduced his subject. He did not claim the complete elimination either of all man-made statics or of any

(*Continued on page* 844.)



ON FIVE METRES

By W.L.S.

A review of some very interesting ultra-short-wave experiments carried out by our popular contributor whilst on holiday in Yorkshire.

JUST after I mentioned that I should be doing some 5-metre work on my holiday this year a regular correspondent of mine wrote and inquired why I always seemed to take "busman's holidays" instead of forgetting all about radio and being content with "having a jolly time."

I have often wondered myself! But I have come to the conclusion that a radio enthusiast *can't* take a busman's holiday. The reason is simply that any form of radio work carried out a few score miles from home is so completely *different* and so full of new interest that it comes as a complete change.

A Brand-New Transmitter.

Thus it was entirely without regrets that I set off in the direction of Yorkshire with half a car-load of five-metre gear. This consisted of a brand-new transmitter and modulator (seen in the photographs illustrating this page) and the old and trusty receiver which I have not succeeded in improving yet.

As the journey was entirely devoid of radio interest it is sufficient to say that we arrived. Having recovered from the effects of sitting still for six hours or so, we lost no time in interviewing the "base station" (G 6 OO), operated by Mr. T. Woodcock, at Bridlington. G 6 OO is situated not many feet above sea level, and Bridlington is fairly well enclosed by hills: not a very promising outlook.

My own transmitter and receiver were unearthed from the rest of the luggage and rigged up in the back seat of the car, with an aerial consisting of a quarter-wave (about 4 ft.) poking horizontally out of each rear window. Five minutes after the batteries were connected up we were sailing along the main road to Hornsea, in reliable two-way communication with the "home" station.

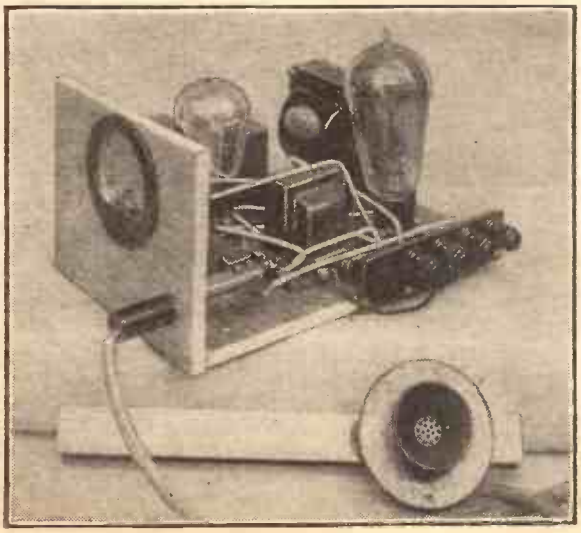
The strength of signals at a few miles showed us that this aerial was not all that it might be. Accordingly a bamboo pole was found and mounted vertically at the rear of the car. A half-wave aerial (about 8 ft. long) was then draped down from the top of this; the sunshine roof was opened slightly; and a sort of "sideways-V" aerial arranged. This worked much better.

Power from Batteries.

The portable transmitter, by the way, derived its power from three 60-volt dry batteries and a 6-volt accumulator for L.T. supply. The drain on the latter was about 2 amps. and on the dry batteries about 40 milliamps most of which was consumed by the modulator. The actual input to the push-pull oscillator was never more than about 3 watts.

VERY SIMPLE

The transmitter is shown to the right, the glow lamp, which is wired permanently in the aerial coil, serving to indicate when the circuit is in tune. Below is the modulator unit: The microphone is wired to a plug which automatically switches the valves off when withdrawn from its socket.



Before I deal in detail with the tests carried out a more detailed description of the kind of gear used will probably be of interest. My own transmitter, as will be seen, was equipped with a single turn of bare copper wire for an "anode coil." Two old 6-volt power valves were used as oscillators, and this turn, of about 7-in. diameter, was simply connected from one anode to the other and tuned by a neutralising condenser.

The H.T. supply was tapped on to the centre of this turn through an "H.F. choke" consisting of a kind of small spring of No. 18 wire—simply wound on a pencil for about twelve turns and allowed to spring off.

The grid coil—from one grid to the other—was somewhat similar to this choke, except that it had only eight turns. This, again, was centre-tapped, the centre connection going through the grid leak (30,000 ohms) and an H.F. choke to the filament.

Another single-turn coil of the same diameter as the anode coil served for aerial coupling.

The whole affair was modulated by the choke-control system, using a valve of the L.S.5 A class, which, in turn, was fed by a transformer-coupled stage into which the microphone was plugged.

The "Home" Station.

Readers who are not familiar with transmitting circuits need not bother themselves here about the principles of modulation. Those who are will see at once that the whole thing was just about as straightforward as it could possibly be.

"Tone," or interrupted C.W., was also arranged for by making the speech amplifier oscillate.

The "home" transmitter used the same circuit arrangement, but, being fixed, was fed from the A.C. mains.

The receivers were somewhat similar. My own, in the car, used an aerial consisting of only a few feet of wire stretched along the roof, with the option of an additional length of flex when stops were made.

In a further article I hope to give details of some of the more interesting tests that we carried out.

AN OLYMPIAN CRITIQUE

Britain's National Radio Show at Olympia generally affords not only a great spectacle, but a unique synopsis of radio progress. And this year's Show has proved of outstanding interest, as is shown by this very intriguing account of its main features.

BY A SPECIAL CORRESPONDENT.

THIS year I approached Olympia from the west, so that there were fewer indications that I was drawing near to the world's greatest Radio Show than one encounters when one arrives from the east. Therefore, subconsciously, I expected less, for there weren't those great overhanging road advertisements and hoarding displays to prepare the mind for big things to come.

And so it was that the vast Exhibition burst upon me in the nature of a bombshell. Addison Road was quiet—almost deserted for a main thoroughfare; there were not many people to be seen outside the building. Everything pointed to a disappointingly attended show.

Vividly Painted Picture.

"Still, it's only the afternoon," I said to myself. "When the evening comes——"

Even the big vestibule seemed to be empty except for a few attendants. But through the plated-glass panels on the huge doors one could glimpse another world: colours, lights, an immense number of people. It was like looking at a vividly painted picture of just what an Exhibition ought to be.

I passed through the turnstiles and then entered the Grand Hall. What a sight! An enormous bazaar humming with life. Above, great neon lights spiralling into chandeliers; at the far end a noble staircase, from which sprang large archings of illumination, surrounding a big, colourful representation of the coat of arms of the R.M.A.—"terrestrial globe proper," "eight stars of eight points of the third," wings, thunderbolt and wreath.

Yes, a most impressive sight—though, to see the Grand Hall at its best, one has to go up to the gallery. There, leaning over the rails, one can view practically the whole of the Exhibition.

It is an unforgettable experience, and, year after year, I have always made a point of going straight to it.

It gives one the full "Exhibition atmosphere." Others start their stand-by-stand inspection the moment they arrive.

Favourable First Impressions.

I could see them doing it this year. The big swing doors open: in flows a cluster of visitors. With one accord they swoop down on the nearest stand.

Well, everyone to his taste. I prefer to take the first opportunity of obtaining as big a perspective of the whole show as is possible.

My first impressions of the Exhibition, gained as I leant over the gallery rail, were wholly favourable.

There seemed to be thousands more visitors than there were at the same time last year, and, subsequently, the official figures of attendance confirmed that this was so.

The arrangement and decoration of the stands were better than ever. The colour-scheme appeared to be brighter and there was less uniformity.

Previously I have had occasion to criticise the rigid standardisation of decoration schemes at Olympia, but this year no such criticism could be made.

The lighting was exceptionally skilful. The main illumination did not in any way detract from the individual lighting of the stands.

These showed up clearly as brightly, even gaily lighted, entities, and did not melt into a mass of glowing luminescence.

The whole place was filled with music: an incredibly beautiful effect and one to be heard nowhere else. Hundreds of modern loudspeakers (at least one on practically every stand) gave a perfect acoustic distribution to the first-class output of the giant B.B.C. amplifier.

Some High-Lights.

I made my tour of the stands methodically, and I took copious notes on my way round because there was so much that deserved recording. However, I am afraid I shall not be able to interpret the whole of my notes, for there would not be space to accommodate them. Also, of course, there was inevitably a certain amount of duplication. So I shall select the high-lights haphazardly, and I trust none will conclude that because certain things or firms are not mentioned they have been deliberately excluded for any special reason.

The first stand to attract my attention was that of Belling-Lee. The central object of interest was a cathode-ray apparatus which showed exactly the acoustic wave of the Belling-Lee pick-up. A fascinating and instructive exhibit. On a glass screen could be seen a faintly trembling but very clear and bright wavy line. This illustrated perfectly the fine characteristics of the pick-up.

Close by Ever Ready were showing their radio horse; you have probably seen it in photographs. It was the representation of a spirited charger carried out with wireless parts. A rather weird robot effect.

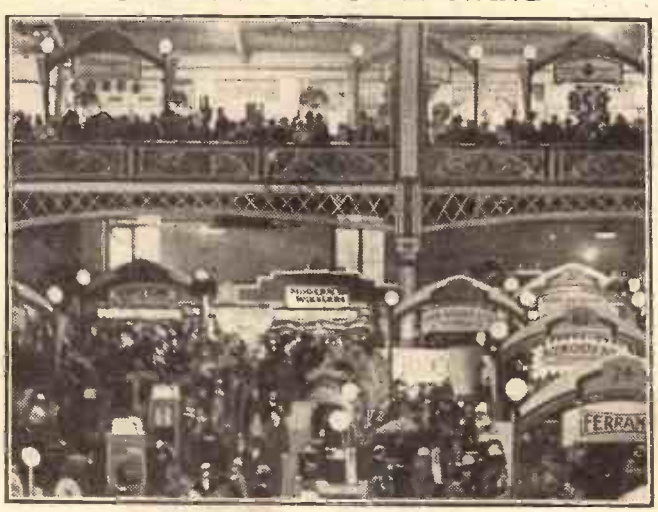
Passing on, I encountered R.I., and was particularly attracted by their magnificent superheterodyne set. It is replete with modern refinements, as you have read in previous issues of "P.W." The modernistic front is embellished with a simple design conveying the impression of a musical note, with the "dot" formed by the loudspeaker fret

Skilfully Placed.

Curiously enough, the first thing I noted at the Columbia stand was something that was not radio—and that was a dictaphone. It lent a distinctly businesslike air to the display. This, the Columbia stand, was one of the best-lighted stands at the show, for it was a mass of skilfully placed neon lights.

(*Continued on page* 832.)

THE SHOW IN FULL SWING



Under the normal lighting conditions in the evening, when the Exhibition was in full swing, this picture was snapped by a "P.W." photographer, using a hyper-sensitive panchromatic plate, to give an idea of the well-distributed lighting effects.

PETO-SCOTT

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Specified Valves £1/11/3.
Specified Peto-Scott Universal Cabinet 16/6.

These are the Parts the Author Used

		s.	d.
1	**PETO-SCOTT** ebonite panel, 16" × 7", ready drilled	5	0
1	**PETO-SCOTT** "METAPLEX" baseboard, 16" × 10"	1	9
2	**GRAHAM FARISH** "ZELOS" ·0005-mfd. tuning condensers	10	0
2	**IGRANIC** 2296/24 Indigraph vernier dials	10	0
1	**J.B.** No. 1080 ·0003-mfd. diff. condenser, reaction	4	6
1	**TELSEN** ·0003-mfd. max. pre-set condenser	1	3
3	**T.C.C.** tubular 1-mfd. fixed condensers	4	0
1	**DUBILIER** 610 ·01-mfd. fixed condenser	3	0
1	**LISSEN** ·0003-mfd. fixed condenser		6
1	**DUBILIER** type 620 ·0001-mfd. fixed condenser	1	3
1	**LEWCOS** 50,000-ohm volume control and 3-pt. on-off switch	6	0
1	**LISSEN** 2-megohm grid leak, wire ends	1	0
3	**GRAHAM FARISH** "OHMITE" resistances with horizontal holders:—(1) 100,000-ohm and (2) 1,500-ohm	6	0
1	**IGRANIC** 2265/3 H.F. choke	3	9
1	**R.I.** Quad Astatic H.F. choke	3	6
1	**LISSEN** L.N.5071 3-pt. on-off switch	1	0
1	**LISSEN** L.N.5070 2-pt. on-off switch		10
3	**W.B.** 4-pin valve holders	1	6
1	**TELSEN** Audioformer compensating L.F. transformer	11	6
1	**BELLING-LEE** wander fuse	1	0
2	**PETO-SCOTT** terminal strips, 2½" × 1½"		6
4	**BELLING-LEE** type "R" terminals		10
2	**CLIX** accumulator tags		4
6	**BELLING-LEE** wander plugs	1	0
1	**RADIOPHONE** "Pullback" 10-ft. length insulated wire		6
1	**PETO-SCOTT** vertical screen, 10" × 6", (undrilled)	2	0
1	**BELLING-LEE** anode connector		4
2	**BRITISH RADIOGRAM** type 12 coil formers with terminals and soldering tags	3	0
3	ozs. 38-gauge enamelled wire, flex, screws, etc.	2	8
	KIT "A," CASH OR C.O.D.	£4	8 6

Any item supplied separately. If value over 10/- sent Cash or C.O.D. Carriage Paid.

Exact to Specification

PILOT "CLASS B" CONVERSION KIT

Converts your present Battery Set to "Class B" Amplification. Complete with all necessary components, including driver transformer, "Class B" output choke, W.B. 7-pin valve holder, B.V.A. 240B 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 and other Parts unobtainable from your local dealer SENT C.O.D. We have the largest stocks in the country. Orders over 10/- sent Post Paid. (Easy Terms available on orders over £2/0/0). Quotations by return. No obligation — Send 5/- only

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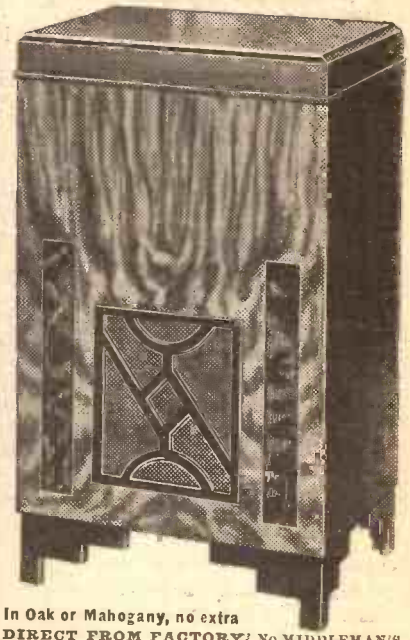
BUILD YOUR NEW SET into the INLAID WALNUT ADAPTAGRAM

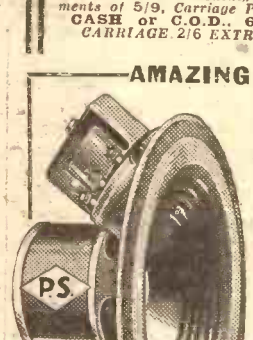


In Oak or Mahogany, no extra

DIRECT FROM FACTORY! No MIDDLEMAN'S PROFITS. Built by master craftsmen of the piano trade. Real inlaid walnut, mortised, tenoned, french-polished. **With screened motor-board by the new METAPLEX PROCESS.** Front ready drilled to take your set. Ample room for Speaker and batteries. Size 38" high, 22" wide, 15½" deep. Baseboard depth, 14". Speaker compartment, 17"—19"—14". Plain front or vignetted for panels up to 18"—8". Baffleboard 3/6 extra. *Balance in 11 monthly payments of 5/9, Carriage Paid.* **CASH or C.O.D., 63/-.** *CARRIAGE 2/6 EXTRA.*

YOURS FOR **8/3**

AMAZING OFFER



PETO-SCOTT PERMANENT MAGNET Moving Coil SPEAKER

15/-

Cash or C.O.D. Carr. Paid

Exquisite tone; sensitive to every sound inflection. Moulded diaphragm. Cobalt magnet. Tapped input transformer for Power or Pentode.

Also Mains Models for A.C. (2,500 ohms) or D.C. Mains (5,000 ohms). Cash or C.O.D. 15/-

Immediate Delivery.

All Models in Walnut polished Cabinet. Cash or C.O.D. 2/5/-

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STRICT PRIVACY GUARANTEED — WE DEAL WITH YOU DIRECT

AN OLYMPIAN CRITIQUE

(*Continued from page* 830.)

Pride of place in the Westinghouse show was given to a large model of the famous Westector "cold valve." Here also were to be seen some fine battery-charging outfits suitable for all grades of charging stations.

The display of Epoch loudspeakers had a striking background of a number of big stars, fashioned from brilliants and connected by small light points, which twinkled on and off just like real stars in a clear autumn sky.

Novel Presentation.

Novelty of presentation was certainly to be found on the Dubilier stand. All the well-known Dubilier resistances and condensers were there by the hundred, neatly strung out in rows. The thought occurred to me that without duplication it would not have been easy to have created much of an effect with such small components, though, as a matter of fact, Dubilier had so much apparatus to exhibit that that constituted no real problem to them. Indeed, it was a matter of some surprise to discover what a large number of different fixed condensers they manufacture, both for radio and other purposes.

The Ekco display was modern throughout. The stand itself, with its chromium plating and neon lighting, was right up to the minute, as well it might be in view of the sets it carried. These new Ekco receivers are the very last word in modern radio. And their prices!

I think the palm for sheer effectiveness must be given to Mullard. Theirs was not a stand at all in the ordinary sense, but a perfect model of a mediæval castle. All round the ramparts were valves standing almost shoulder to shoulder, and behind them continuously marched a line of bayoneted soldiers. Lighted signs urged passers-by to "Join the better radio brigade."

Sectional Models of Valves.

An extremely effective idea, perfectly presented. Supplementing this were huge sectional models of various of the Mullard valves, showing exactly how they are built up.

I had to spend quite a while examining the new Lissen car set. This is an extremely fine piece of work, and I am sorry for the constructor who overlooked it.

Lissen valves were admirably advertised by means of coloured lights, exactly the shape of Lissen valves. This is, as far as I know, a quite new scheme.

Great interest was occasioned at the Lissen stand by the young ladies busily at work assembling Lissen home-constructor kit sets. I wondered what happened with the assembled sets, for the job was apparently so easy and so quickly done that during the run of the show hundreds of them must have been assembled. Or was each day's collection dismantled in the dead of night, all ready for the young ladies to reassemble the next day?

Many visitors lingered for long periods at the Marconiphone stand because of the admirably displayed, large and very clearly drawn diagrams that were posted around it. These diagrams illustrated the circuits of the various Marconiphone sets, and the interest aroused by thus boldly proclaiming the secrets of these sets' "innards" was quite noticeable.

Another feature of the Marconiphone stand was a huge searchlight-shaped instrument representing the receiver of 1960. Tuning is merely a matter of asking for a station by name, and a bulb is automatically illuminated when the station is tuned in.

Predicting the receiver of the future is not easy, but this Marconiphone exhibit certainly starts one on an interesting train of thought. In view of the rapid advances we have seen in radio during the last few years, it does not seem to be stretching imagination too far to assume the spoken word will eventually relieve us of the bother of tuning.

H.M.V. had the most interesting exhibit in the whole of the show. At least, that is my opinion. But it wasn't a radio set, accessory or component. It was a bar of gold weighing 18lb. and valued at just under two thousand pounds. It was guarded by a stalwart individual who was obviously a policeman, or had been one.

Two thousand pounds, and yet it was only a few inches in length! It did not even seem possible that it could weigh 18 lb., though gold is one of the heaviest of all metals. No, I don't wonder that prospectors will face the most terrible hardships in search of gold. It is a terrifyingly fascinating metal. People were standing round that H.M.V. ingot just looking—and looking—and——

A Touch of Genius.

There was also a chunk of silver, but they didn't look so long at that!

The purpose of these lumps of valuable metal was to illustrate the expense and care undergone in the manufacture of H.M.V. sets. Apparently both gold and silver are used in large quantities. But you don't get a large quantity in any one individual set!

There was a touch of genius about that bar-of-gold idea. I can still see it in my mind's eye—it successfully reminds me of H.M.V.! Almost equally clever was the provision of a number of ordinary telephone receivers, each bearing a printed plea for the visitor to pick it up and listen.

When I arrived no one was accepting the invitation—they must have thought there was a catch in it! However, I was there to find out all that was going on, so I picked up one of these 'phones without hesitation and heard some skilful sales talk about H.M.V. sets. After listening awhile to this interesting, cultured voice I put the 'phone down and, looking round me, noted that my example had had the effect of getting all the other 'phones engaged!

Photographs that Faded.

A third feature was the backgrounds of large photos showing various scenes in the H.M.V. factories, and so on. I was told later that these photos had all started to fade just before the show opened because of some interaction with the non-inflammable material on which they had had to be pasted.

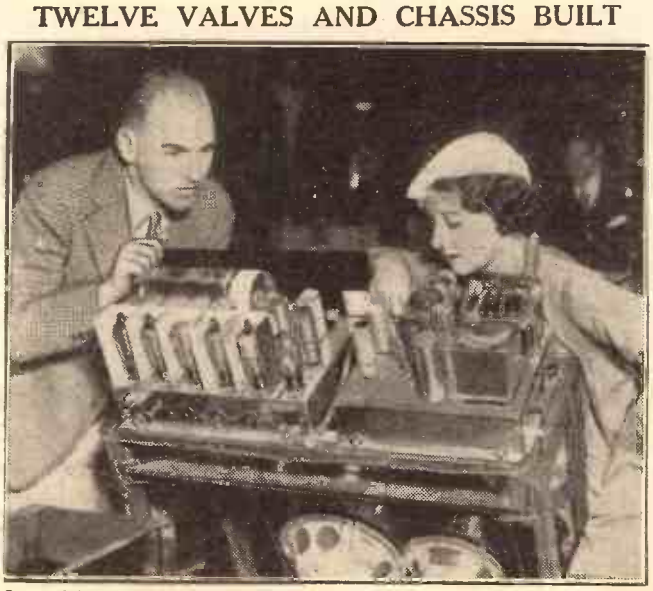
London was scoured for a famous photographic expert, and at length he was located in a cinema. Whereupon he was torn away from his entertainment and hurried

(*Continued on page* 834.)

STRAIGHT-LINE RESULTS

As usual, some of the attractions were not too technical to mee with the hearty approval of all who saw them.

TWELVE VALVES AND CHASSIS BUILT



Some of the multi-valvers were a revelation this year, and this radiogram is a typically interesting one with no less than twelve valves.

AN OLYMPIAN CRITIQUE

(*Continued from page* 832.)

to his laboratory to study the problem of these fading H.M.V. photos.

He at last discovered that an alkali in the backing material had caused it, and so he prepared an acid solution to neutralise the alkali and bring back the pictures. And this did the trick, and the pictures were restored just in time for the opening of the Exhibition.

The Edison Swan Electric Co. had an appropriately dignified display in which I saw with appreciation that the Ediswan cathode-ray tube, as used in the "P.W." televsion viewer, was prominently placed. The B.T-H. pick-ups and R.K. reproducers, and Ediswan batteries and accumulators, and the very comprehensive range of Mazda valves were to be seen in full strength. By the way, what excellent mains types those Mazdas include! It was with something akin to affection that I regarded the famous A.C./Pen., for I had one of the first to be made, and it is still giving excellent service.

Permeability Tuning.

POPULAR WIRELESS was represented on the Varley stand, too, for here could be seen a model of the Varley permeability tuner such as was used in the world's very first permeability tuning set. This in turn was to be seen on our own stand, but of that more anon.

The Telsen exhibits formed an exhibition in themselves. I did not realise that so many and so varied a range of radio components and sets were made by this famous Midland firm, mighty though I knew its output to be. But there must have been at least five hundred different items shown in neatly arranged glass cases. The design and manufacturing detail behind such an achievement is staggering to contemplate.

There were many people around the Telsen stand admiring the polished finish of the multitude of inexpensive but high-class components. And there, too, on the stand itself was the managing director, Mr. Macnamara, enthusiastically engaged in conversation with one of his visitors, who may have realised, but probably did not, that he was speaking to the human dynamo that initiated and is still the life force of the firm that has made home-constructor history.

Some fine valve models were on show at the Cossor stand: huge facsimiles of the more important members of the great Cossor family. I was specially interested in these, because only a week or two before I had had the privilege of visiting the enormous Cossor factory at Highbury and seeing Cossor valves actually being made. An unforgettable experience.

Cossors also had exhibition models of their famous Cossor Melody Maker sets in glass cases. Melody Maker! What a name! Was it the sets which made the name famous or the name which made, and is still making, the sets famous? Of course, the name trips off the tongue so smoothly simply because of the years of great success achieved by Cossor Melody Maker sets. I don't suppose the name sounded so wonderful to many when it was first coined!

The various Ormond components were shown to great advantage by being mounted on polished panels. An obvious sort of thing to do, you might say. But so many things seem obvious—after someone else has thought of them!

Osram prominently displayed Catkin valves, and these all-metal types created no small attention. There was one huge Catkin arranged as a cannon shooting at the world and, presumably, studding it with Catkins!

At T.C.C. a particularly interesting demonstration was being given. The object of this was to prove convincingly that wet electrolytic condensers are quite unharmed by overloads. I consider that this was a very valuable propaganda demonstration, for the idea is widely held that if you pass too much current through an electrolytic it is bound to be ruined.

Demonstration of Electrolytics.

But here you were clearly shown that, in so far as T.C.C. wet electrolytics, at any rate, were concerned, overloads breaking down the dielectric film were quickly followed by a "healing" action that fully restored the health of the component. And this quite automatically into the bargain.

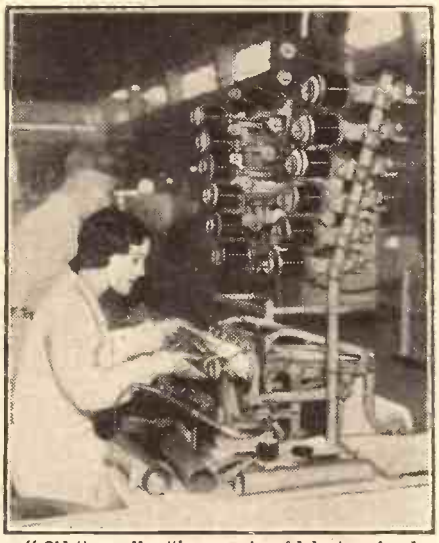
I was glad to note that at last Blue Spot have completed their extremely fine range of moving-coil loudspeakers by the inclusion of mains-energised types. There is a growing demand for this type, owing to

(*Continued on page* 836.)

TOLD BY A TELEPHONE

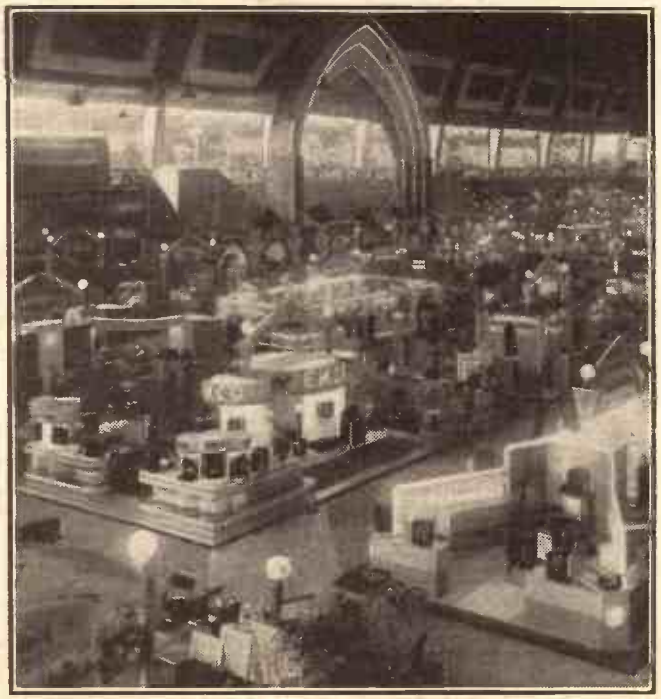
One interesting innovation this year was an H.M.V. record which talked to would-be customers if the salesman was engaged when they called at the stand.

HOW COILS ARE MADE



"Old-timers," with memories of laborious hand winding, were specially interested in the automatic coil-winding apparatus.

IN THE MAIN HALL



A general view, showing one of the great arches that featured in this year's decoration, and giving a good idea of the varied arrangements of the stands.

TELSEN

ELECTROLYTIC PAPER AND MICA

CONDENSERS

TELSEN MICA CONDENSERS

Adaptable to flat and vertical mounting. H.F. losses, even in the larger sizes, have been virtually eliminated. Grid leak clips supplied free with the smaller capacities. *In capacities of from ·0001 mfd. to ·001 mfd.* ·002 - 1/- ·006 - 1/3 **6D.**

TELSEN TAG CONDENSERS

At reduced prices

Of compact and sturdy construction. May be mounted on either insulated or metal panels. Tags enable the condensers to be connected to any other components, either directly or by soldering. H.F. losses are negligible. *In capacities of ·0001 mfd. to ·001 mfd. ·002 mfd.* 6d. **4½D.**

TELSEN PRE-SET CONDENSERS

At reduced prices

Give widest variation between maximum and minimum capacities, and exceptional range of selectivity adjustment when used in the aerial circuit. High insulation with low loss. In mfd. capacities of from ·0001 to ·002 1/3

TELSEN RESISTORS WITH WIRED ENDS

Very small and light, and easily suspended in the wiring of a receiver. Supplied in the following values:—Power rating of ½ and 1 watt: 250, 500, 1,000, 1,250, 5,000, 10,000, 20,000, 25,000, 50,000, 100,000 250,000, 500,000 ohms resistance. Price 1/-

Power rating of 2 watts: 250, 500, 1,000, 1,250, 5,000, 10,000, 20,000, 25,000, 50,000, 100,000 ohms resistance. Price 2/-

TELSEN HIGH VOLTAGE ELECTROLYTIC CONDENSERS

An outstanding achievement in condenser design.

Excellent for use in smoothing circuits and other positions in which high voltage high capacity condensers are required. The special bracket and terminal supplied with the condenser enables it to be mounted on any type of baseboard or chassis.

Cap.	275 working peak voltage	500 working peak voltage
4 mfd.	3/6	4/6
6 ,,	3/9	5/-
8 ,,	4/-	5/6

TELSEN LOW VOLTAGE ELECTROLYTIC CONDENSERS

Ideal where a very high capacity with a fairly low voltage is required, as in automatic bias circuits for L.F. valves. Very compact, with wired ends for easy suspension in the wiring.

25 mfd. at 25 volts	2/6
50 ,, *at 25* ,,	3/-
25 ,, *at 50* ,,	3/-

TELSEN SMALL TUBULAR CONDENSERS

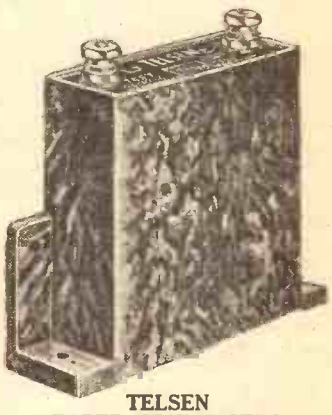
Very small yet highly efficient, with wired ends for easy suspension in the wiring.

Cap.	Price	*Cap.*	Price
·0001 mfd.	1/-	*·002 mfd.*	1/-
·0002 ,,	1/-	*·005* ,,	1/-
·0003 ,,	1/-	*·006* ,,	1/-
·0005 ,,	1/-	*·01* ,,	1/3
·001 ,,	1/-	*·1* ,,	1/6

TELSEN PAPER CONDENSERS

At reduced prices

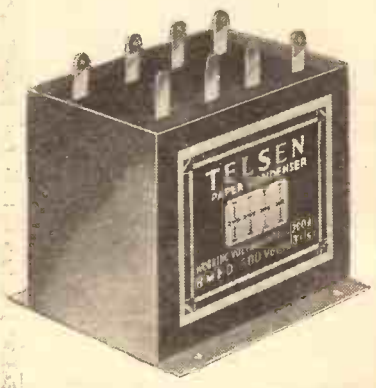
Represent a very definite advance in current condenser practice. Only the highest quality foil paper and the finest linen tissue are employed, each individual plate being self-sealing and the case itself being finally triple-sealed with a newly discovered bituminastic compound, for permanent efficiency. Every condenser is subjected to rigorous tests up to Post Office and Admiralty standards, the exclusive method of construction making them genuinely non-inductive. They give the highest insulation with complete freedom from breakdown—built for lasting efficiency under all conditions.



TELSEN PAPER CONDENSERS

Specially designed for 2-way fixing.

Cap. mfd.	500 Volt Test	1,000 Volt Test
·01	1/3	1/9
·04	1/3	1/9
·1	1/6	2/-
·25	1/6	2/-
·5	1/6	2/-
1	1/9	2/6
2	2/6	3/6



TELSEN PAPER BLOCK CONDENSERS

In metal cases with soldering tags.

Cap. mfd.	500 Volt Test	1,000 Volt Test
4	4/9	6/6
6	7/-	9/6
8	9/6	

TELSEN FOR EVERYTHING IN RADIO

ANNOUNCEMENT OF THE TELSEN ELECTRIC CO., LTD., ASTON, BIRMINGHAM

AN OLYMPIAN CRITIQUE

(*Continued from page* 834.)

a widening use of them in mains outfits. This is because the field winding of such an instrument can be used for other purposes. For example, a common use is as a smoothing choke. And, of course, a high sensitivity and good power-handling qualities can be obtained in inexpensive constructions.

I must not forget to mention one of the outstanding battery displays. I refer to Block batteries, which are notable for their striking advancement of design.

In completing my tour of the ground floor of the Grand Hall I came to the Bulgin stand, but will refrain from introducing the over-used "last-but-not-least" cliché. There you are: it had to creep in!

Anyway, I thought the Bulgin stand was worth spending plenty of time over. It was not a large stand, but it held a large number of extremely interesting items. Mostly of the smaller kinds, these included some fine switches and valuable radio gadgets.

In the Gallery.

The gallery was disappointing. It was mainly occupied by wholesalers, and their stands were apparently for the most part designed for traders rather than members of the public: for they were merely sober collections of sets and accessories of various makes. And, anyway, these were individually on view in a vastly more colourful and forceful manner downstairs.

It is true that the B.B.C. was in the gallery, but after having contributed towards the big theatre they must have got tired, as their gallery show was only the amplifier that supplied music for the loudspeakers on the various stands (and which had to be somewhere, anyhow) and the sectional model of Broadcasting House that appeared last year. I do hope that this now rather dingy-looking model will not develop into a hardy annual and be solemnly carried to Olympia year after year through the centuries!

The G.P.O. Display.

As a complete contrast, the much-maligned Post Office had a really marvellous display in the National Hall. I take off my hat with the greatest respect and admiration to them. Don't let me hear anyone say anything about the Post Office being red-tapish, stiff, starchy or anything else like that. Whatever their sins, they must all be forgiven them for their truly wonderful contribution to Radiolympia.

Without the slightest exaggeration I say that the Post Office exhibit alone was worth the visit to Olympia. And did they treat the visiting public offhandedly and with cold formality, as they are traditionally supposed to do? They most decidedly did not. Their hall-within-a-hall was equipped with a plentiful supply of comfortable plush seats for the free use of anyone desiring a rest, and there were dozens of pleasant young men eager to explain in detail all the fascinating apparatus on show.

One of them spent about half an hour demonstrating and telling me all about the latest Teleprinter apparatus. He even went to the length of producing pencil and paper and drawing diagrams to explain the various points. And I did not have to ask for this, either; it was all volunteered.

As well as a multitude of modern radio and telegraphic items there were some intriguing historical exhibits, including the very first three-electrode valves to be made by De Forest.

Hearing Heart-Beats.

An item that was attracting considerable attention was the special heart-beat amplifier. By means of this it was possible to hear the sound of one's heart amplified so much that it could be reproduced at great volume on a loudspeaker.

A complete automatic telephone system was also demonstrated and explained, and there was a whole room devoted to electrical interference, with a display of the various things, such as flashing signs and domestic electrical apparatus, which is likely to cause it.

Yes, the Post Office rose to the occasion nobly and deserve all our thanks for taking such pains to arrange such a fine show and for contributing so much obvious enthusiasm to its presentation.

(*Continued on page* 838.)

LOOKING DOWN ON THE GRAND HALL

This general view shows that, despite the orderly arrangement of the stands, a great deal of individual variety was achieved in the presentation of the various displays.

THE RADIO HORSE

A representation of a spirited charger made with wireless parts and exhibited on the Ever Ready stand.

AN OLYMPIAN CRITIQUE

(*Continued from page* 836.)

So far I have said little about our own —the POPULAR WIRELESS—stand. But I have deliberately avoided doing so in the stand-to-stand part of this critique because, as a stand, the "P.W." exhibit has already been adequately described. You will all remember the article entitled "Our Cavalcade of Radio" which appeared in "P.W.'s" first Exhibition number.

At the "P.W." Stand.

You see, the "P.W." stand was the one stand in the whole of the Exhibition we knew all about beforehand, even to the placing of the chairs! As a matter of fact, we had a beautiful little model of it on which every detail was precisely planned.

When I arrived at the "P.W." stand after my tour round the show (I had been there before, but only to leave my hat) I found a big crowd gathered about it. There were two queues lined up, one of visitors anxious to consult our experts about radio problems and the other of visitors waiting their turn to peep into the stereoscopic viewer we had. This contained a number of fine stereoscopic photos showing with great clearness the stages of assembly of one of our sets.

I stopped and listened awhile to some of the questions that our experts were being asked. They were keen, intelligent questions—such questions that are a real pleasure to deal with.

We were able to display a most impressive group of sets, including Britain's first "Class B" set, the world's first permeability set, and, in fact, the first practical expressions of every new development of importance that has occurred this year. And it was plainly obvious that this visible and tangible evidence of "P.W.s'" pre-eminence in the world of radio journalism was creating a considerable impression on all.

General Summing-Up.

And now for a general summing-up of the whole show. This is not going to be at all an easy task this year. Those who have actually been to the Exhibition will be in a position to realise the magnitude of the task.

The only possible way of presenting a proper perspective is to take the show in sections, as it were, for there are more than a few striking impressions that need separate treatment of that kind.

First, then, the appearance of sets. It is logical to deal with that first, because it is by its appearance that a receiver makes that all-important "first impression." Except, of course, when it is switched on, when quality is equally vital. However, we we shall come to that later.

Cabinet Designs.

But every time and always it must be remembered by those who contemplate buying a new set that they will have to live with it. Even when it is not working it will be standing here or there, in this or that room, either as a pleasant object to look at or as an "eyesore."

Not that many of this year's sets qualify for the latter description. All the same, I cannot admire the taste of some of the cabinet designers. Modernism run riot; curious cubism rampant!

Still, these things are so largely a matter of taste, and tastes vary so widely, that I suppose many people will like very much those sets I like least, and vice versa.

And the salient fact remains that, on the whole, Radiolympia revealed that as much attention is now paid to æsthetic considerations of design as to circuital development.

This is, of course, exactly as it should be, for, as I have indicated, a radio set is an item of furnishing in a house.

It would be hard to buy one which would gracefully mould into a Victorian setting, but no difficulty could be experienced in suiting any style encountered in any modern house.

But there seems to be a tendency to maintain that beehive form in many quarters. It's all right, as far as it goes, but the more up-to-date rectangular shaping is, I think, much better.

Sets are smaller this year; I don't think there is the slightest doubt about that. Smaller and neater. Also, as I suppose everyone has noticed, the consolette has proved all-conquering.

I am not altogether convinced that this is desirable. There are many arguments in favour of a speaker separated from the set.

For instance, when this is done either the set or speaker can be replaced independently. It is not a case of all or nothing. Again, the point of sound emission does not remain irrevocably tied up with the point of tuning control.

Separate Speaker Advantages.

Personally, I find it much more convenient and much more conducive to good listening to have my set here, where I can obtain easy access to tuning controls, and my speaker there, where it distributes its sound energy to the greatest advantage in the particular room in which it is working.

And there can be no doubt whatever that some of the sets at Olympia were "under-speakered" owing to the fact that space is limited in some of these highly compacted consolettes.

A little speaker squashed into a restricted space and bounded on all sides by odd bits and pieces of apparatus cannot work to its best advantage. Indeed, let me whisper, some of the sets sounded very pre-1933 for that reason. This, mind you, is my personal opinion, and I am open and willing to be proved wrong.

Of course, the above remarks do not apply at all to very many of the sets that figured at Radiolympia. Some of them—and I say this with all sincerity—are truly superb, and possess output responses of most magnificent qualities.

All the same, there was nothing to discourage the home constructor. Such quality can easily be duplicated in home-built apparatus.

And Radiolympia convincingly proved that.

The Home Constructor.

Every worth-while development was represented by easy-to-use home-constructor parts and accessories. It is evident that the industry, rather than underrate the home-constructor movement, is favouring it by giving it the earliest benefits accruing from commercial-set development.

And this, together with its own inherent advantages, gives it a long lead. Thus its overwhelming attractiveness and the prosperity of those who cater for the man who "rolls his own."

A CENTRE OF FIVE-METRE ATTRACTION

This glimpse of the "Modern Wireless" stand was secured before the crowds arrived, just as the show was about to open, the only way our photographer could obtain an unobscured view. Five-metre enthusiasts quickly seized the opportunity of inspecting the 5-metre receiver and also the home-built transmitter for the same waveband. Another star attraction here was a magnificent all-electric radiogram, the Diodion Plus.

RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos.

Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article.

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

All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

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

QUESTIONS AND ANSWERS

MODIFYING A D.C. H.T. MAINS UNIT TO PREVENT MOTOR-BOATING.

C. K. (Margate).—"I wonder if you can help me by suggesting a means of altering an eliminator which worked O.K. on a simpler set, but which motor-boats on the new one, although there is only the same total current drawn from it by the new set?

"I know it is the eliminator at fault, because both sets work equally well on batteries which I borrowed to test that point.

"The firm which supplied it has gone west, but the wiring is very simple. It contains three big condensers, a tapped resistance and an L.F. choke.

"I don't know the value of the resistance, but the condensers are all marked '2,' which I take to be 2 mfd. The resistance is one continuous winding, but marked in sections A, B and C.

"The present connections are as follows: The two minus terminals (input and output) to one side of each condenser and to one end of section C of the resistance.

"The resistance junction between C and B sections goes to other side of one condenser and to + 1 terminal.

"In the same way the junction point of resistance sections A and B goes to H.T. + 2 terminal and to another condenser.

"The + input terminal is connected to one end of the L.F. choke, and its other end goes to remaining terminal on the other condenser and A section of resistance. That is all.

"I hear that when a potentiometer resistance arrangement of this kind is used it can often be rewired to get over motor-boating troubles, but nobody I have asked can tell me *how*."

It is quite possible to rearrange the same components to give a different circuit, and one which is less liable to cause motor-boating.

But to do this the resistance, at present one continuous winding, must be split into two. Moreover, the voltages obtainable from it under the new conditions will be dependent upon the number of ohms in the various sections, which we do not know.

However, from your description we think it probable that the output voltages will be about right if the following alterations are made:

First cut the A section of the potentiometer away from B, leaving two separate resistances. We will call the original A section "A" and the other one (formerly B and C) we will call "Z."

Now rewire as follows: The two negative terminals (input and output) to the three condensers as before, but *not* to either of the resistances.

Input + to choke, as before; other side of choke to one condenser, as before, and also a new lead

(*Continued on next page.*)

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

connecting this point to one end of "A" and to one end of "Z."

The other end of "A" goes to the H.T. +2 terminal and to one of the "free" condenser terminals, as before.

Finally, the other end of "Z" goes to the H.T. +1 terminal and to the remaining condenser terminal. In all probability you will find this works well, but even if it doesn't you will be no worse off, as you can easily revert to the original arrangement if required.

LOOSE CAP ON AN S.G. VALVE.

W. N. (Chesterfield).—"When replacing the valves I noticed that the connection to the top of the screened grid seemed shaky. Closer investigation showed that the whole top terminal and the cap on which it is fitted were loose, and not secured to the bulb as before. I, naturally, did not expect it to work; but, to my surprise, I found, when switching on, that it was just as good as ever.

"Thinking it very unusual, I mentioned it to a friend at the office, but he tells me that it is nothing out of the ordinary. But neither he or I can see why it does not stop the valve working, if the vacuum inside the bulb is as all-important as is generally supposed."

The vacuum *is* all-important, and the reason that the valve continues to work as before is that the vacuum is unimpaired, although the cap is loose.

Underneath the loose cap the wire connection from top terminal to anode is intact, and it is sealed round by the glass bulb as before. The difference is that its external anchorage has become loose, and little tugs and strains on this may now affect the connecting wire, whereas formerly any such strain was taken by the rigid cap.

If you take care never to pull on the connection in any way it will continue to work as well as ever.

IS IT SHUNT-FED?

R. C. C. (Whitstable).—"I have heard that with an L.F. transformer the reproduction quality is best when the transformer is shunt-fed through a resistance.

"In my own set there is a resistance attached to the transformer's primary (H.T.) terminal, but I am not sure that this is the proper shunt-fed arrangement. This is the complete wiring of the detector plate circuit:

"Anode terminal of valve holder to reaction condenser and to H.F. choke. Other terminal of this choke to A terminal on L.F. transformer.

"H.T. terminal of this transformer goes to one side of the resistance (30,000 ohms) and to one side of a 2-mfd. fixed condenser. (The other side of this condenser goes to earth, and the other side of resistance to H.T. +.)

"The transformer's secondary terminals are connected as usual—G to grid, etc.; but I do not know if this constitutes a shunt-fed arrangement or not, as I thought with that system the primary and secondary are joined together, whereas mine are not.

"But if not shunt-fed, what is the resistance connected to the transformer's H.T. terminal for?"

Your transformer is *not* shunt-fed. The purpose of the resistance, connected as described, is to work in conjunction with the 2-mfd. condenser as a decoupling device.

You will notice that the H.T. current has to pass through the primary of your transformer to get from the anode of the valve to H.T. +. In a shunt-fed arrangement the current is diverted from the primary altogether by a coupling condenser which is in series between the primary and the H.T. supply.

(See the reply to H. H. (Ilford), last week, for further details of this.)

IMPROVING AN INDOOR AERIAL.

J. J. S. (Kirby).—"Being a new house, there is a total lack of trees, shrubs, etc., so I am very loath to put up an aerial pole which will be doubly conspicuous, as the situation is hilly.

"Consequently, more in fear than hope, I tried what could be done with an indoor wire. And oh, what a surprise!

"There are at least twenty different stations I do not know, as well as British, so no unsightly aerial for me. The only thing that I wonder now is whether a better kind of wire, or aerial, in the roof might not be an improvement on this one, which is flex fitted in behind the picture rail, round two sides of the room."

The actual wire used will probably make little, if any, difference to your results, as you appear to be in a good situation where any sufficiently good conductor will provide the necessary input to the set.

DO YOU KNOW—

the Answers to the following Questions?

There is no "catch" in them; they are just interesting points that crop up in discussions on radio topics. If you like to try to answer them, you can compare your own solutions with those that appear on a following page of this number of "P.W."

(1) To what European station—sometimes received in this country—belongs the distinction of using the lowest power?

* * *

(2) At approximately what speed do wireless waves travel from the transmitting to the receiving aerial?

* * *

(3) What is Dublin's wavelength?

But the *rearrangement* of the wire is always well worth trying, because it sometimes makes a big difference.

You might, for instance, try what an extension of the wire to three walls instead of two will do. And if the set is situated in a corner of the room it is sometimes a good plan to run twin wires, one going to two sides of the room and the other to the other two sides, the two wires being brought together at the down lead, where both are connected to the set.

In fact, you should experiment a little, as every indoor aerial needs to be judged on its reception merits, and the only way to find the best for any particular location is to try the various possibilities. It should not be necessary to spoil walls or appearances by running long leads to the roof-space.

WHERE TO GET "P.W." BACK NUMBERS.

"Please say in what number of 'P.W.' you gave the particulars of cathode-ray television. Also where to write for this, and how much?"

The principal cathode-ray television articles appeared in "P.W." Nos. 573, 574, 575, 576, 577 and 578 (May 27th to July 1st inclusive).

Any back number of this journal which is still in print, but is unobtainable locally, can be supplied on application to the publishers. The address is The Amalgamated Press, Ltd., Back Number Department, Bear Alley, Farringdon Street, London, E.C.4. Price 4d. per copy, post free.

A SIMPLE FILTER CIRCUIT FOR D.C. MAINS.

L. S. (Russell Square, W.C.1.).—"Although the quality is good, there is a trace of roughness which it is suggested is due to a certain amount of high frequency brought to the set via the power mains.

"To prevent this I have been advised to use a little home-made filter unit, consisting of a plug-in coil holder, in which to place various coils, and a ·1 mfd. mica condenser. There are also two two-point plugs, one to go to the set and the other to the socket in the skirting board, the coil being wired between one plug's

(Continued on next page.)

"P.W." PANELS. No. 134. MILAN.

As a result of Mussolini's progressive radio policy, Milan possesses a recently built 50-kilowatt station, which operates on a wavelength of 331·5 metres. It is well received in this country.

* * *

Milan is linked with Turin, Genoa and Trieste, and all these names are given by the woman announcer, the English equivalents being: "Milano—Torino—Genova—Tree-estay."

* * *

Quite recently Milan opened an experimental relay station, "Milano Vigentino," which works on the 453·2-metre wavelength on low power.

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from previous page.*)

prong and the other's, whilst the condenser is joined across the set-plug's contacts.

"What I do not understand is that it is supposed to be tried in first one mains lead and then in the other's; but it seems to me that if I reverse the mains plug I put negative on the set instead of positive. Please explain how such a filter can be tried in both positive and negative leads from the mains."

THE ANSWERS

TO THE QUESTIONS GIVEN ON PAGE 841 ARE GIVEN BELOW:

(1) This unenviable distinction belongs to Uddevala, a Swedish relay that operates on 229 metres with a power of '05 kw.

* * *

(2) At the speed of light, approximately 186,000 miles per second.

* * *

(3) The main "Dublin" programme goes out on high power from Athlone on 413 metres. But the old Dublin station has been reopened as a relay, and this now works (on 1·2 kw.) on 217 metres.

DID YOU KNOW THEM ALL?

If you put the mains plug in as at present, and the set plug is correctly placed as regards its negative and positive prongs, you get the condenser bypass across the set's input and the coil in one (say, the negative) lead, where it may or may not act as desired.

Reversing the mains plug alone will, as you say, reverse the polarity, and the set will fail to respond. But if you reverse *both* the plugs in their appropriate sockets at the same time, ignoring the marking for a moment, you have in effect transferred the coil to the opposite mains lead, leaving the condenser still across the set's input. If this gives the desired results, alter the marking and continue to use the plugs in the new position.

GETTING MORE FROM YOUR AERIAL

(*Continued from page* 8 4.)

bare hand or brought through a long run of lead-covered cable without noticeable loss. But let the earth connection or any other point get corroded, and then there is a difference! A thick wire is all to the good. But a series condenser is fatal. A parallel or leakage loss is relatively unimportant, but series resistances must be avoided.

A high-impedance aerial—the indoor variety is typical (see Fig. 2)—is quite different. It is like a high-pressure water supply, in which there is so little water that the slightest leak runs away with the power, but there is plenty of pressure to squeeze it through a narrow pipe.

Good Insulation Needed.

The insulation must be first-class, to prevent electrical "leakage," and there must be no long lead-in to cause capacity loss. But there is no sense in going to some trouble to use heavy stranded wire when all the turns of quite thin wire in the tuning coil have to be traversed.

Likewise the obstacle of a series condenser is taken in its stride. And a high-resistance earth connection, or even no earth at all, does not cut down reception nearly so badly as with a "tapped coil" aerial system, though, of course, there is no point in unnecessarily adding to resistance losses.

MIRROR OF THE B.B.C.

(*Continued from page* 822.)

A Panel of Organists.

In view of the difficulty of maintaining an adequate standard of performance among outside organists, the B.B.C. has decided to form a panel of three contract organists who will work from year to year. This will consist of Thalben Ball, C. H. Trevor and Berkeley Mason. Of course, this will not rule out the possibility of occasional performances by distinguished guest organists.

The B.B.C and Scotland.

It is possible now to indicate something of what the new regime of the B.B.C. will mean to Scotland. The Rev. Melville Dinwiddie, the new Regional Director, has sought guidance and has got it. Scottish broadcasting will be diverted from the paths prepared for it by the bright young men: it will assume a new cast of high seriousness and purposefulness.

This will extend its popularity in the orthodox circles, but it remains to be seen whether the younger element, and particularly the Nationalists, will continue their influence and support. Perhaps they will feel that they still have some stake in the service because of the retention of Mr. Murray MacLaren as the programme official in Edinburgh.

THE EDISON SWAN ELECTRIC COMPANY, LIMITED

In our issue of August 19th, Mr. W. W. Burnham of The Edison Swan Electric Company, Limited, was erroneously referred to as Chairman and Managing Director.

Mr. C. F. Spencer is Chairman, and Mr. P. Kelly is Managing Director of this Company.

THE LINK BETWEEN

(*Continued from page* 820.)

in the interest of readers and to satisfy my own curiosity, it was desirable that I should be among the first to experience the joys of listening while driving.

I had hoped to be able to pass on some first-hand information, and, as a matter of fact, in that respect the fulfilment of my ambition brought to light several interesting facts. But, alas! one often has to pay for experience. I did.

The outfit with which my tests were conducted was home made, and as it was purely experimental no particular attention was paid to the way in which it was fitted to the car.

I must do it justice and say that it worked remarkably well—so well, in fact, that on the second day out my attention was so distracted by a particularly interesting announcement that I overran a signal, and on the very next day the speaker, which was also a temporary fixture to the roof of the car, fell off and hit me on the head.

All the same, the genuine joys of car radio are manifold, and if you instal one of the specially designed sets, such as the new Lissen Auto-Radio, it does add tremendously to the enjoyment of motoring.

As a matter of interest, the new Lissen Auto Outfit is one of the best I have seen so far. The control block clamps on to the steering column, and the actual set can be tucked right out of view. It is operated by bowden cables.

From my own tests I am convinced that there is a tremendous future for car radio providing it is used in the proper place. To my way of thinking, it is a very dangerous procedure to attempt to use it in towns, for when the radio is on inside the car it is almost impossible to hear the warning signals of other cars at corners and cross roads.

The toll of the road is already far too heavy to incur any further risks. In all respects but that one I am completely in favour of it.

* * *

AN "A.A." OF RADIO.

One thing leads to another. From cars my thoughts swivelled round to the A.A., and, by the same process of mental correlation, to a little instrument the purpose of which is to help radio people that encounter trouble.

(*Continued on next page.*)

THE LINK BETWEEN

(Continued from previous page.)

The Pifco "All-in-One" Radiometer gives an instant and reliable verdict on the condition of practically all radio components and circuits. It is a most useful instrument to have about the place.

The standard model, which is intended for use with battery sets only, costs 12s. 6d. For the mains-set user a de-luxe model is available at two guineas.

"P.W." readers desiring further information can obtain it through the medium of our postcard literature service. Just send the usual postcard to us marked "Pifco," and state whether you are interested in the battery or mains-set tester.

New Varley Catalogue

I have just received a copy of the latest edition of the Varley Component Catalogue. If you want, free of charge, 28 pages of information of real interest to home constructors, take my advice and obtain a copy of this catalogue without delay.

OUR POSTCARD SERVICE

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

It is excellently produced and well printed, and if all the component manufacturers followed the example which Varleys have set the home constructor would indeed be well served.

Naturally, I am going to include it in the postcard literature service, and I strongly advise early application. **(No.46)**

A LANCASHIRE RECORD.

We hear that, as a result of the enormous business done at Radiolympia, Messrs. Ferranti Ltd. have taken the unprecedented step of arranging to miss the annual Lancashire holiday, the Oldham "Wakes."

So far as we are aware, such a thing has never been known before in Lancashire, and it is interesting to note that the step has been taken with the full approval and co-operation of the twenty thousand people concerned.

TELSEN'S LATEST "RADIOMAG"

NUMBER 5 of the "Radiomag"—which was issued concurrently with the opening of Radiolympia—is, without a doubt, the most ambitious effort that has so far emanated from the Telsen Electric Co., Ltd.

It covers, in a particularly attractive manner, almost every aspect of home radio, and that Mr. Rupert Collins, the enterprising editor, should thus have succeeded in producing an issue which is far and away better even than the last one is a striking tribute to his personal resourcefulness and energy.

Of outstanding interest in the generous contents of this new issue are comprehensive and informative articles on all the latest aspects of radio technique. "Class B" amplification, the new Telsen iron-cored coil, the choice and care of H.T. batteries are but a few of the many subjects which are discussed at length in "Radiomag" No. 5. In addition, complete details are given for the construction of six fine receivers, for three of which full-size blueprints are presented free with every copy.

Altogether, "Radiomag" No. 5, with its attractive four-colour cover, and at the reduced price of threepence, is a very creditable effort, and one of which the Telsen Electric Company and Mr. Rupert Collins in particular can justly be proud.

ECKERSLEY EXPLAINS

(*Continued from page* 828.)

interferences of the type "C" in my diagram. On the other hand, he showed, without question, how truly local interference could be completely eliminated with his new-season's models equipped with the new device.

Many leading engineers were present to witness the demonstration, and the Post Office was represented by its most distinguished technicians. Coming at a time when a special committee is sitting to investigate and report upon the whole question of man-made static, the invention has real importance both in the practical and political sense. Our congratulations to the management of K.-B.'s for their foresight in tackling one of the most pressing problems; our admiration for the technicians who have so completely applied theory to successful practice.

But remember, it won't help to ameliorate the technical futilities of the new Lucerne Plan, and Jove and his lightning still dominate us (until we use wire instead of wireless broadcasting ?).

THE LISTENER'S NOTEBOOK

(*Continued from page* 822.)

Mr. Gillie Potter was better than ever, and I'm sure he would be the first to admit that his jest anent the Governors of the B.B.C. owed its success to the way the audience reacted to it. Confined to a padded cell, where there is nothing to encourage him, he would never have hit the mark as he did.

A packed house (and a packed studio can never be called that) is indispensable if wireless is to do justice to variety.

* * *

By the way, I didn't think Henry Hall chose the best numbers for such an occasion. His third, a medley of old tunes, was the only one that could be called a typically Henry Hall number.

The other two were tuneless—nothing more than the rhythmic noise that one associates with bands of less repute. One of Henry Hall's best qualities is his restraint combined with excellent musical taste.

* * *

Strange to relate, the Houston Sisters seemed unused to the microphone, in much the same way as was Cyril Maude in "Quinneys" a week or so ago. Much of their clever stuff was lost in a babel of noise.

They moved along, too, at a speed with which no microphone could cope.

* * *

Horace Kenney got a surprising reception considering the antiquity of his Fireman *cum* Jolly Cobbler turn. True, he had introduced one or two new jokes into the act, but in the main, it was the same as was relayed from the Palladium ages ago now.

It is high time he got busy on something new, though I love his "jollity." He must keep that.

* * *

The Rodney Hudson Girls were just syncopated atmospherics to us. But the Olympians were delighted, and as they had contributed to the success of the show they deserved to have this tit-bit all to themselves.

* * *

The failure of the West Indians at the Oval in the Third Test Match upset broadcasting arrangements because it knocked Mr. Howard Marshall's second eye-witness account on the head. This was a pity.

I, like many listeners, am fond of Mr. Marshall's accounts. The B.B.C. did the next best thing by asking Mr. Gerald Heard to step into the breach. In spite of the latter's long run as a broadcaster, there isn't any indication that he is tiring of us or we of him.

Although he spoke about the Radio Exhibition, to which the newspapers had already given columns, the staleness of his news didn't matter. In his hands it seemed as fresh as paint.

TURNING OUT THE TALKS

(Continued from page 817.)

listener need not be bored—or upset! A few practised hands are, of course, given greater latitude before the microphone, but their number is few. The remarks of Christopher Stone are not entirely impromptu, for he makes brief notes. Sir Walford Davies, too, gives satisfaction if he scribbles a few remarks on the margin of a book of sonatas.

Vernon Bartlett, on the other hand, is so anxious lest his next talk will not be ready in time that he starts dictating it the morning after he has broadcast the previous one. And as an example of the careful preparation with which talks are turned out, Vernon often spends an hour over his opening sentence.

"It has to be good," he says, "or twenty per cent of those listening will switch off right away."

Rehearsed Debates.

I am able to reveal that these "*so* spontaneous" debates and discussions are not entirely unrehearsed. In many cases every word is agreed upon beforehand. In others the two debaters may meet over dinner and outline the principal points in their argument. Whoever is in the better temper then presumably gives in to the other!

But to pass on. Agreement over the manuscript is followed, in the case of speakers new to the microphone, by a voice test.

Very, very rarely is there a failure here, for coaching can usually work wonders. The voice physicians may peg away with a man who *will* drop his last syllables for an hour and then ask him to come again tomorrow, but perfection is always attained in the end.

Till at last comes rehearsal. The three general talks studios all open off one corridor, in a modernistic recess of which the probably agitated speakers wait. "3 B," "3 C" and 3 D" are the labels attached to these asylums of speech, and doubtless speakers are permitted their choice. "3 C" would be my preference.

The 1933 atmosphere is bright and cheerful and comfortable and homely. The desk is so fitted that as I go through my little speech I can slide the discarded pages into a slot at my side. The imitation window looks like a window. Whereas in "3 B" one is perpetually aware of the imitation.

In Arnold Bennett's Chair.

How dreadful if listeners were to hear the dropping of my last syllables as I wonder whether the handsomely bound books really are books or whether the fireplace ever has a fire! I shall sit, it is true, in a comfortable chair from Arnold Bennett's home, which the novelist probably used as he wrote his books—but what if I acquire that great author's stammer rather than his inspiration?

"3 D" is right off my list. This studio is largely a table and four chairs, and is the home of debates and discussions. But a queer feature is the large plate-glass window through which one can see the adjoining listening room. "3 B" and "3 C" and even Christopher Stone's "3 A" are viewed by a peephole. One can only suppose "3 D's" more prominent viewing space to be intended as a warning to debaters who may forget themselves in the heat of the argument!

A rehearsal in the proper studio, and then the great night. The talkers read their manuscripts, an engineer listens-in in the adjoining listening room, the minute hand of the clock takes fifteen paces, the red light flickers into green—and that's that.

Records Sometimes Made.

Sometimes the words are recorded by Blattnerphone for a possible posterity or—far more likely—a New Year's Eve "Do-You-Remember?" programme. This reminds me of when His Majesty the King visited Broadcasting House and they played him a record of one of his own broadcast speeches. "Dear me!" said his Majesty, "I must have had a cold!"

Radio speakers evoke correspondence as well as variety artistes. Some ask for information, some praise or blame, many are amusing.

Sometimes, things go wrong. One speaker, booked to introduce a famous visitor to England to the microphone, was horrified to learn that the celebrity had not turned up. Recovering, he sprang into the breach himself and gave an impromptu talk lasting twenty minutes!

THOSE RADIO IDEAS

Some Valuable Hints for the Inventor.

THERE are probably hundreds of valuable radio ideas wasted every year because their originators do not know what to do with them. A proportion may have little or no "patent potentialities," but, nevertheless, it is still possible that they could be sold for acceptable sums.

Should the idea be patentable, then the patent laws provide adequate protection for the inventor. Once his claim is properly staked by a carefully drawn up provisional application the way is clear for free and open negotiations.

Useful ideas are worth money, and there are many firms who are prepared to pay well for them. Obviously, the idea must be disclosed, and there is a slight risk that must be taken in so doing; but it is only a slight risk. Indeed, there is practically no risk at all if the firm to whom the idea is submitted is one of the well-known British radio concerns.

Provisional Protection.

Many home constructors and amateur and professional service men must, in the course of their experiments, receive happy brain-waves in the nature of circuit modifications and improvements in set and component design, and, doubtless, quite a few apply for provisional patent protection, for this is a simple and moderately inexpensive process. And it is just as certain that hundreds of such patent applications are allowed to lapse every year because the inventors cannot afford to develop the ideas and take out complete patents, or for some other reason.

But an invention is saleable even if it is only provisionally protected. For example, Marconi's Wireless Telegraph Co., Ltd., probably the biggest buyers of radio ideas in the world, are always prepared to consider "provisionals" with a view to purchasing them, although it must be pointed out that they look more kindly on one that has been properly drafted than one which is hurriedly and carelessly prepared.

TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio.

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

Multiple Speakers.

I HAVE often been asked by readers whether there is any advantage to be gained by using two separate loudspeakers, either on the same baffle board or mounted in some other way, having different characteristics, one specially adapted for the higher register and the other for the lower register, the object being to get a more uniform response throughout the audio range.

Theory and Practice.

There is a good deal to be said for this theoretically, although in actual practice I am not sure that it works out in quite the same way. I have many times tried all sorts of combinations of loudspeakers, not only speakers having maximum sensitivity in different parts of the register, but also speakers of entirely different types, and it doesn't work out in reality quite as it does on paper. There are, in fact, some dual loudspeakers—two speakers mounted on one baffle board—actually available on the market, so there is no difficulty in trying out a tested arrangement if you want to do so.

Try This.

The experiment is quite an easy one to try for yourself if you have two or three different loudspeakers on hand; but a good deal depends upon the choice and adjustment of these speakers, which is where the commercial people have the advantage, as they spend a deal of time matching up and selecting speakers adapted to work in harness together.

I think that perhaps one of the main troubles is that two or more speakers never seem to give you the added advantage which you might expect, altogether apart from questions of frequency response. A number of speakers of more or less the same type always seem to lose something individually when they are worked together from the same source.

All-Round Tone.

Broadly speaking, and in answer to the various queries I have had on this point, I should say that it was better to get one good speaker with an all-round tone and good response curve rather than to make up a composite speaker, as it were, of a number of units. At any rate, that has always been my experience, and I have, at different times, given quite a lot of attention to this particular subject.

Panels.

It is funny what changes have taken place in the last few years in radio panels. It doesn't seem so very long ago since we had polished wooden panels of mahogany or other fancy wood; and then we got ebonite panels, some of them very beautiful, and the set was "not the thing" unless it had one of these very special mahoganite or such-like hard rubber panels.

Surface Leakage.

All sorts of questions used to be discussed about the electrical leakage taking place in wood, and various dopes were available for rendering the wood free, as far as possible, from electrical conductivity. In fact, I remember reading a comprehensive article in an American paper giving the results of a lot of scientific tests on wooden panels, dried in various ways and then treated with different varnishes. If I remember rightly the article succeeded in proving that properly treated wood was as good as the best ebonite!

Shortly after this came aluminium panels, which were not only fashionable for their appearance, but also helped with the screening of the set. These metal panels were, as you might have expected, responsible for a large number of accidents with short circuits, burnt-out valves, and so on; but at the same time they were very convenient for fitting the components and in many cases ornamental.

The Cycle Comes Round.

In accordance with the cycle which seems to be continually taking place in radio matters, the wooden panel is coming back into its own again. But it is doing so in rather a different way; for whereas in the old days we had to rely upon the insulation of the panel itself being good, nowadays we have so many parts of the set made up in units—each with self-contained insulation, so to speak—that the panel is reduced practically to a mechanical support and plays little part in the electrics of the system.

Curiously enough, I have always had a preference for a nicely figured and polished wood panel, and I think it can be made to look much more natural than ebonite, not so much like a scientific instrument. A radio set is perhaps a scientific instrument when all is said and done; but we use it primarily as a musical instrument, and the more natural and the less incongruous it can be made to look the better, it seems to me.

Little Things!

A reader wants to know why it is that, as he says, terminals are always put "in the most impossible places."

(*Continued on next page.*)

TECHNICAL NOTES

(Continued from previous page.)

Ask me another. Why is the gas-meter always put at the extreme far end of the cupboard under the stairs, and why is the electric fuse-box always put up against the ceiling, so that with nothing short of a window-cleaner's ladder can you get at it—and this in the dark, when all the lights have gone out? If anybody can answer me these questions they can probably tell me the answer to the other about terminals.

Design.

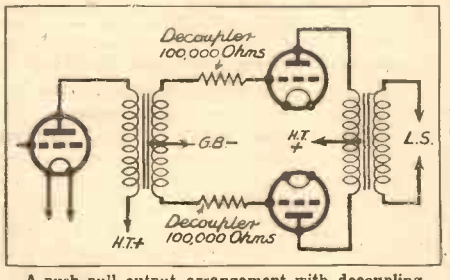
I suppose the fact is that the first man who did it was an idiot, and all the people since have followed him without stopping to think. Some manufacturers have had the common sense to put the terminals so that they project on the component in a really accessible position, and it is to be hoped that as time goes on others will follow suit.

I am afraid there is nothing much you can do when you get a component with the terminals so near the base that you can hardly manipulate the screwed heads of the terminals. The only thing is to be patient and fiddle around until you get the wire connections to make a reasonably safe hold.

Push-Pull Decoupling.

I spoke recently about some of the characteristics of a push-pull output stage, and mentioned that sometimes there was a tendency to instability, and also that even though the valves might be matched when they were first installed they would probably "age" differently and so get out of step, as

PREVENTING INSTABILITY



A push-pull output arrangement with decoupling resistances inserted in the grid leads to prevent instability and make up for lack of matching in the valves.

it were. This can be overcome by the use of a decoupling resistance of about 100,000 ohms in each of the grid leads from the tapped transformer to the grids of the push-pull valves. This will be seen in the accompanying diagram.

Diffusing the Sound.

I had a letter a few days ago asking me to try putting a loudspeaker facing against the walls at the corner of a room, the walls serving as a sort of right-angle reflector. As a matter of fact, I have tried this many a time, and I expect most of you have, too. Sometimes with a speaker which is very "directional" this little dodge makes a lot of difference, especially if there is a fair amount of volume available to make up for what is lost in the reflection against the wall and also the consequent diffusion or spreading of the sound. Curiously, also, it depends quite a lot on the nature of the wall surface. If this is covered with thick, soft wallpaper the effect will not be very good; but if it happens to be a bare plaster wall or other hard substance the effect is generally much better.

As I say, if you have sufficient volume available and other conditions are right you can sometimes get a much better all-round effect than by having the speaker pointing directly towards the centre of the room. Anyway, there is scarcely anything easier to try, because it only means putting the loudspeaker in a corner and turning it the other way, so you can readily make the test for yourself.

Transformer Characteristics.

When studying the characteristics of speech transformers it is practically impossible to consider them except in relation to valve characteristics. Of recent years valves have been produced of much lower impedances than formerly, with consequently heavier anode currents. This again reacts upon the question of transformer design, because if we use a very small transformer it will be saturated, and the same thing applies to even larger transformers if the primary inductance is sufficiently high to give good quality with only a very small anode current in the preceding valve.

Parallel Feed.

It is for reasons of this kind that the parallel-feed system was brought in. In this arrangement a non-inductive resistance is introduced into the anode circuit of the detector, which causes the low-frequency current to pass away through a coupling condenser through the L.F. transformer. By this arrangement the primary winding of the transformer is isolated from the D.C. current by the condenser.

The result is that there is no D.C. current through it to interfere with its inductance; and as the inductance remains high, good quality of reproduction can be obtained with a very small transformer. Most of you will be familiar nowadays with the general features of the parallel-feed system; but, for the sake of any of you who may not be, I should mention that the anode resistance referred to above—non-inductive, by the way—may be about 25,000 or 30,000 ohms, whilst the coupling condenser should be 1 microfarad, unless other values are recommended by the transformer makers.

Motor-Boating.

A point to note about this arrangement is that, since the primary inductance of the transformer remains high, the relatively low audio frequencies are well reproduced, and consequently motor-boating is liable to take place. If you are interested you can easily show that this is so by taking out a cheap inefficient transformer which may be suitable, although not perhaps giving very good reproduction, and put in a better and more modern transformer, when you will almost certainly find that motor-boating will be set up. I am assuming, of course, that the original transformer is not decoupled.

You should watch this point when going in for the parallel-feed arrangement, because, whilst you want to get a better frequency response, owing to the higher primary inductance of the transformer, and the fact that this higher inductance is maintained, nevertheless you don't want to

(Continued on next page.)

TECHNICAL NOTES

(*Continued from previous page.*)

pay for this extra efficiency the price of motor-boating.

H.F. and L.F. Chokes.

Readers often ask me why chokes are divided into high-frequency and low-frequency chokes, and whether there is any essential difference between the two. The fact that the low-frequency choke has an iron core, whilst a high-frequency choke has an air core, seems to give the impression sometimes that the two types of choke are entirely different in principle.

As a matter of fact, there is no difference whatever in principle, and both depend upon impedance. The impedance of a coil of wire to alternating current increases with the frequency. Therefore the higher the frequency the smaller the inductance which is required to produce a given impeding effect.

Impedance.

The result of all this is that a choke with an air core may act as quite sufficient impedance for *radio*-frequency currents—that is, it acts as what we call a *high*-frequency choke—whereas when *low*-frequency currents are applied to it they pass through relatively easily.

In order to give sufficient impedance for low-frequency currents we must very greatly increase the inductance of the choke, and this we can do by increasing the size or number of turns of wire, or more particularly by giving it a core of iron or other magnetic material. The magnetic permeability of iron being enormously greater than that of air, we get an enormous increase in the inductance of any coil by simply inserting an iron core into it.

Inductance of Choke.

You will see from this that there is no difference at all between high-frequency and low-frequency chokes, except in the matter of inductance. I should, however, add that it is not good practice to make a high-frequency choke with an iron core, even if the inductance is kept low.

You might think that if you have an air-core high-frequency choke of a certain size you could make an iron-core high-frequency choke of the same impedance, but very much smaller in size. This is true, but it would not be so suitable because the iron, although having very much greater magnetic permeability, exhibits another characteristic known as hysteresis.

Briefly, hysteresis means that there is a lag in the magnetic response, and this in certain cases may give rise to trouble.

Ohmic Resistance.

Both high-frequency and low-frequency chokes should be wound with wire of ample current-carrying capacity for the purpose in view, so that, although their impedance may be large, their ohmic resistance is small.

With a choke you don't want to stop the *direct* current; what you want to stop is the *alternating* current which may be superimposed on it.

If you merely wanted to stop *both* alternating current and direct current you could get the same result more simply by using a *resistance* of suitable value, so the fact that we have to use a choke instead of a simple resistance shows that we require something which discriminates between direct current and alternating current.

Choke Coupling.

Choke coupling is a very common method of coupling one valve to the next, the choke being used in conjunction with a condenser. The choke coil is put into the anode circuit of the first of the two valves to be coupled, and the anode is then connected to the grid of the following valve by means of a condenser.

If the first of the two valves is a high-frequency valve, clearly it will be passing high-frequency current on to the next valve, and the choke will need to be an H.F. choke. If, however, the valve in question is on the other side of the detector stage, it will be handling low-frequency current, and it is a low-frequency choke that will be needed.

Other Couplings.

Choke-capacity coupling is in great favour owing to the very good quality of reproduction which can be obtained by its aid.

It has the disadvantage as compared with transformer coupling that it does not give a step-up between one stage and the next. As compared with resistance-capacity coupling, on the other hand, it has the advantage—particularly if the choke has a very low ohmic resistance, as I mentioned above—that it does not cause an appreciable drop in the high-tension voltage applied to the anode.

With resistance-capacity coupling, as you know, it is necessary to add so many volts to make up for the voltage drop in the anode resistance when this is carrying the anode current, and so to ensure that the anode actually gets its correct voltage in the end.

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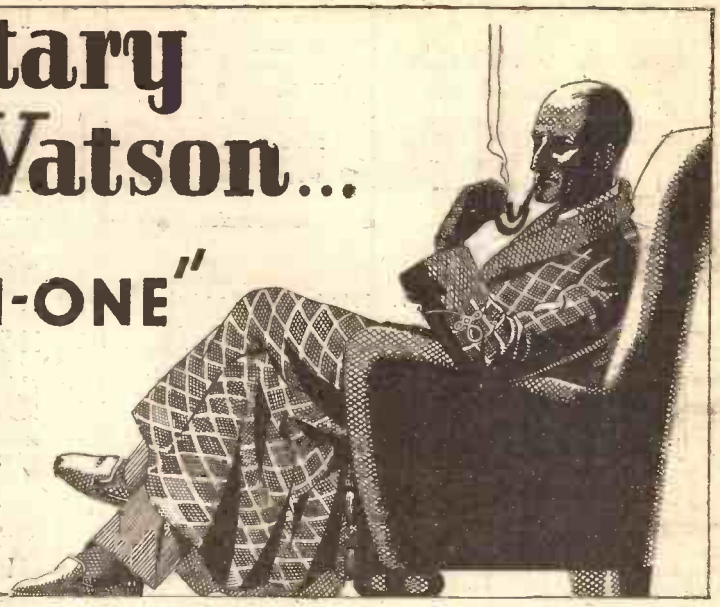

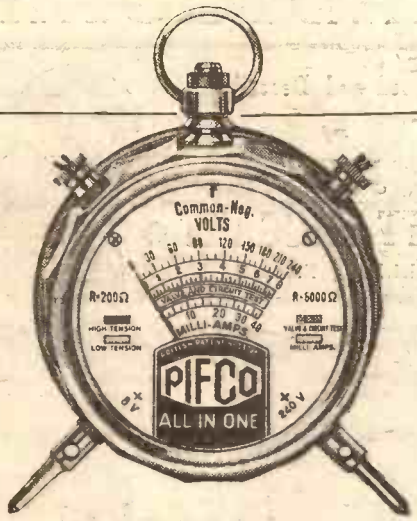

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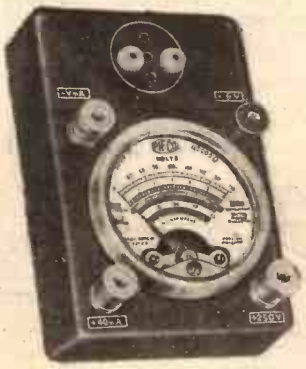

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Wonderful New Radio Device.

SPEAKING before the Institute of Radio Engineers in Chicago, Mr. T. R. Gilliland recently described a new instrument by means of which the outer layers of the "ionosphere" 550 miles high can be explored. This marvel records automatically the ionization of the three upper layers beyond the stratosphere and determines their distances.

Over here the ionosphere is better known as the Kennelly-Heaviside layer. Amongst the interesting things which it is hoped will be done with the new gadget is the measurement of the earth's magnetic forces at heights of hundreds of miles.

Why "Man-made Static" is Naughty.

I DO not remember seeing any English legal decision about interference with radio reception which gave reasons for its illegality—if indeed it be illegal here. But in Germany a recent case of interference brought forth the view that the right of radio "listening" is comparable to the right of "peaceful possession" as sanctioned by the German civil code.

Hence it was decided that anyone who creates interference by using an electrical device is bound to instal a preventive apparatus.

Rapid Rejoinders.

T. N. (Harrogate).—No, sir! An ampere is not a quantity; it is a *rate*. A coulomb is a quantity of electricity, and a second is quantity of time; an ampere is a flow of a coulomb per second. Get the idea?

R. S. G. (Bath).—No, there is no connection between your own *Ariel* and the *Ariel* of the "Daily Mirror." Two different persons, quite unknown to each other.

L. H. (Putney),—Sorry we do not see eye to eye about broadcasts to schools. You try to get a boy or girl a job in an office. Then you will find that business firms need business qualifications, not earthworm lore. And, after all, it's the job which puts bread into mouths.

L. C. (Hove).—My favourite book is the pass-book. In these days there is not much happiness possible in a cottage, with bread and cheese, even if there is a radio set.

Bach to Come Back!

HAVING purchased some more job lots of Bach cantatas, the B.B.C. plans to begin working through them on Sunday, September 17th.

In order to make them go further, they are to be broadcast on alternate Sundays, and I suppose that when in 1935 the last one is performed the time will be ripe for the first lot to be brought out again. These cantatas will be given in the Concert Hall, and the B.B.C. organ will take part in them.

Last Word in Radiograms.

IN the September issue of the "Wireless Constructor" Mr. John Scott-Taggart returns to the single-knob control idea, and describes the construction of his "Olympia" Radiogram, an all-electric (A.C.) model, with every modern refinement, including iron-core coils, ganged tuning and pre-detector volume control.

J. S.-T. explains why he has gone back to the single control in producing this ideal family set. And his Armchair Talks grow more amusing, though no less instructive.

Great Firm Defies Lumbago.

AS an expert in lumbago I was moved to admiration for the Gramophone Co. when I learned that it has installed hundreds of lifts in its works. These lifts are really platforms to hold radio sets, etc., and can be so raised or lowered that the work may always be at hand level.

No more sudden clicks in the lumbar region for the Gramophone Co.'s people! I hear, too, that although there were already 8,000 of those people, their numbers were increased by 1,000 in anticipation of the Olympia rush.

I hope the whole 9,000 are now "wearing their fingers to the bone" in their endeavours to cope with orders—in a Pickwickian sense, of course.

Fine D.F. Rally.

NOT long ago the Golders Green and Hendon Radio Scientific Society held its seventh annual direction-finding competition in the neighbourhood of Berkhampstead, St. Albans, Watford, and Amersham. The transmitter was controlled by Mr. D. N. Corfield (G5CD) and the check transmitter by Mr. A. R. Gardiner (G5RD).

The results showed much improvement on previous years, over 80 per cent of the competitors finding the hidden station. The average error of the first two groups was only 0·8 per cent. The group of Mr. Maurice Child and Mr. J. C. Exerson won the first prize.

How to Organise Radio Clubs.

I FREQUENTLY receive letters from the secretaries of newly-formed radio clubs asking for advice about syllabuses, lecturers, etc. As it is impossible to deal at length with this subject in these Notes the Editor has agreed that I write a short article about it.

I am a believer in clubs, and I shall place my experience at your disposal as soon as I have finished my 1933 sun-sea-bathing.

(Continued on next page.)

ARIEL CONTINUES HIS RUNNING COMMENTARY ON RADIO

Candid Criticism.

RADIO critics in the U.S.A. seldom butter their words. Here is a joyous sample.

Commenting on a certain organisation of teachers and mothers who are "raising the very dickens about programs which 'over-excite' their children," one human battering-ram says: "The aforementioned society is only one of a number recently formed to exploit parental fear for the purposes of establishing a form of radio censorship. Program producers are apt to be timid sheep, easily sent into hapless ditherings by the boos of any organised minority, no matter how small. Radio censorship is in the offing, and more uplifters will grow fat." What you might call a swift kick in the slats!

U.S.A. Farmers Drop Radio.

IN 1931 about one in every two Iowa farms had a radio receiver. At the end of 1932 this proportion had dropped to about one in three, or a decrease of 29·2 per cent in the number of farm-owned sets.

As the number of sets in operation tends to increase under normal conditions this falling-off is a sad reflection of the slump, for it has been ascertained that in nearly every instance of discontinuance the cause was the inability of the farmer to buy replacement valves, batteries, etc.

I Fear the Worst.

I WAS afraid so! Henry Hall is going to bring back from the U.S.A. a series of new American "numbers." Why in tarnation he must do that, when he began his succession to Jack Payne so well as a conductor of the more melodious type of dance music, fair beats creation!

I fear that the tom-tom has entered his soul. May I be proved wrong! But I do protest against this fluttering of B.B.C. moths round American candles. Is British broadcasting to be British—or American?

This is not a narrow nationalism, but a plea for the British composer. What do the Americans know of dance music which they have not learned from Europe and Africa?

Wireless Relay Services.

IT may or may not be news to you that the wireless relay question at Bristol is being handled by the Sanitary Committee. Is that incongruous? Or is it appropriate? No prizes are offered in this interesting guessing competition.

Interference Films.

THE Pathé Company is co-operating with the Post Office in obtaining a film of the work of the famous G.P.O. detector vans. I wonder if the secret of how the authorities trace a pirate-listener successfully, even though his set isn't working, will be revealed by the camera's all-seeing eye?

Or is this yarn no longer sponsored by our enterprising P.O.?

Is Music Dying?

ACCORDING to the American Society of Composers, Authors and Publishers, the "talkies" and radio are killing "the lovely art of music."

The society declares that in America the number of musicians in the theatre has dropped from 19,000 to 3,000 since 1925; that sheet-music sales during the same period dropped from $2,639,351 to $827,154; that the piano sales have dropped from $93,670,000 to $12,000,000; and that the incentive for young persons to study music as a career is almost entirely killed.

The society maintains that composers are now compelled to write "enforced, inferior music." That last is not true of this country, where a large volume of superior music is broadcast and young British composers are encouraged.

SHORT WAVES

MEANS BUSINESS.

The man who is visiting all the Radio Exhibitions with a set look.

* * *

THROW-BACK.

Wireless sets are now quite common in remote South Sea islands.

Natives are evidently relapsing into civilisation.—"Sunday Pictorial."

* * *

Teacher: "Bobby, will you find Madrid on the map?"

Bobby: "I don't believe I could, teacher; but it comes in at ninety-nine on the wireless."

* * *

"Life is always changing,"
Is a hackneyed phrase, I know;
The—er—lemonade is not so good
As twenty years ago;
The miracles of Science
Bring new beauty into life—
You switch on your loudspeaker,
So you cannot hear your wife.

* * *

ON A SUNDAY NIGHT.

The B.B.C. "sausage machine" is still to grind out the old thing on a Sunday, between 6 p.m. and 8 p.m. It's the deacons without their collecting plate—though, come to think of it, we do pay for it all.

G. F. Bell. "Reynold's News."

These Terrible Telephones.

THE wordy warfare which next door's parrot engages in with their radio set when the local oscillating fiend is at work makes the following yarn, by K. R. G. Browne, in the *Evening News*, ring true. A young politician who had to telephone to his party leader mistook the "number engaged" signal for the great man's voice, and stood for ten minutes with his hat off, saying "Quite" at intervals.

Getting the Bird.

ON the other side of the world—in New Zealand, to be exact—there lives an enthusiastic listener who possesses an attractive set. Every night when he switches it on a kingfisher flies down and perches on his aerial. The bird stays there until the concert concludes, when it makes its departure. Our B.B.C. programmes usually get a different sort of "bird"!

A Matter of Opinion.

OF course, there are at least two sides to everything. And while loud loud-speakers drive some people frantic, it is interesting to note that they have their advocates. In a northern local newspaper I recently read a letter from a woman who was apparently quite angry with those who had written complaining about the disturbance caused by sets operated in gardens and near open windows.

"It is fine having music while a woman is working," she said. Personally, I always find my own radio music much more to my liking than that of my neighbours!

This Series Will "Go."

AT last! A series of talks has been arranged for the autumn, entitled "Anywhere for a News Story." Fleet Street "stars" will describe some of their exploits in search of "scoops."

Come! this is the real stuff—real, healthy, true adventure stories. Photographs of sinking ships, Ladysmith, a bike ride round the world, eh? All told by rollicking gentlemen of the Press—than which there are no better, neither.

What with these hot yarns and the "Proms." the autumn listening bids fair to be fruity, if not golumptuous.

Another Matter of Opinion.

"UNFORTUNATELY, Mr. Eric Maschwitz was not a great success as the commentator," reported one of the radio critics. Funny! I thought that he was a great success, and that the broadcasts from Olympia owed a lot to his cheery efforts.

The more book, film and radio criticisms I read the more I wonder why they should be written at all! At least, in so far as the majority are concerned.

Car Radio.

AS I predicted some time ago, car radio is making strides. At this year's motor show at least two makes of car will be shown fitted with complete receiving outfits and three or four with aerials as standard, and there may be others.

The other day I drove a considerable distance in a radio-equipped car belonging to a friend. But he made the mistake of having the set operating too loudly; it was not at all easy to hear the horns of other cars through the music. My experience is that in cities especially the volume of a car radio set must be kept down to a pretty low level or it may become dangerous.

ARIEL.

FOR the first time in the history of Glasgow's radio exhibitions, the one which is now being held at the Kelvin Hall is officially an R.M.A. Show, and that fact alone has made all the difference between what might have been mediocrity but what is in practice an exhibition second only to that which has just concluded in London.

The R.M.A.—or, to give it its full name, the Radio Manufacturers' Association—is an organisation composed of almost all the leading radio names in this country. It exists to protect the interests not only of its members, but of the industry as a whole, and any exhibition to which it has given its official recognition is assured of success from the start.

Glasgow's own Radio Exhibition, which is now officially recognised by the Radio Manufacturers' Association, affords an excellent opportunity for countless numbers of our Scottish readers to become acquainted with the very latest tendencies in modern receiver design. To these, and to others not able to visit the show in person, this illuminating survey of the exhibits at the Kelvin Hall will be of particular interest.

All the Important Firms.

That is why the exhibition at the Kelvin Hall this year surpasses anything of the kind that has been seen in Scotland before. R.M.A. recognition means R.M.A. support, and in consequence, unlike previous years, there are very few of the larger firms who are not represented.

From the point of view of the visitor, of course, it makes a tremendous difference. It means to say that as a result of his visit, he can become acquainted with all the very latest improvements that the industry has to offer, instead of, as in previous years, only just a few of them.

This year it is true to say of the Glasgow Show that if you cannot see just exactly what you are wanting, you may safely assume that it isn't yet invented. But that is most improbable, for never before in the whole history of radio in this country have there been so many amazing developments in the course of a single year.

Tremendous Advances.

Radical departures from what has hitherto been regarded as standard practice are to be found in almost every branch of the industry: departures, moreover, that represent tremendous advances. The introduction of iron-cored coils has inaugurated a new era in selectivity. Amazing developments in valve technique have set up hitherto undreamed-of standards of performance. The perfection of Class B amplification has solved to a large extent the great problem of the battery user.

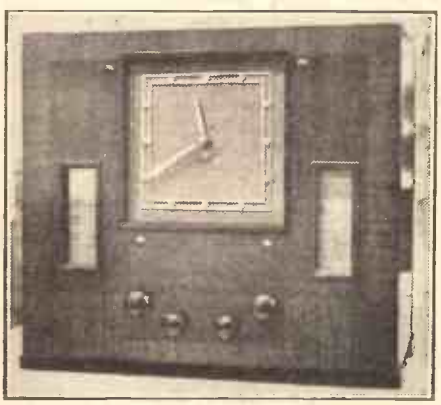
Literally, there is something new for everybody, as will be obvious from the necessarily condensed survey which follows. Obviously, in the course of the present article, it will be impossible to deal with everything, and it will therefore probably be best to concentrate mainly upon the present tendencies.

Not by all the literary efforts in the world can we hope to dispense with the desirability of a visit, for undoubtedly that is the most satisfactory way of becoming up to date in so far as radio matters are concerned. If you *can* go, then by all means take advantage of the few remaining days

But if a visit in person is impossible, the survey which follows will, at least, enable you to become familiar with the numerous ways in which your set can be brought into line with modern tendencies.

In this connection, it will perhaps be most helpful to take the case of a more or less straightforward set, and to work through from the aerial to the output in the light of all the developments which are to be seen at the Kelvin Hall. With the question of commercial sets we can deal afterwards.

FIRST PUBLIC EXHIBITION



This brand-new H.M.V. model—the "Greenwich Superhet Selective Five"—is being shown for the first time at the Kelvin Hall.

Better to be Sure.

"Safety first" is a slogan which can be applied even to wireless. Fortunately, few are the cases of installations being struck by lightning, but it is better always to be sure than sorry. To safeguard your set, it is a sound scheme to fit a lightning arrestor in the aerial lead-in circuit, and the one which Bulgins are showing on Stand 72 is ideally suited for the job. Moreover, it is very reasonable in price.

Coming to the actual set itself, the first thing, of course, is the coils. If you want to be modern and thereby to enjoy real selectivity, it is abundantly obvious from the Kelvin Hall Show that you must go in for those of the iron-cored variety. Without a doubt they are a vast improvement over the ordinary types and, suitably connected, they do give a performance adequate for modern requirements.

High Standard of Workmanship.

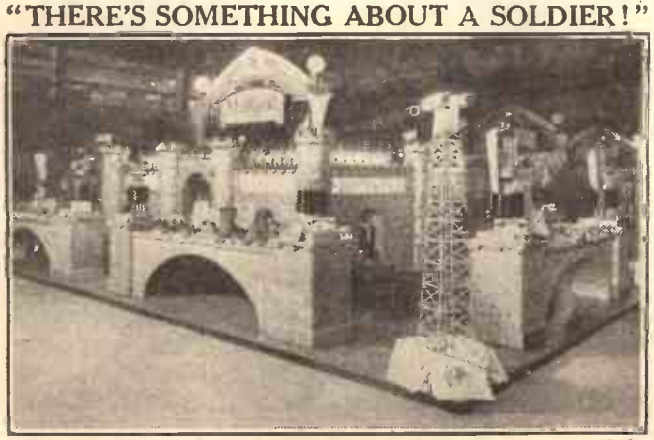
A typical example is the famous Varley "Nicore" range, which can be inspected on Stand 25. The core in the case of the Varley coils is made from a secret dust alloy, and the efficiency of the coils is remarkably high.

Another notable iron-cored coil exhibit is that which is being shown by Igranic. "Igranicor" coils, as they are called, are every bit up to the standard which one would expect from this old-established firm. You can inspect them at your leisure on Stand 23, and you will be impressed with the high standard of workmanship that has been put into the production of them.

R.I. in the production of their fine range of iron-cored coils, are to be commended for the amount of attention they have given to the needs of the man who wishes to use iron-cored coils in an existing receiver.

(Continued on next page.)

"THERE'S SOMETHING ABOUT A SOLDIER!"



Thanks to the ingenuity of Mr. G. F. Green, the "Better Radio Brigade"—Mullard's famous slogan—is strikingly represented in the design of their exhibition stand.

A SURVEY OF THE GLASGOW EXHIBITION

(Continued from previous page.)

Normally, a coil change of this description would completely upset all your tuning dial readings, and you would have to start afresh to calibrate the set. But not so with R.I. "Micrion" coils, for an adjustment is provided on the coils themselves which enables you to match them up with any existing circuit. A clever idea, and one for which you should make a special point of looking when you visit Stand 63.

REELS OF ANOTHER KIND!

Miss Dorothy Ward, the famous pantomime "star," lends a hand at the Marconiphone coil-winding machine. All the coils made on this machine during the Glasgow Show will be used in actual Marconiphone receivers now in production.

The *pièce de resistance* in the realm of tuning circuit developments is undoubtedly the Permeability Tuning Unit which Varleys are showing on their stand. "P.W." had the pleasure of first introducing it to the public in the "Nu-Tu," a receiver design which appeared exclusively in this journal about nine weeks ago.

Permeability tuning is destined to play an important part in the future of receiver design, and, for the time being, it is a development which can only be enjoyed by the home constructor.

Astonishing Progress.

From the question of coils and tuning circuits we pass on to H.F. valves, and here again the progress that has been made is little short of astonishing. The present tendency as reflected in the exhibits at the Kelvin Hall is definitely towards valves with very high stage gains.

On Stand 31, for instance, which exhibits the products of Messrs. A. C. Cossor, is shown the 220V.S., a relatively small consumption variable-mu S.G. valve of particular interest to the battery user. It is something quite new, as also is the M.V.S./Pen., an H.F. pentode for mains operation.

One of the most notable Mullard advances is a new multi-mu S.G. valve requiring a grid bias of only 4½ volts. The P.M.12M., as it is designated, is featured on their Stand (36), together with two new A.C. types, the V.P.4 and the S.P.4. They are both designed to give a very high stage gain, the V.P.4 being of the multi-mu type.

On Stands numbers 34 and 35—those of Osram and Marconi respectively—prominence is given to the new unbreakable valves, the first details of which were revealed exclusively in "P.W." An S.G. Catkin valve is included in both ranges.

The Mazda contribution to up-to-date H.F. amplification takes the form of a high-efficiency H.F. Pentode for A.C. mains receivers. It is styled the A.C./S.2/Pen, and it gives a very high stage gain.

Most of the commercial receivers this year incorporate the anti-fading scheme known as automatic volume control. Home constructors, too, can take advantage of this development by incorporating in the detector stage one of the new Marconi M.H.D.4 valves, which has been specially developed for A.V.C. circuits.

A New Transformer.

On the L.F. side, the year's most outstanding development is undoubtedly that of Class B amplification, but it isn't the only channel along which progress has been made. R.I., for instance, have made an important contribution to the science of low-frequency amplification in the form of an entirely new Auto-Parafeed transformer. It is a nickel-iron transformer with internal shielding, and it has a voltage ratio of 1-4. The primary inductance, incidentally, is 85 henries. Employed under the maker's recommended conditions, the response curves of this new R.I. production are exceptionally good.

The tremendous success of A.T.B., the scheme that was invented by "P.W.'s" Technical Editor, has prompted Varleys to produce a compensating R.C. coupler for use in A.T.B. circuits. It is to be seen on their stand at the Kelvin Hall, and it is the only one of its kind on view at the show.

Input and output transformers and output chokes for Class B amplification are now obtainable in almost all the leading makes. From the point of view of performance, there is not a great deal to choose between them. Some are slightly more expensive than others, and the question of which ones you should use is absolutely a matter for individual preference. In any case, whatever make you select, you cannot go very far wrong.

Noteworthy examples to be seen at the Kelvin Hall are Ferranti (Stand 38), R.I. (Stand 63), Bulgin (Stand 72), Varley (Stand 25), and Igranic (Stand 23).

The Question of Economy.

A great deal of experimental work has been devoted to the question of suitable valves for Class B output, and as a result almost all of the leading valve makers are now producing one.

The 240B on Stand 31 is the commendable effort of Messrs. Cossor, and as a matter of passing interest it was one of the first Class B valves ever to be produced in this country.

Mazda, in the design of their Class B valve, have closely studied the question of economy of operation. The Mazda P.D.220 is very economical in use, and it gives an undistorted output of one and a half watts with 135 volts on the anode.

One of the features of the Mullard Class B valve which is exhibited on Stand 36 is the fact that it can be used with a low-power "driver" valve. Used in conjunction with a Mullard P.M.2 D.X. for the "driver," the Mullard P.M.2B gives an excellent performance.

Reference to valves for the output stage naturally leads up to the question of suitable speakers. Here again, from the various models which are being exhibited at the Kelvin Hall, it is obvious that tremendous progress has been made.

IN THE PUBLIC EYE

Taking a look at the construction of the "Popular Wireless" Catkin Three, as seen in the stereoscopic viewer, one of the popular features of our stand at the Scottish Exhibition.

In general, the prices are not appreciably lower than last year, but in view of the remarkable improvements which have been effected, it is even more remarkable that prices have not been *increased!*

New and improved principles of both production and reproduction feature in almost all the ranges exhibited, and there is roughly a dozen of them.

W.B. (Stand 70) are giving prominence to a range of speakers incorporating an entirely new system of construction which is termed

(*Continued on page* 894.)

A "CLASS B" SPEAKER UNIT

GREAT POWER WITH H.T. ECONOMY

IDEAL FOR BATTERY USERS

A "P.W." Research Dept. Product.

MADE IN AN EVENING

ADDS ON TO YOUR SET

Designed by K. D. ROGERS.

"POSITIVE grid drive," or "Class B" amplification, during the last few months has swept the whole country as the popular method of obtaining output power with economy in battery-operated receivers.

The number of "Class B" sets and amplifiers is rapidly increasing as new ones are built or old ones are modified.

The modification of a set having two stages of L.F. is usually a simple matter, being merely the substitution of different components and valves in the L.F. section.

Where one stage of L.F. is employed, such as in a screened grid, detector and output receiver, the conversion is not so conveniently carried out as a rule, owing to the fact that there is generally not sufficient room on the baseboard or chassis to accommodate the necessary additional parts and valve.

No Alterations to Set.

There are two ways out of the trouble: one is to use a "Class B" adaptor as an addition to the set, a rather clumsy method, and the other is to use a special "Class B" speaker unit. This is the method we are about to describe, employing a simply-built unit that can be constructed in not more than half an hour or so.

The advantage of "Class B" is so great that it is well worth every owner of a one L.F.-stage battery set to consider very seriously the prospect of converting in the manner to be described.

Powerful loudspeaker reproduction, from a valve output of up to 1,000 or 2,000 milliwatts, can be obtained with an average H.T. consumption of absurdly low proportions, while the alterations to the set are absolutely nil.

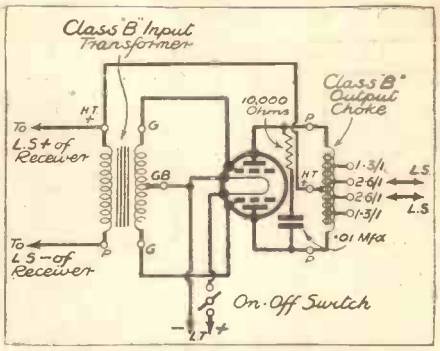
This is achieved by the simple expedient of fixing all the "Class B" components on a baseboard at the back of the loudspeaker baffle, the only connections to the set being those to the output terminals and the L.T. supply.

Using an Ordinary Speaker.

The speaker can be your own moving-coil speaker, or it can be a new one with a special "Class B" transformer incorporated. We have taken as an example an *ordinary* speaker, so that, in addition to the "Class B" input, or driver, transformer, we have on the baffle baseboard an output transformer *and* on the speaker its own input transformer—three transformers in all. If a special "Class B" speaker is used the output transformer is obviated.

The maximum power output of the "Class B" stage is determined by the valves and

EXTREMELY SIMPLE



The fundamental simplicity of the unit is well illustrated by this diagram of the circuit.

the transformers employed, and this should be decided by the constructor before he chooses his components. We have taken the full output of 2,000 milliwatts as our output, which is the maximum obtainable with the parts and valve mentioned in our list of components.

If less than 2,000 milliwatts is required (with somewhat less H.T. consumption, of course) a slightly smaller "Class B" valve can be used, with different driver-transformer ratio and careful choosing of a driver valve.

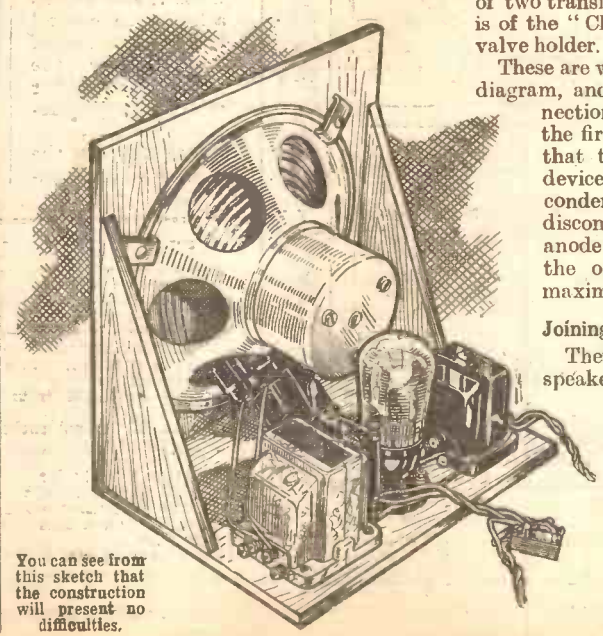
Should the constructor decide to cater for a different output he should get in touch either with the valve manufacturer whose valve he is to use, the transformer manufacturer whose transformer he favours, or with ourselves, so that he may be quite certain that the team of components and valves he uses shall be in perfect order.

Connecting to Set.

This is a desirable state of affairs in all radio sets, but it is absolutely essential to success where "Class B" is concerned. Without accurate team choosing "Class B" amplification cannot be wholly satisfactory, either in the power developed or in the quality of reproduction achieved.

The actual construction of the unit is merely the fixing of a small baseboard behind the baffle and the mounting on it of two transformers (only one if the speaker is of the "Class B" type) and a seven-pin valve holder.

These are wired up in accordance with the diagram, and the unit is ready. The connections to the set are simple. In the first place, it must be made sure that the set has no output filter device, and if it has the choke and condenser comprising it must be disconnected, and the output valve anode taken to one output terminal, the other going to H.T. positive maximum.



You can see from this sketch that the construction will present no difficulties.

Joining Up L.T.

Then the input of the "Class B" speaker unit is connected to the two output terminals of the set, and with the joining of the filament leads to the L.T. battery the linking is complete.

In the unit illustrated we have included an on-off switch for the L.T. supply. This is useful if it is desired to connect the L.T. leads of the unit

(Continued on next page)

A "CLASS B" SPEAKER UNIT

(Continued from previous page.)

to the L.T. battery instead of to a point internal in the set.

If the switch is omitted the flex leads from the unit to the L.T. must be connected to points on the L.T. supply that are controlled by the switch on the set. Suitable points are the positive and negative sides of one of the valve holders in the receiver.

Selecting a "Driver."

The output valve of the set will probably do as the driver valve, for it is likely to be of the L.P.2, or P.M.2A type. The suitability of the valve should be queried with the manufacturer of the "Class B" valve, or with us, to make sure that the team is properly arranged.

There is nothing further to be done now but to mount the speaker with its small baffle and baseboard either in a suitable cabinet or on a large baffle. Place the "Class B" valve in the seven-pin holder, make the maximum H.T. of the set about 120 volts, and everything is ready.

A few words should be said about the matching of the loudspeaker to the "Class B" valve. This is achieved by means of the tappings on the output choke and the transformer on the speaker, provided a special "Class B" speaker is not used. We are assuming that an ordinary speaker is used, such as that shown in our model of the unit.

High-Note Control.

The two tappings on the output choke should be tried, together with the various ratios obtainable on the speaker transformer, the combination that gives the best quality being used as the final arrangement. In the case of the speaker employed by us the middle and one of the outside terminals on the speaker transformer, together with the 2·6 ratio on the "Class B" choke, proved most satisfactory.

Where other loudspeakers are concerned it is possible that the 1·3 ratio on the choke might be more suitable, so this should be tried as well as the 2·6 ratio when the various taps on the speaker are tested.

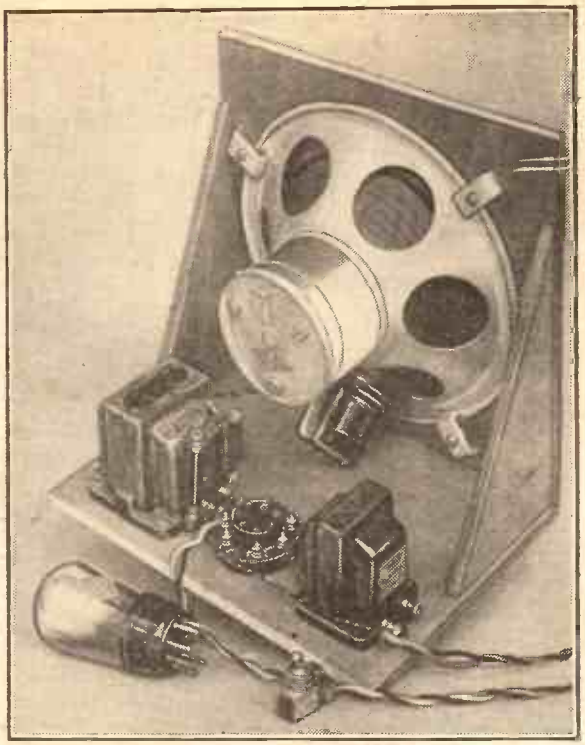
Across the output of the set is a resistance-capacity load which assists in suppressing any tendency of the "Class B" valve to oscillate and thus cause distortion, while it also acts as a high-note control to prevent excess of "top" over the middle and lower musical reproduction.

The values of the resistance and condenser chosen are those most suitable for average operation, but the amount of effect that the filter has on the reproduction can be determined very easily.

If the high-note response is too much the balance of the reproduction can be restored by increasing the value of the condenser or decreasing that of the resistance. Conversely the amount of "top" can be increased by reducing the capacity of the condenser (using a condenser of less capacity) or by increasing the value of the resistance.

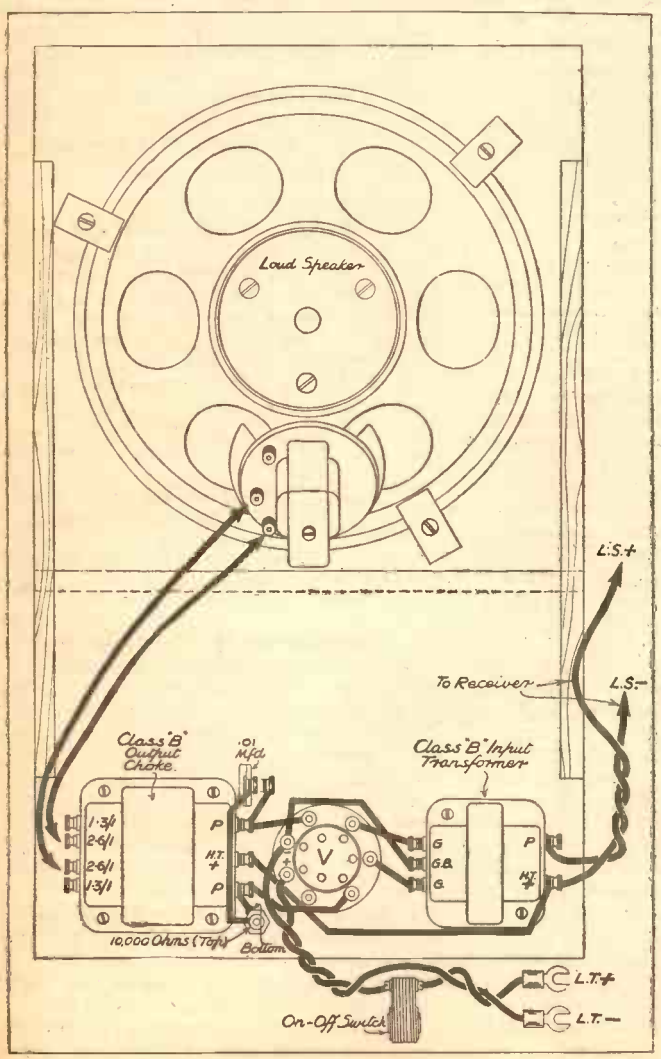
Using Grid Bias.

We have stated earlier that with suitable alterations in the component ratios different "Class B" valves can be used. It must be made clear, however, that, should it be desired to use the Marconi or Osram "Class B" valve (B.21), provision must be made for biasing it with 4·5-volts negative grid bias. In this event it will be most convenient to use a separate bias battery on the speaker unit rather than to carry leads to the set to employ the bias battery already in the receiver.



If the unit's low-tension supply is taken from one of the valve holders inside the set a separate on-off switch need not be used.

HOW THE UNIT IS WIRED



When the L.T. connections are taken direct to the accumulator an on-off switch should be joined in the L.T. + lead, as shown here.

FULL DETAILS OF THE PARTS TO USE

Component.	Make used by Designer.	Alternative makes of suitable specification recommended by Designer.
1 Permanent magnet moving-coil loudspeaker, with wooden chassis	Peto-Scott	—
1 "Class B" input transformer	Lissen	Ferranti, R.I., Telsen, Varley, Wearite, Benjamin
1 "Class B" output choke	Telsen	Varley, Benjamin, Wearite, R.I. or Ferranti transformer
1 Seven-pin valve holder	W.B.	Benjamin, Ferranti, Wearite
1 ·01-mfd. fixed condenser	Dubilier 670	—
1 10,000-ohm resistance with terminals or wire ends	Graham Farish "Ohmite"	Dubilier
1 Snap switch	Bulgin S.80.SB	—
10-ft. connecting wire	Radiophone "push-back"	—
1 "Class B" valve	Cossor 240B	See text
Flex, screws, etc.	Peto-Scott	—

ECKERSLEY EXPLAINS-

"I HAVE," says G. W., of Reading, "been reading an article in which the word 'transient' appears. What is a 'transient'?"

I'll try to explain what I think is meant by the word as best I can. There is some confusion of thought on the subject. Mine is not confused, but it may be different.

Supposing I had a pair of copper wires reaching from here to there. Suppose the ends of the copper wires were joined through, let's say, a loudspeaker at the far end. At the near end I have a battery, and I join this, through a switch, to form a complete series circuit as: battery, switch, "go" wire, loudspeaker, "return" wire, and battery.

Effects From Sudden Causes.

Now I close the switch. If the speaker and the wire were quite non-inductive the current would grow from zero to its maximum value infinitely quickly—i.e. at the same given moment of switch closing there would be no current and full current. If there was any inductance in the circuit, then the current would grow more slowly, at one moment no current, at the next fraction of a second some current, until after a very short time had elapsed there would be all the current.

HEARING IS BELIEVING!

P. P. Eckersley writes: "Hearing is Believing," but so adept has broadcasting become in faking the real thing that many people did not believe those nightingale broadcasts were true.

In either case, I have sent a "transient" down the wire because there is a transient change of current and then a steady state of steady current flow.

When people in the effects studio let off a loud and sudden noise which interrupts a stillness, then they make a "transient" out of the sudden sound impulse, this growing from zero to maximum very quickly.

This "steep-fronted" wave of sound, this sudden change of state, would be represented in a diagram which plots intensity against time as a square thing, as in Fig. 1.

"What is a transient?" This question forms the basis of our Radio Consultant-in-Chief's explanation this week. He illustrates its importance and also has some interesting remarks to make on obtaining first-class quality.

We have to make an electrical system which will transmit the sudden steep-fronted sound-wave, which must, in fact, be able to deal with transients.

A very clever man (Fourrier, I expect) showed that the diagram of Fig. 1 could be formed out of the resultant of an enormous number of sine waves having different phase and frequency. If, in fact, we could close a switch in the effects room which simultaneously made contact with thousands of alternating-voltage machines, each giving a different frequency between, perhaps 20 cycles and 20,000 cycles a second, we could, without bothering about microphones at all or without shattering the nerves of temperamental artistes by firing off revolvers, reproduce exactly the sound of the revolver in a perfect loudspeaker connected to these alternators via a perfect amplifying system.

Do Iron Cores Distort?

So far as I can see, then, the conclusion is obvious. If the amplifier is able to magnify every frequency equally it will magnify in effect all the different frequencies which comprise the transient! Nor will it, *if* it amplifies every frequency equally, distort the phase relationships in the component frequencies of the transient.

I held for some time that any iron in any circuit gave transient distortion because it messed up the phase relationships in the different components of a transient. Now, in spite of the non-agreement of distinguished colleagues, I must see that the theoretical arguments set out above are incontrovertible. It is inconceivable that anything which amplifies equally at all frequencies distorts phase relationships—none of the formulæ dealing with this question tell me that this can be so.

Nevertheless, up to some time ago I was convinced, purely by aural tests, that the insertion of the best transformers available in any amplifier did seem to do something nasty to quality. On the other hand, I heard the only really satisfactory quality I have ever heard in New York, and the Bell Laboratory people, like good telephone engineers, had an apparatus simply covered with iron-cored transformers. But their amplifier had equal response between 30 and 12,000 cycles per second! And that's the point, isn't it? I had used a transformer which probably "cut top."

Loudspeaker Deficiencies.

Transformers are inclined to cut top, and might for this reason have spoiled quality (not that it matters in broadcast receiver or gramophone-amplifier design, because in neither of these cases can you get real top without either heterodyne or sideband spitting or needle scratch).

When it comes to loudspeakers I am more diffident about transients than I am when setting out my theory—no, not mine, but my interpretation, anyway—as I have done.

But again it seems to me you cannot get away from the fact that a uniform response will give a uniform reproduction of the component parts of a transient. But then I ask myself, Is it possible to conceive of a loudspeaker, with its wide and "breaking-up" paper cone, giving such a uniform response?

Again, some people argue that you can buzz phases round and round and round in ever-whirling vectors and make no difference to the reproduction; but the particular

(*Continued on page* 893.)

TRANSIENTS ILLUSTRATED

The instantaneous change of intensity in current coincident with a sudden sound is what really constitutes a transient.

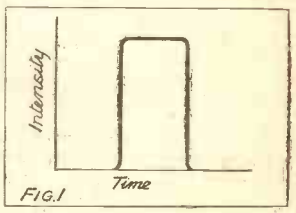


FIG. 1

THE MIRROR OF THE B.B.C. By O. H. M.

THE B.B.C. AND ITS CRITICS

Henry Hall's American Reception—Counting the "Lookers-in"—A Welcome Return—Frowning on Mothers

STRANGE to relate, the B.B.C. threatens to relent a little of its attitude of stony indifference to critics. At least, this much I presume one is entitled to infer from the proposal that the music critics are to be given an opportunity of meeting Dr. Boult and his principal assistants before the beginning of the next symphony season.

I shall be interested to see whether the jealousy plus bureaucracy entrenched in the higher circles at Broadcasting House manage to kill this proposal yet.

Henry Hall in America.

Henry Hall has had something like a royal reception in America. All the dance band and music kings were en fête. Paul Whiteman was his particular host; but there was eager competition from Rudy Vallee.

Of course, it is not generally recognised in this country that Henry Hall is credited, and rightly so, with the introduction here of some of the most successful recent American dance-band hits, including "Stormy Weather." He has therefore indirectly added substantially to the incomes of the American dance-music industry.

There is also the fact that Henry has definitely set himself against plugging, and this has gained him a great reputation even among those who practise the art.

The Television Rumpus.

There are still echoes of the great television rumpus caused by the B.B.C. asking "lookers-in" to write in and say they did so, the idea being to find out, if possible, how many, if any, did "look-in." Of course, the announcements were badly timed. If nobody should be looking-in early in August, that was no proof of the uselessness of television transmission.

Also it was a mistake to give the announcements in such a hole-and-corner way, as though the authorities rather hoped nobody would hear them or of them. In the end, therefore, this incident reacted against the policy of eliminating the Baird 30-line transmissions, but I look to see the attempt renewed with greater determination.

A Plethora of Producers.

Even the generous duplication of staff made possible by the new "output" and "input" regime of the B.B.C. has not yet managed to absorb the whole army of producers, dramatic and otherwise.

The truth is that the B.B.C. has about a dozen well-qualified and extremely competent producers, all specialised. But with the steady contraction of alternative programmes there is less and less to do.

The lot of those who are bound to be weeded out is anything but enviable, unless they can get squeezed into one or other of the new Overseas broadcasting concerns.

The Interlude Again.

I am glad to acknowledge that my campaign for the restoration of the interlude has already borne fruit. Miss Cecil Dixon's return to the microphone was not celebrated by any flare of trumpets, but it was generally welcome, all the same.

I hope, therefore, we have seen the end of the tiresome and needless silent gaps with the pounding beetle "foretelling doom" to all and sundry.

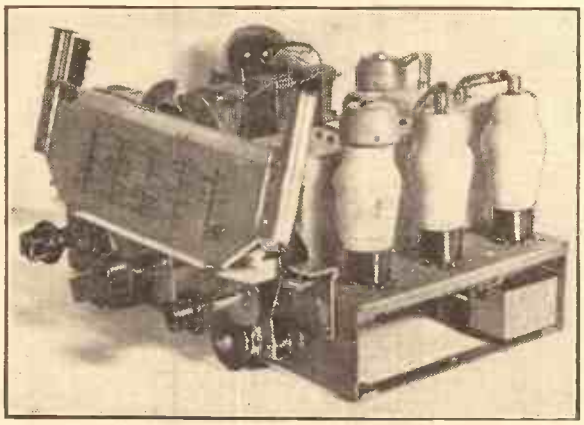
Married Women Employees

The B.B.C. seems to be taking a strong and original line about married women employees having children. While there is supposed to be no general rule, it is the fact that the practice of combining the raising of a family with the conduct of duties at Broadcasting House or elsewhere in the B.B.C. is frowned upon.

It is rumoured that there has been at least one case in which the official who tried this on lost her job. I could understand and would approve the B.B.C. not employing married women at all; but, "seeing as 'ow" they are employed, it looks like stretching the limits of relations between master and servant to make "domestic policy" part of the contract.

(*Continued on page* 896.)

AMPLIFICATION OF ONE MILLION



The overall amplification of this superhet receiver shown at the German Radio Show is 1,000,000. It has full automatic volume control and shadow tuning.

The LINK BETWEEN

BY G. T. KELSEY

Weekly jottings of interest to buyers

MY weekly pat on the back this week goes to the Dubilier Condenser Co. (1925), Ltd., for the excellent way in which they have produced their new catalogue.

It might be thought that there is not such a lot to talk about in connection with fixed condensers, but this new Dubilier effort is an education all on its own. Its 36 pages are full of information of interest to every home constructor, and among other things it contains a comprehensive treatise upon the increasingly important subject of spark suppression in car radio installations.

I strongly recommend all "P.W." readers to take steps to obtain a copy of this new Dubilier production, and in view of the interest that it is likely to arouse I propose to include it in the "P.W." postcard literature service. The full title of the booklet is "Choosing Your Condensers and Resistances," but it will only be necessary for you to quote the number at the end of this paragraph when making application through us. **(No. 47)**

By Air to Olympia.

To speed up the conveyance to and from Olympia of their many provincial dealers, Marconiphone hit upon the bright idea of establishing an air service during the recent Exhibition.

The fleet of sixteen 'planes covered a distance of well over 12,000 miles during the course of the Exhibition, and on one of the runs a record was established for the journey from Manchester to Heston. The actual flying time was 1 hour 28 minutes.

That is certainly one way of annihilating distance. May we hope that some enterprising aeronautical concern will establish a similar service next year for ordinary visitors? I am confident that it would prove exceedingly popular if it were carried out on the lines of the Marconiphone service. To be able to fly to London, tour the Exhibition and to return the same day is certainly a great attraction.

Wet H.T. Battery Spares.

For the benefit of "P.W." readers who are at present using "Standard Wet H.T. Batteries" for high-tension supply, I have been asked to call attention to the fact that spares can no longer be obtained from the original manufacturers.

Applications for replacements for batteries of this type should henceforth be addressed to the Wet H.T. Battery Co., of 26 Lisle St., Leicester Square, London, W.C.2.

(*Continued on page* 896.)

OUR POSTCARD SERVICE

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

Do you know the meaning of wattage rating ? It is a term frequently used, but often not clearly understood. In this article our contributor, Mr. R. H. Bradley, discusses this somewhat neglected subject and gives simple practical examples of how the various values may be worked out.

WHEN we know the voltage of the H.T. and the anode current taken by a valve it is a simple matter to calculate the value of decoupling, voltage dropping and automatic bias resistances. Or if we know the value of the resistance it is equally easy to calculate the voltage drop.

Resistances in Series.

But what does often appear somewhat confusing is the wattage rating of the various resistances, and this is especially so when we find two resistances of different wattage rating used in series. At first glance it would appear that as both are carrying the same current, both should be of the same rating. But it will be noticed that when two resistances are used in this manner it is the one of lower resistance which has the lower wattage rating.

Supposing we have a large power valve taking 62·5 milliamps when the grid bias is 32 volts. The resistance that will drop this voltage and provide automatic bias will be: $\frac{32 \times 1{,}000}{62{\cdot}5}$ or 510 ohms.

The wattage rating for such a resistance is found by multiplying the voltage by the current (in amps.), so that in this case it will be $\frac{32 \times 62{\cdot}5}{1{,}000}$ or 2 watts.

A resistance of the 3-watt type would probably be recommended. But 510 ohms is not a standard value, and as it will be better for the valve if it is over rather than under biased, the resistance used would probably be 600 ohms. This, again, is not a standard value, so that we should use a 500-ohm in series with a 100-ohm.

For R.C. Coupling.

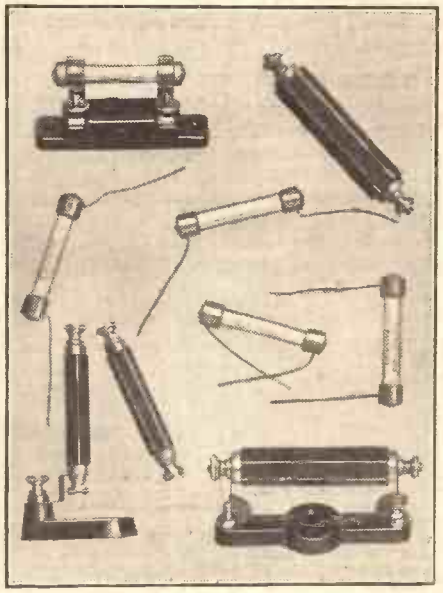
The voltage drop across the 500-ohm resistance would be $\frac{500 \times 62{\cdot}5}{1{,}000}$ or 31·25 volts, and across the 100-ohm resistance it would be $\frac{100 \times 62{\cdot}5}{1{,}000}$ or 6·25 volts. (The total bias will then be 37·5 volts.)

The wattage rating of the 500-ohm resistance will be $\frac{31{\cdot}25 \times 62{\cdot}5}{1{,}000}$ or 1·95. Thus a 2-watt type would be suitable. For the 100-ohm resistance the wattage will be $\frac{6{\cdot}25 \times 62{\cdot}5}{1{,}000}$ or ·39, so that a 1-watt type will be more than sufficient.

Thus it will be seen that, to calculate the wattage rating, all that is necessary is to ascertain the voltage drop across the resistance and to multiply it by the current.

When the resistance used is not the exact value that would give the correct voltage drop the calculation is a little more involved. Supposing, for instance, that the big power valve referred to earlier is preceded by a smaller power valve used as a resistance-coupled stage, and that this valve takes 25 milliamps when the voltage is 200.

WHAT RATING?



The wattage rating of a resistance depends upon the current passing through it and the voltage drop. A resistance capable of handling several watts is a far more substantial affair than one designed to handle a fraction of a watt.

We will suppose that, in order to supply the last valve, the total voltage available is 500; this will consequently have to be dropped by 300 to be suitable for the L.F. stage.

The necessary voltage dropping resistance would be $\frac{300 \times 1{,}000}{25}$ or 12,000 ohms.

But this 12,000 is not nearly sufficient to provide for the resistance coupling, the decoupling and the automatic bias.

Thus we might have a 20,000-ohm decoupling resistance, a 10,000-ohm resistance coupling, plus the automatic bias resistance. Ignoring the latter for a moment, it will immediately be evident that we cannot calculate the voltage drop by multiplying the resistance by the anode current, because this would be $\frac{30{,}000 \times 25}{1{,}000}$ or 750 volts, which are more than we've got. The reason for this is that as the resistance is increased the current is reduced, so that the valve can no longer take 25 milliamps. It is consequently necessary to find out what current it can take.

Finding the Working Voltage.

As the valve takes 25 milliamps when operating at 200 volts, its own resistance must be $\frac{200 \times 1{,}000}{25}$ or 8,000 ohms (this, of course, is the D.C. resistance, and must not be confused with the A.C. resistance or impedance). The total resistance in circuit will therefore be: 8,000 (valve), plus 20,000 (decoupling), plus 10,000 (coupling), plus 320 (automatic bias). This gives a total of 38,320 ohms.

With a supply at 500 volts the current will therefore be $\frac{500 \times 1{,}000}{38{,}320}$ or 13 milliamps.

The voltage drop across the decoupling resistance will be $\frac{20{,}000 \times 13}{1{,}000}$ or 260 volts, and across the resistance coupling it will be $\frac{10{,}000 \times 13}{1{,}000}$ or 130 volts, making a total of 390. In addition there will be 4 volts dropped across the automatic bias resistance, so that the valve will be operating on a voltage of 500, minus 394, or 106. (An examination of the valve maker's curve should confirm that at this voltage the anode current is approximately 13.)

Same Current, Different Wattage.

The wattage of the decoupling resistance should be $\frac{260 \times 13}{1{,}000}$ or 3·38, and for the resistance coupling it should be $\frac{130 \times 13}{1{,}000}$ or 1·69. For the decoupling resistance we must therefore use a 4- or 5-watt type, or, if this is not obtainable, two 40,000-ohm 2-watt resistances in parallel.

For the resistance coupling a 2-watt resistance will be quite suitable. This is another example of two resistances being used in series and carrying the same current, yet being of different wattage rating.

All the interesting news and views of current short-wave practice.

IF there *is* any suggestion of a kind of "close season" for short-wave radio, surely it ended on August 15th this year. The Show, coupled with the annual Convention of R.S.G.B., sets us all off with renewed impetus.

Personally, I can say that I am scuttling about like a two-year-old, simply as the result of meeting so many old and new friends at the Show and Convention. All the latent enthusiasm that we all possess for our hobby seems to come out at this time of the year.

A.T.B. on Short Waves.

Radio is a collection of coincidences! Early this morning I was thinking hard on the subject of applying A.T.B. to a short-waver, together with the attendant advantages, and, lo! by the evening post arrives a letter from "W. H." (Tottenham) asking whether something can't be done about that very thing.

It is not too easy a matter, but I am getting down to it in three or four different ways, two of which show quite considerable promise.

"W. H." also wants to know: (1) would extension handles improve the "H.A.C. Three-Valver"; and (2) wouldn't an air-dielectric reaction condenser improve matters?

COMBINED INSTRUMENT

A combined Telefunken radiogram and television receiver on view at the German Radio Exhibition. The cathode-ray method of non-mechanical scansion is employed.

Remote Control of Instability.

My views on the subject of extension handles are very definite. They are a delusion and a snare. As I have said before, if one "cures" hand-capacity trouble by their use, one hasn't cured it at all, but merely pushed it six inches further away.

All the other little troubles that go with it are still there, and the fact that they are six inches further from your nose doesn't help at all.

Hand capacity is the result of instability, and that instability has got to be stamped right out of the set before one is satisfied. There wasn't any in the "H.A.C. Three-Valver," and therefore extension handles will not be worth the space they take up.

Programmes from Kenya.

In reply to (2), I don't think an air-dielectric reaction condenser is preferable to the solid-dielectric type except in very exceptional cases. I wouldn't dream of using a solid-dielectric type for *tuning*, though.

A nice log has arrived from "H. N. D. B." (Hull), the most interesting feature of which is the reception of a few South African amateurs on the 20-metre band during August. Incidentally, the "V Q's" (Kenya and Tanganyika) have been coming in splendidly of late, from 6 p.m. right through until 11 p.m. on some nights.

A Good Address.

Three or four people seem to be attracted by the "Correspondence Bureau" suggested by "J. T. S." (Leicester). I am forwarding their names to him myself; but if any others want particulars I shall be glad if they will now write direct to the sponsor of the scheme. His address is: Mr. J. T. Smith, 65, Marshall Street, Woodgate, Leicester. Stamped, addressed envelopes for replies, please.

The N.Z. DX Club.

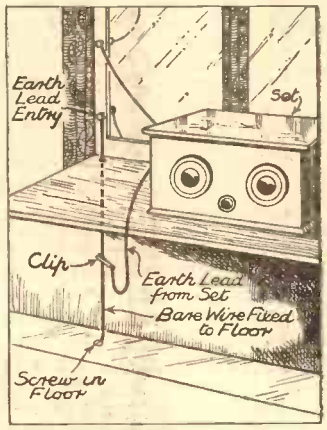
I am asked to bring the New Zealand DX Club to the notice of short-wave enthusiasts. Its aims are to forward the interests of all DX listeners by supplying up-to-date station lists, etc., and several branches are being formed in this country.

For full particulars apply to Mr. Stephen Cullen, whose address is 33, Dilston Grove, London, S.E.16.

CURING HAND CAPACITY

WHEN hand-capacity troubles are present on a short-wave set they can often be cured by removing the earth lead completely. This holds good mostly in cases where a long lead has to be used. Another method of curing them, however, is this: Generally the earth lead comes into the room via a corner of the window.

Instead of connecting it directly to the set, join a length of stiff bare wire to the point of entry of the lead, and take this straight down to the floor, anchoring it to a screw.



By moving the clip up and down the earth wire a spot is found where handcapacity does not affect tuning.

Now take a flexible lead from the earth terminal of the set and terminate it with a crocodile clip. By sliding this up and down the wire from the window to the floor it is often possible to find a point at which hand-capacity effects will disappear completely.

THE LISTENER'S NOTEBOOK

Frank comments on recent programmes and on microphone personalities of the moment.

I DON'T think "The Game" showed any advance in the development of purely radio drama. Has it been laid down anywhere that radio drama must deal with *post-war* idealism and realism? It's very dull subject-matter at its best, and becomes duller on repetition.

As soon as Sir William Gray began his speech to the boys of Marten House School one could guess the rest, so post-warish was the plot.

If anyone did excel in this play, it was the players themselves. For clearness and precision I've never heard a better cast. It was just as well, for I listened under difficulties.

Missing the performance on the National wave. I was forced to take the repeat show on the Regional, with its background noises from unwanted stations. I hope all listeners who use the Regional aren't troubled as I am. If they are, then the B.B.C. are wasting time and money to keep it going.

But to return to "The Game" and radio drama generally. Since *seeing* a stage performance of a Priestley play a few nights ago, I've been wondering why a broadcast play seems so colourless.

* * * *

I sometimes wonder in my own case whether I am too conscious of the B.B.C.'s method of production. I can never get the multiple studios plus control panel out of my mind during a performance.

I often regret that the B.B.C. has let us into this secret, for frequently I imagine that when A butts into a conversation that he is not hearing I can detect a lack of spontaneity in his remark.

Perhaps this is just imagination, but there you are!

Another weakness of most radio drama is its complete lack of humour. Witness "The Game." There wasn't a single laugh in it from start to finish. Priestley can write a play full of tense moments, but he knows the value of the relief afforded by a laugh, and so he introduces here and there a remark that produces an audible stir in the auditorium.

"The Game" wasn't without interest, but it just didn't give that something which a play-loving public always gets from a theatre. That's why I call it unsatisfactory. I can't say it was colourless. But it wasn't multi-coloured. It was just grey.

* * *

It will be some time before one is completely used to the woman announcer. At present it seems all wrong that she should read out racing, cricket and football results, not to mention fat-stock prices. She is rather deliberate with the preambles that usually precede these announcements, but doubtless she will rattle them off when she becomes more familiar with them.

It was amusing, as she announced some cricket results one evening, to observe her obvious bewilderment over the fact that it was possible in the same match for one player to get 127 and another 5 for 47. Strange game, cricket!

By the way, isn't it rather curious that Mrs. Borrett should have been given so much publicity, while her men colleagues got none?

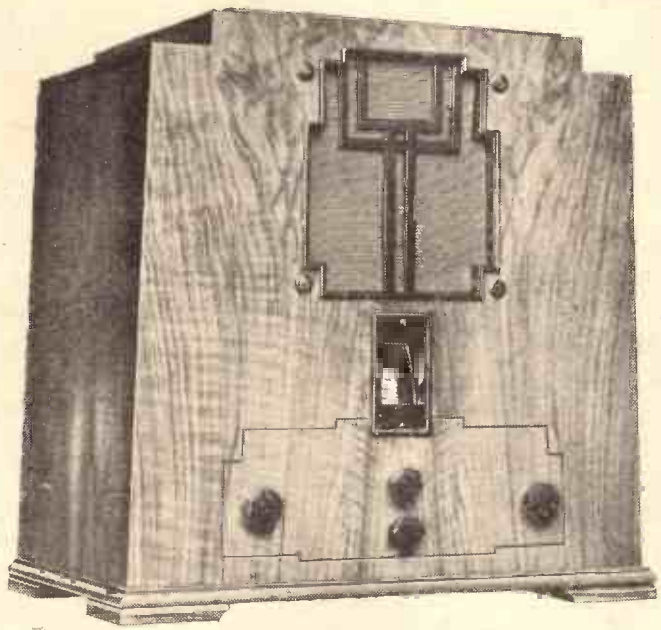
* * * *

The second week of variety from Olympia—or should I say from the theatre at Olympia?—was as glorious a success as the first. The Exhibition was, of course, responsible for most of the enthusiasm there. Naturally, this enthusiasm was brought into the theatre. Radio stars felt the benefit of it, with the result that broadcast variety made history.

It is a sad thought that variety will take a retrogressive step when it goes back to the unsympathetic atmosphere of the studio. This is inevitable for the time being, but it will be tragic if the B.B.C. hasn't learnt this obvious lesson that these performances had to teach. However, it is encouraging to know that the commentator of these Olympia shows saw the value of the theatre audience, judging from his remarks before the last performance there. By the way, I thought his little speech on this occasion ranked with the stars themselves for brilliance.

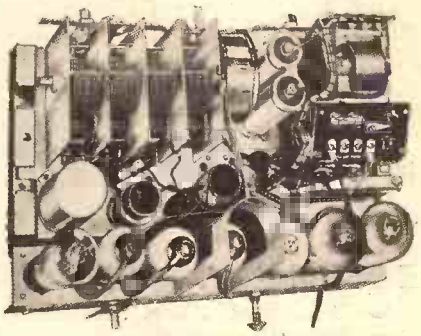
(*Continued on page* 895.)

THE NEW HIGH POWER SUPER-HET WITH EXCLUSIVE STATIC SUPPRESSION



- **Seven valve band-pass super-heterodyne for A.C. Mains.**
- **Absolutely consistent adjacent-channel selectivity.**
- **Unique Static Suppressor, adjustable for minimum background.**
- **Genuinely unlimited range.**
- **2¼ watts undistorted output—enough for three extra speakers.**
- **Full Delayed Automatic Volume Control.**
- **Duplex tone control adjusting both bass and treble.**
- **Illuminated scale carrying station names and wavelengths.**
- **Superb energised moving coil speaker of wide response.**

Hear this remarkable new model for yourself and you will realise that in its tremendous power, unprecedented selectivity and perfect tonal quality it is a definite step ahead even for Marconi. Merely to look at the figured walnut cabinet with its unusual lines and beautiful finish is to realise that here is something definitely different, definitely superior. But hear how the full Automatic Volume Control eliminates fading—how the super-selective band-pass circuits cut unerringly through interference—and how the unique Static Supressor provides a background of silence unbelievable in so powerful a set—then will you decide that Marconi 276 is your ideal 1934 receiver.



A rear view of the all-steel rubber mounted chassis, which gives some idea of its skilful design and fine engineering construction.

MARCONI 276

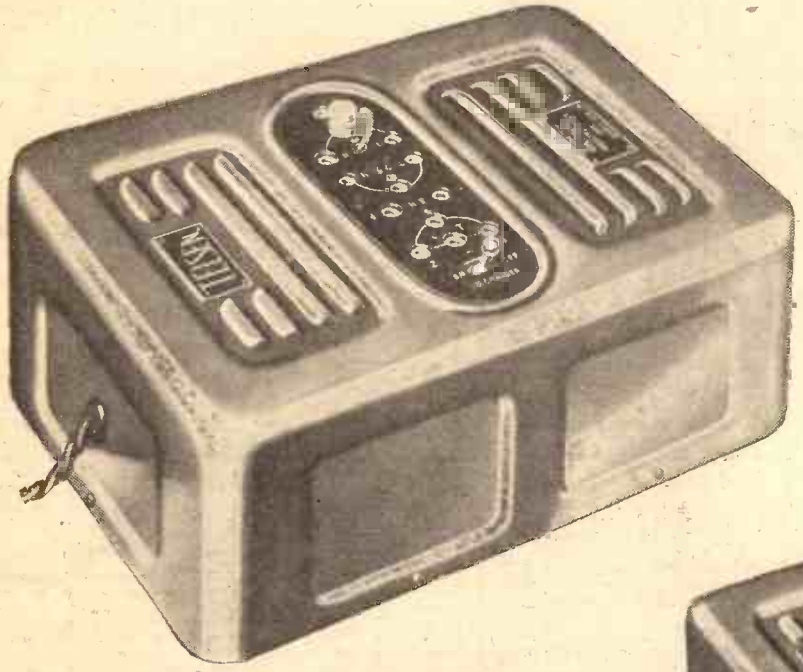
PRICE 22 GNS.

EXTENDED PAYMENTS GLADLY ARRANGED

ADVERTISEMENT OF THE MARCONIPHONE CO. LTD., RADIO HOUSE, LONDON, W.1.

Telsen MAINS UNITS

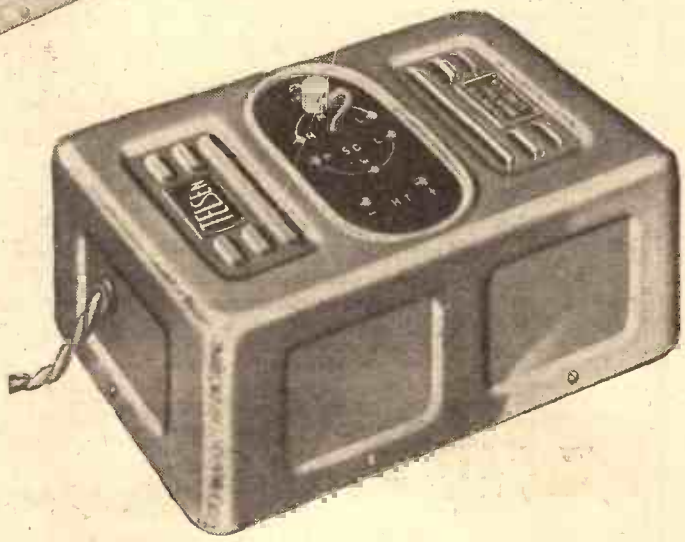
cover every requirement



THE new Telsen Mains Units are the outcome of long research and experiment by some of the finest radio engineers in the country. No effort has been spared to achieve their perfection, every conceivable refinement being embodied in their up-to-the-minute design. Switch over to Telsen now—and rid yourself for good of the distortion and L.F. oscillation which accompany run-down batteries, and the constant expense incurred in their replacement.

TELSEN H.T. UNIT AND L.T. CHARGER FOR A.C. MAINS.

For input voltages between 200 and 250 at 40 to 100 cycles. H.T. output is 28 m.a. at 150 volts, with separate Max., Det. and S.G. tappings, at each of which a choice of high, medium or low voltages is available. Very generous smoothing equipment eliminates hum. Charges 2, 4 or 6 volt accumulators at 0.5 ampere, the use of these facilities leading to such a saving of charging costs that the unit soon pays for itself. Very solidly built, and completely screened by an artistically finished metal case. **97/6**



TELSEN H.T. AND L.T. UNIT FOR A.C. MAINS.

Similar to the "H.T. unit and L.T. charger" but, as it is intended to provide complete power for receivers employing A.C. valves, the L.T. charger is replaced by a centre tapped transformer winding capable of supplying 2.5 amps. at 4 volts. Very well made in every respect and completely screened by its artistically finished metal case. **67/6**

TELSEN H.T. UNIT FOR D.C. MAINS.

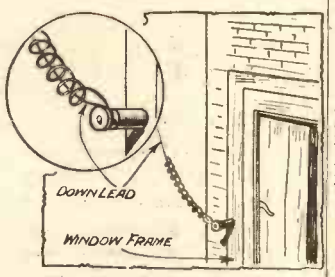
For D.C. inputs of from 200 to 250 volts. Adequate smoothing is provided to remove ripple. Output is approximately 28 m.a. at 150 volts. Max., S.G. and Det. tappings are provided, at each of which a choice of high, medium or low voltages is available. Enclosed in a well-finished metal case which provides complete screening. **35/-**

TELSEN FOR EVERYTHING IN RADIO

ANNOUNCEMENT OF THE TELSEN ELECTRIC CO., LTD., ASTON, BIRMINGHAM

STRENGTHENING THE LEAD-IN.

TO prevent the aerial lead-in from breaking off at the joint to the lead-in tube, take a piece of 16- or 18-gauge copper wire and twist it round a pencil till it forms a spiral



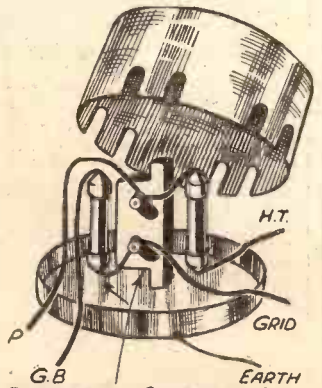
Preventing a broken down-lead.

spring 5 or 6 in. long. Pass the lead-in through this and fasten the ends of both to the lead-in tube by its screw. This will stop the swaying in the wind and consequent sharp bending of the wire which usually breaks the aerial at this point.

SCREENING COMPONENTS.

HERE is a little scheme which I have found useful, and may be of interest to others.

When rebuilding a set, the chief aim apart from making it efficient, is a neat appearance. It is easy to buy Glazite, or similar material, for the wiring, but often the use of old-type condensers, chokes, transformers, etc., though quite O.K. in use, spoil the finished job. In my own case I had several of these, but made everything much smarter by the following idea. Firstly, for the R.C.C. unit, procure a small round tobacco tin and screw the lid to baseboard. Next, the fixed condenser and the two leaks are mounted upright so as to leave clearing room for the



COMPONENTS SUSPENDED ON THEIR OWN CONNECTING WIRES

tin to fit over, notches being cut in the lip for the wires passing through. The home-made tuning coil and transformer were mounted similarly in various sized tins, the covers being easily slipped off for inspection or test. All the covers are now brushed carefully with any colour Chinese lacquer (obtainable at the well-known sixpenny stores). This idea has transformed my old "junky" set to something important looking. It is advisable to earth the lids when screwed down.

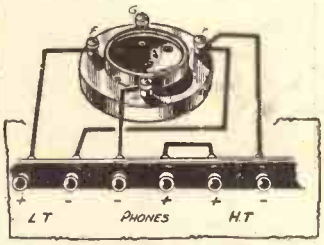
USING ADAPTOR AS SET.

MANY short-wave "fans" who possess a short-wave adaptor and an ordinary broadcast set may wish to listen-in on short waves when the family are using the "big" set.

With the aid of a valve holder, terminal strip and half a dozen terminals, the adaptor may easily be changed into a one-valve set.

Mount the parts on the adaptor baseboard, or, if there is no room there, on a spare strip of wood, and wire up as shown in the sketch. Connect the appropriate terminals to the batteries and 'phones, insert the adaptor-plug into the valve holder, and listen in.

The batteries and 'phones may be left permanently connected to their terminals, so that when it is desired



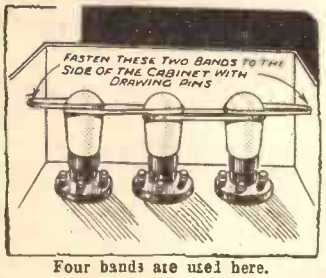
How the holder is wired.

to use the adaptor with the broadcast set it takes only a second to change over, and vice versa. This is very useful when a distant station is heard on the 'phones and it is desired to get it on the loudspeaker before it fades.

It is advisable to use a separate aerial for the adaptor. When wiring make sure the H.T.— terminal is connected to the correct L.T. terminal; in most sets it is the L.T.— terminal. All these remarks do not apply to the superhet type of adaptor.

A CURE FOR MICRO-PHONICS.

IF your valves are arranged in line, and you suffer from microphonics, here is a good cure for them.

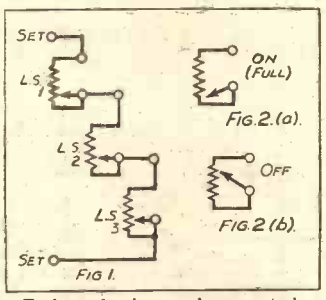


Four bands are used here.

Fasten each valve to its neighbour by means of a rubber band, and attach the bands of the end valves to suitable components or to the sides of your cabinet.

SPEAKER VOLUME CONTROL.

HERE is a simple method of working three or more loudspeakers in different rooms so that each one can be switched on or off and have its volume controlled without affecting any of the others.



Each speaker has a volume control.

For each L.S. a variable potentiometer of, say, 500,000–50,000 ohms will be required, and an ebonite block or wooden box for mounting. (The writer used the wooden cover of an old bell set.)

The method of connecting each potentiometer is shown in Figure 1. It will be noted that the L.S.'s are in series. The set must have a choke output.

Figure 2a shows the potentiometer with its moving arm so that the resistance is "all in," and therefore the L.S. is "on" at full strength.

Figure 2b shows the moving arm in the position where the L.S. is "shorted," and therefore "off."

Volume control is obtained by leaving the moving arm in intermediate positions.

ONE GUINEA FOR THE BEST WRINKLE!

Readers are invited to send a short description, with sketch, of any original and practical radio idea. Each week £1 1s. will be paid for the best Wrinkle from a reader, and others will be paid for at our usual rates.

Each hint must be on a separate sheet of paper, written on one side of the page only. Address your hints to the Technical Editor, "Popular Wireless," Tallis House, Tallis Street, E.C.4, marking the envelope "Recommended Wrinkles"

Will readers please note that the Editor cannot, in any circumstances, guarantee to return rejected Wrinkles, and that payment for published hints is not made until ten days after they appear.

The best Wrinkle last week was sent by Mr. G. G. Wilner, 14, Beech Hill Road, Eltham, S.E.9, to whom a guinea is being awarded.

SHORT-WAVE COILS.

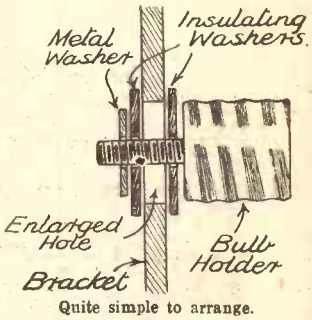
EMERGENCY short-wave coils can be made from Glazite, or similar insulated wire, of a gauge not less than 18. The coil of Glazite is about 12 turns, of a diameter suitable for short-wave coils, and all you have to do is to cut off the requisite number of turns and bind the coil in two or three places. A little wire should be left to make connection.

One coil of Glazite is sufficient to make three or four short-wave coils. It is interesting to note that stations are displaced a few degrees lower on the dial when using coils of this description in place of coils made of bare wire. This is due to the capacity existing between adjacent turns being increased by the insulating material.

INSULATING A BULB HOLDER.

OCCASIONALLY it is desired to insulate a bulb holder from the bracket to which it is fixed. In the event of no suitable insulating bushes being available, a safe method is as follows: First enlarge the hole in the bracket to about ¼-inch diameter with a drill or by any suitable means, and then cut out two washers about ⅝-inch diameter from presspahn or similar insulating material. Cardboard will do if nothing better is available, but a good insulating material is preferable.

Drill a hole in the centre of each of these washers to take the centre screw of the bulb holder, and then assemble as shown in the diagram. The metal washer illustrated is most important, and should be about ⅞-inch diameter. When assembled and tightened up,

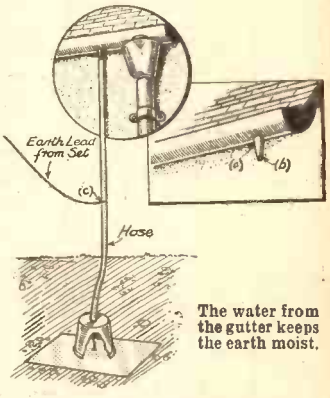


Quite simple to arrange.

the metal washer, being smaller than the hole, will draw the presspahn washer partly into the enlarged hole in the bracket, thereby centring the screw in the hole and effectively preventing it from touching the sides. There is no need to force the washer into the hole, the normal tightening being quite sufficient, if the presspahn washers are about ⅛-inch thick.

A SELF-DAMPING EARTH.

WHERE structural conditions of the house permit, an excellent earth can be obtained as shown in the illustration. A small hole is bored in the guttering of an outhouse or low roof, and the spout of a cheap funnel soldered in as depicted at (a). A piece of old garden hose is then secured firmly to the free end of the spout (b). The earth wire from the set is then inserted through a small



The water from the gutter keeps the earth moist.

hole (c), made in the hose at any convenient point, and hose and wire are then taken down to the earth plate. An inverted flower-pot will serve to keep the hose in position, and prevent undue strain on the wire. The hole in the side of the hose should, of course, be sealed with rubber solution.

Continued on next page.

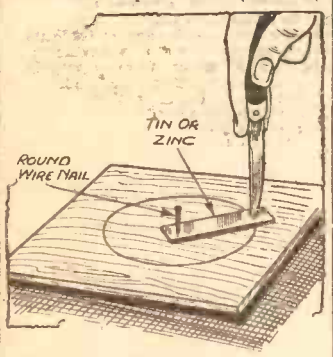
RECOMMENDED WRINKLES

(Continued from previous page.)

CUTTING OUT CONES.

FREQUENTLY in the construction of cone loudspeakers it is necessary to cut out circles of large diameter in such materials as paper, cardboard or felt. Even where compasses are available for marking out it is by no means easy to cut out the circle neatly with knife or scissors, especially when cutting an inner circumference.

A simple and effective method is to take a small strip of thin tin (or better



Neat cuts are obtained in this way.

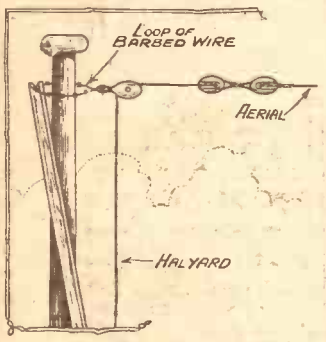
still, zinc) and to scratch on same the radius of the required circle. Through one mark drive a round wire nail, and at the other place an old pocket knife and tap through the metal until the point of the blade protrudes some ⅛ in.

If the nail is now driven through the centre of the material in which the circle is to be cut the whole may be slowly rotated and, with reasonable care, a clean-cut circle will result.

FOR BROKEN HALYARDS.

SHOULD the misfortune of a broken aerial halyard befall any reader of "P.W.," there is no necessity for him to climb aloft to replace the fallen member. A simpler and much less hazardous method of effecting the repair is as follows:

Procure a short length of barbed wire, sufficient to form a loose loop around the base of the mast, and to the loop attach a pulley. Thread the halyard



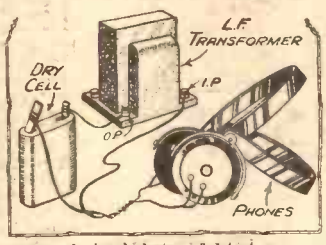
To save lowering a mast.

through the pulley in the usual way, and then, with the aid of two or three clothes-props lashed together, push the loop up into position at the masthead. The aerial is now pulled taut by means of the halyard, and at the same time the clothes-props are withdrawn. The "barbs" of the wire loop will bite into the wood of the mast, and a secure and not unsightly repair is the result. If a still neater appearance is desired those "barbs" which are not required to make contact with the mast may be nipped off.

TESTING L.F. TRANSFORMERS.

THE usual method of testing for a breakdown in an L.F. transformer, etc., with 'phones and battery, and listening for the loud click when making and breaking the contact, is not always reliable owing to the possibility of the ends of the broken wire touching. I recently tested a transformer, which I knew to be faulty, using this method, and the loud clicks passed it O.K.

The following is a perfectly reliable test: Connect winding under test to 'phones and battery in the usual way (see sketch), but instead of making and



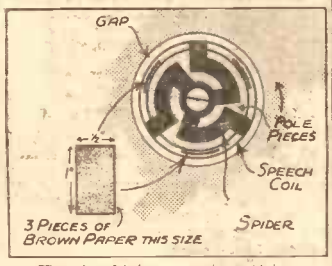
A simple but useful test.

breaking the contact, leave the leads *connected*. On listening through the 'phones, the result, if the winding is O.K., is *perfect silence*. If there is a break in the wire, a rushing and faint crackling noise will be heard, just the same as is heard in a set with a faulty transformer, only on a smaller scale. This test has never failed me.

CENTRING THE MOVING COIL.

THE speech coil of a moving-coil speaker sometimes develops a rubbing contact with the sides of the gap, causing distortion and loss of volume. The only remedy is re-centring, which, as a rule, is such a delicate operation that most constructors refer it to the makers for re-centring.

A simple way of doing this, however,

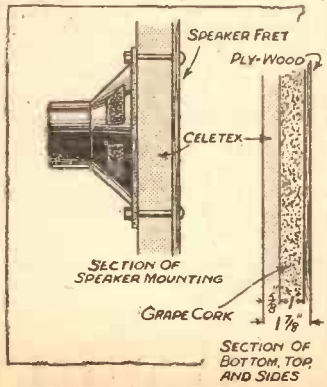


How to obtain accurate centring.

is to first loosen the screw that holds the centring spider in position. Three slips of brown paper are cut and placed at equal intervals between the inside of the speech coil and the polepiece of the magnet. This holds the coil clear whilst the centring spider is screwed up again. The slips of paper are then gently removed. An increase in volume and quality will be at once apparent.

A SPEAKER CABINET.

TO obtain true reproduction from a moving-coil speaker it is imperative that it be housed in a suitable cabinet. Herewith I describe a cabinet-construction scheme which I evolved after months of sustained effort and many failures.



Construction of non-resonant cabinet.

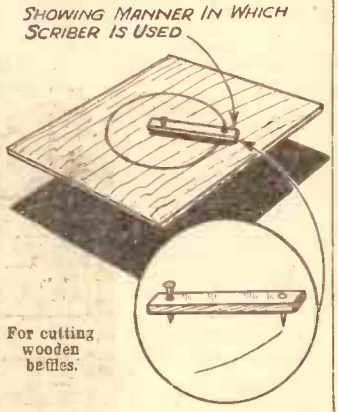
A frame of 1-in. square section wood is made to required design. Plywood is tacked to frame on outside. ¾-in. thick "Celetex" (or similar asbestos base sheeting) is fitted to inside of frame, *after having filled space between frame members with grape cork* (obtainable at any fruiterer's). The speaker is mounted on ¾ "Celetex" and to speaker fret. The rear of the cabinet is plywood, to which "Celetex" is tacked, suitable ventilation being provided for cabinet.

This may appear an expensive scheme, but it is not. My cabinet cost 4s. 6d. for material—and I "scrounged" nothing!

CUTTING BAFFLEBOARDS.

MANY readers have, no doubt, at some time or other, wished to cut a circle in a baffleboard on which to mount a speaker. As a keyhole saw is not always handy, the following is a simple method, and also very effective:

Obtain a piece of wood (about 1 in. x ½-in. section), drill a hole about ½ in. from one end, and large enough for a 2-in. nail to fit easily. Now bore another hole about the same size at a distance from the first equal to the radius of the circle you wish to cut out.

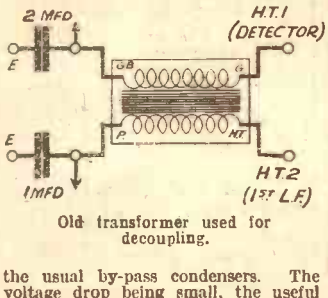


For cutting wooden baffles.

In the first hole insert the nail to act as a pivot, and in the second a very sharply-pointed bradawl, if this is handy (if not, sharpen up the point of another nail and use this in its place). Hold the first nail sharply embedded in the centre of board, and with the second mark round the circle, lightly at first and gradually getting heavier. When you have gone about half-way through, hammer the centre hard to give you a mark on the other side. Turn the board over, and again insert the centre nail, and continue as before. When you almost reach the other cut, the centre of the board will fall out if a light tap is given to it.

BATTERY SET DECOUPLING.

IN sets using small current for detector and first L.F. valve, instead of using wire resistances, use the secondary winding of an old-type L.F. transformer to decouple the detector stage and the primary for the first L.F. stage, with

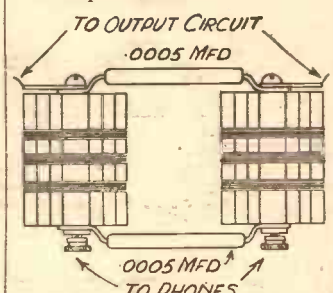


Old transformer used for decoupling.

the usual by-pass condensers. The voltage drop being small, the useful life (with reduced volume, of course) of the H.T. battery is greatly extended, and in practice the decoupling is excellent. Even coupling two run-down batteries in series has been found possible with perfect reception with this scheme, even on ultra-short waves. Do not earth the core if a terminal is provided.

AN H.F. FILTER.

MOST short-wave experimenters have at one time or another experienced that annoying phenomena known as "body-capacity" effects. These can often be overcome by the construction of a simple device known as an H.F. output filter.



The chokes are joined by condensers.

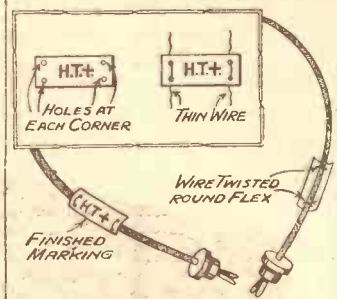
Obtain two pieces of ribbed ebonite former and two '0005-mfd. fixed condensers of the type made for suspending on wiring. With a triangular file nick three series of slots on each former, as shown on the diagram, and wind into the slots a total of some 150 turns of fine wire (old transformer wire will do excellently). The ends of the formers have screwed into them 4 B.A. screws for holding the two fixed condensers which are connected to the ends of the wires.

Connections externally to the 'phones and output stage can be made either to the screws which hold the condensers or to the soldering tags on the condensers.

This device will usually effect a cure even in the most stubborn cases of body capacity.

LABELLING BATTERY LEADS.

A GOOD way of marking battery leads is as follows: Get a piece of thin cardboard (a plain postcard will do nicely), cut into oblong pieces about



A scheme which prevents leads being muddled.

1 in. x ¾ in., mark the different voltages or battery markings on them and pierce two holes at each end. Thread a piece of thin wire through the two holes, then place on the battery lead and twist the wire tight behind and cut off any surplus wire; this will give neat, plain battery markings.

BEWARE HAIRS!

IF there is one thing more than another which spoils reception, it is a constant crackling sound as the dials are turned.

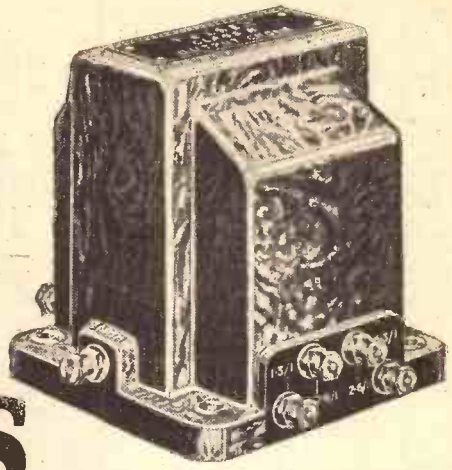
A receiver with this complaint of a chronic type was encountered lately. Its owner averred he had blown all the dust from the condenser vanes, and then thoroughly cleaned them with a pipe-cleaner. Still the trouble persisted.

It was eventually tracked down to a minute hair which was adhering to the fixed vanes, and brushing against the moving vanes as the latter were turned. It was not until the condenser was taken from the set and held up to the light that this trouble was unearthed.

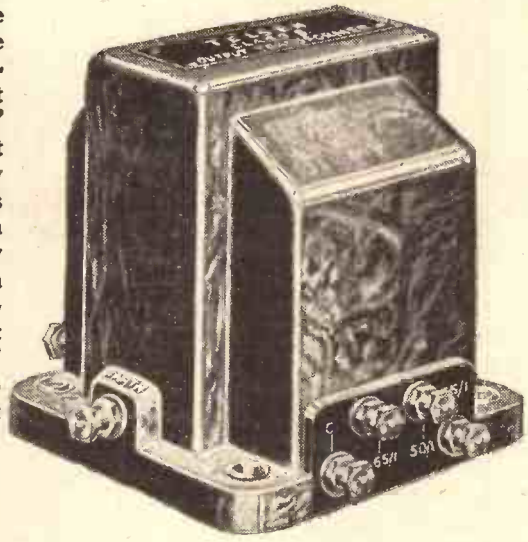
So mind your condenser doesn't sprout a hair!

With a short-wave set working close up to oscillation point a hair could be responsible for much trouble.

TELSEN 'Class B' COMPONENTS



THE use of the correct "Class B" valves alone is not enough to ensure perfect "Class B" amplification. You must also use the correct "Class B" components of whose perfect matching, and lasting efficiency you can be assured. That is why you should use Telsen "Class B" components. They are the outcome of long research and experiment by Telsen Technicians, representing the most enduringly perfect "Class B" components it is possible to produce. Be sure—and insist on Telsen.

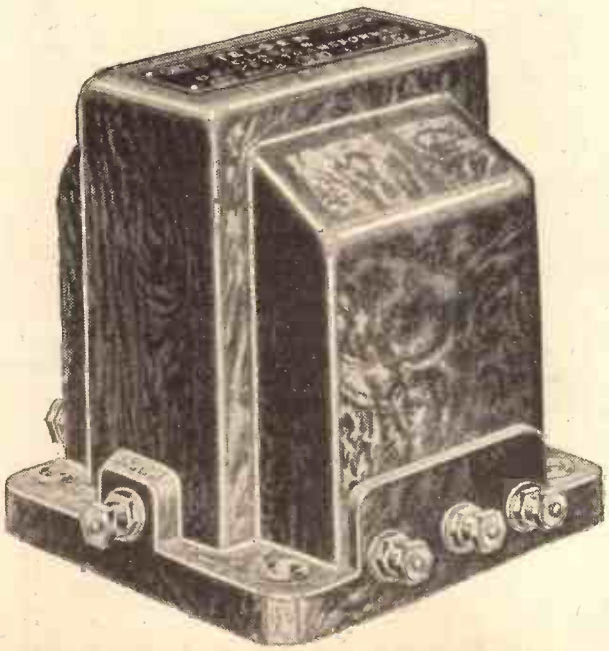


TELSEN "CLASS B" OUTPUT CHOKE

Provides ratios of 1–1, 1·3–1, 1·2–1, 2·6–1, for matching to any Moving Coil speaker having either a high resistance speech coil or a low resistance coil and input transformer. The low D.C. resistance of 220 ohms per half winding, and generous core section prevent distortion. The total inductance is 18 henries. **8/6**

TELSEN "CLASS B" OUTPUT TRANSFORMER

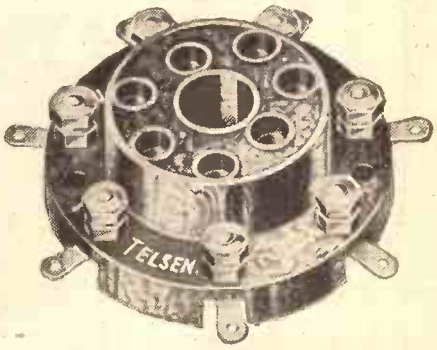
Provides ratios of 35–1, 50–1 and 65–1, ensuring correct matching to Moving Coil speakers having low resistance speech coils. Low primary resistance (200 ohms per half winding) and large core section. **8/6**



TELSEN "CLASS B" DRIVER TRANSFORMERS

Made in two ratios covering the requirements of all the "Class B" valves available at present. Supplied with comprehensive instructions.

RATIO (Overall)	*(Primary to half-secondary)*	Price
1–1	*2–1*	**8/6**
1·5–1	*3–1*	



TELSEN 7-PIN VALVE HOLDERS

Specially constructed to accommodate "Class B" valves. The contact sockets are extended in one piece to form the soldering tags, thus ensuring perfect connection. The terminals are numbered according to the standard R.M.A. system.

7-pin Solid Type - - - **1/6**
7-pin Anti-Microphonic Type - **1/9**

TELSEN FOR EVERYTHING IN RADIO

ANNOUNCEMENT OF THE TELSEN ELECTRIC CO., LTD., ASTON, BIRMINGHAM

Home-built radio that gets EUROPE-AMERICA-AUSTRALIA - all on the same set!

ULTRA SHORT

SHORT

MEDIUM

LONG WAVES

At last the day of All-World Radio has arrived, and you can build with your own hands the first receiver to give you not only England and Europe, but America and Australia direct. The Lissen All-Wave All-World "Skyscraper" 4 tunes from 12 to 2100 metres. It brings two complete new wavelength ranges within reach of the ordinary listener—stations and programmes which before he was never able to receive—Ultra Short and Short-Wave transmissions from the ends of the earth. And remember you get these stations through Double-Balanced Pentode Output giving brilliant reproduction on a Moving-Coil Speaker — as much power as a Mains Set from ordinary high-tension batteries.

FOUR WAVELENGTH RANGES INSTEAD OF TWO!

Lissen have made this All-Wave All-World Radio available to Home Constructors first, because it brings back the thrill of conquest to hear America and Australia *direct* on a set you have built yourself, it makes you an enthusiast to realise what a wonderful thing you have created!

When you see the Great Free Chart of the All-Wave All-World "Skyscraper" 4, which tells you how to build it and how to work it, and why it gives such marvellous results, you will agree at once that it will be wise of you to build for yourself rather than buy a factory-assembled receiver which cannot give you these new and intriguing short-wave stations. The FREE CHART simplifies everything; there are pictures of every part, with every wire numbered, every hole lettered, every terminal identified. YOU CAN'T GO WRONG! But get the Chart and see for yourself—then build the Lissen All-Wave All-World "Skyscraper" 4, the SET THAT SPANS THE WORLD!

COMPLETE WITH FOUR VALVES £5·12·6

DOUBLED BALANCED PENTODE OUTPUT AND MOVING COIL LOUDSPEAKER

The output stage of the All-Wave All-World "Skyscraper" 4 is Quiescent Push-Pull output at its best, incorporating TWO BALANCED LISSEN POWER PENTODE VALVES and giving you brilliant reproduction on a Moving-Coil Speaker. You get mains volume from this set, yet it works from ordinary high-tension batteries and is an economical set to run.

WITH WALNUT CABINET and MOVING COIL LOUDSPEAKER **£8·2·6**

POST COUPON for FREE CHART

LISSEN

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To
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Publicity Dept.,
ISLEWORTH
Please send me FREE copy of All-Wave All-World "Skyscraper" Chart.

Name.....

Address.....

Pop.535

BERLIN'S RADIO SHOW

A review of some of the main features and outstanding items of the Continent's greatest Wireless Exhibition.

By A. A. GULLILAND.

THE first Radio Exhibition in Germany took place in 1924, and very shortly German broadcasting will be celebrating the 10th birthday of its first official broadcasting station, Berlin Witzleben. The revolution through which Germany has just passed has brought about many changes, and none greater than in the realm of radio.

Not one of the leading pioneers of German broadcasting are in office or even present at this exhibition. Some of them, in fact, are confined in the concentration camp at Oranienburg, which the new director of German broadcasting, Mr. Hadamovsky, has ironically termed, "that summer holiday resort."

Television Progress.

The exhibition was the first under the National Socialist government, and it bore a totally different aspect from those held in former years. Competition among firms, as far as size and attractiveness of the stands were concerned, had been reduced to a minimum.

The main features of the exhibition on the technical side was television progress, and a very interesting historical show gave the visitor a comprehensive idea of the development of wireless.

Prevalence of "Shadow Tuning."

German radio sets show marked improvement over those of the last year. The superhet is in two forms—the 3-valve so-called "sport's model" and the de-luxe 5- or 6-valver, complete with automatic volume control, shadow tuning, etc. This de-luxe receiver sells at nearly £25, complete with valves, moving-coil loudspeaker, etc.

Shadow tuning, or some kind of electrical means of ascertaining when the given station is tuned to maximum perfection, is contained in all sets of this price. This type of receiver also incorporates a special knob to adjust the sensitivity of the set, making it possible to eliminate unwanted distant stations and at the same time most atmospherics.

Any station creating more than 10 millivolts per metre in the aerial can be received with these 5- or 6-valvers. Tuning is by one knob, and is usually effected with the volume control in the "off" position, the station being brought in only with the help of the shadow or other indicator.

The new valves, the Binode and the Hexode, are to be met with in all sets. A new power amplifier valve provides undistorted quality at full power. The three-tuned circuits 4-valve straight receiver has still many friends.

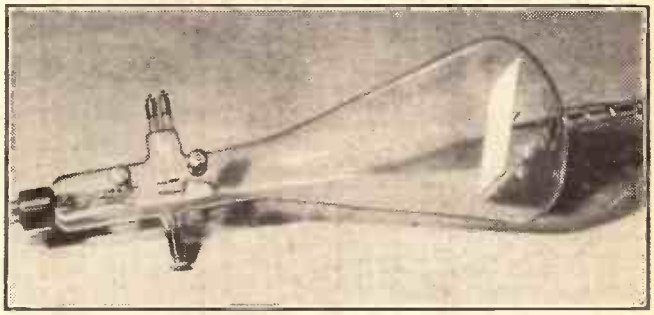
With the exception of the battery "Volksempfänger" (the "People's" set, approved by the government), there are very few battery receivers. Most German sets incorporate three wave bands this year: short, medium and long.

The historic part of the exhibition, together with the special stands arranged by the German Navy and the German Army, give the visitor a very complete idea of the uses of wireless in pre-broadcasting days. The German Air Ministry stand shows the very latest types of direction-finding apparatus for aeroplanes, together with a full-sized plane.

The German Post Office laboratories have, as in former years, concentrated their

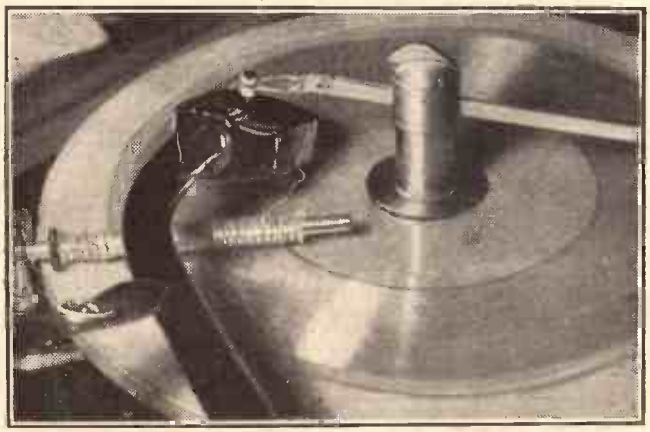
(*Continued on page 894.*)

CATHODE-RAY TELEVISION TUBE



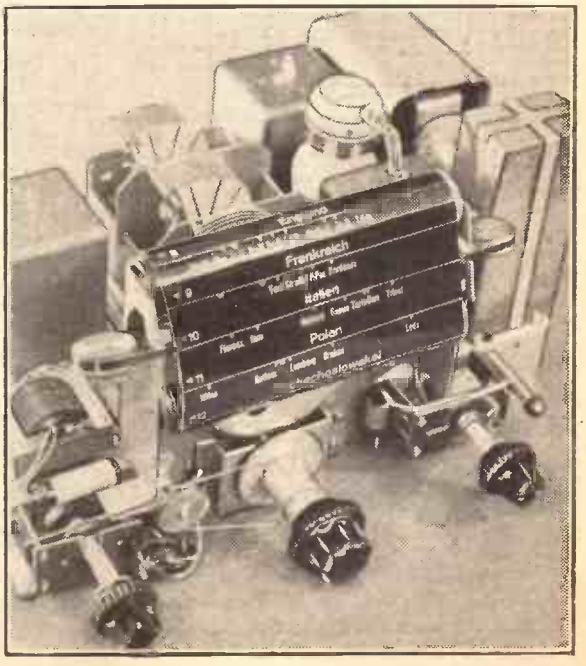
This new device for television reception is due to the famous inventor Manfred von Ardenne, one of Germany's foremost radio engineers.

SOLVING THE PROBLEM OF THE THREAD



One problem of home-recording is the disposal of the thread cut by the needle, and this ingenious device, shown by the Telefunken Co., solves it by winding the thread on to a revolving rod.

THE SENSATION OF THE SEASON



A novel tuning film which has taken the place of the usual illuminated dial has been styled the sensation of the Berlin Show this year.

THE FERRANTI SPEAKER AMPLIFIER

IT is one of the greatest attractions of "Class B" amplification that it can be added to practically any existing set. And now Ferranti have even further facilitated the addition.

They have done this by the production of an ingenious device known as the Ferranti Speaker Amplifier.

This comprises a first-class moving-coil loud-speaker of the permanent-magnet type, on which are neatly mounted special "Class B" driver and output transformers and a "Class B" valve holder.

The whole forms a most compact unit, and when mounted in a cabinet or on a baffle is no larger than an ordinary loudspeaker.

The connections to the set are few and simple, and adequate instructions for making them are provided.

And the results are most impressive. The power output of an average type of battery-operated set can be increased about seven times with very little increase of H.T. current consumption.

A complete "Class B" stage, including the valve is incorporated in this Ferranti speaker-amplifier unit.

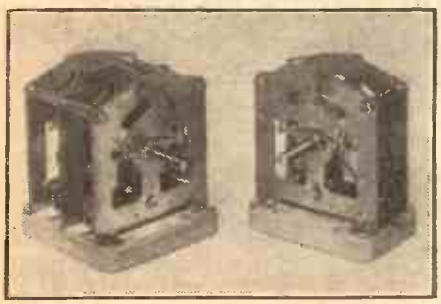
We tried this Ferranti Speaker Amplifier on three different receivers, and in each case it operated magnificently. Ferranti have certainly secured a mastery of this latest radio development, and that is hardly surprising!

The price of the Ferranti "Class B" Speaker Amplifier is four guineas, complete with a Ferranti "Class B" valve, type H.P.2. It can be purchased for £3 10s. without valve.

BRITISH RADIOPHONE CONDENSERS

British Radiophone are making great progress. Already famous for their ordinary gang and single types, they have now turned their attention seriously to the production of short-wave variables.

I have before me as I write samples of their two new types of these. One is a ·00025-mfd. single type,



These variable condensers, a two-gang on the left and single on the right, are specially designed for short-wave work and are a British Radiophone product.

and the other is a two-gang of similar general construction.

This latter is for unified-control superhets and for other such purposes. Also it is obvious it could be connected, if desired, as a highly efficient "series-gap" condenser.

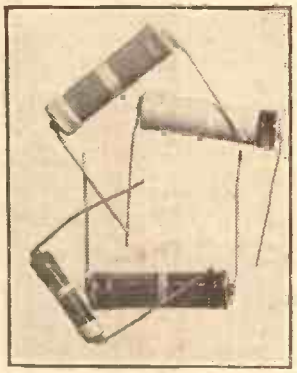
The design is in accordance with the very latest low-loss principles, and there is a negligible quantity of solid dielectric.

The vanes are of hard brass and the frame also is solidly and rigidly built.

A non-inductive pig-tail is run through the hollow spindle, and is kept at a tension in order to eliminate all but the necessary twisting motions.

The movement is very smooth—exceptionally so. In fact—and this is no doubt due to the provision of steel bearings.

Each condenser is provided with a substantial porcelain base, and is thus in line with the best "beam" technique.



The Telsen wire-end resistors seen here are available in ½- to 6-watt types, and with a very wide variety of resistance ratings.

I recommend these British Radiophone short-wave condensers. I should imagine that they will satisfy the requirements of the most fastidious of "fans."

TELSEN RESISTORS

In my opinion, the development of the small wire-end component should be encouraged. This form of construction is extremely convenient, especially to the experimenting constructor.

It makes it so easy to add odd resistances or condensers to a circuit. And, of course, resistances and condensers of this (wire end) form are particularly easy to wire into a new set.

(It does seem so unnecessary, in many cases, to anchor a component weighing but a fraction of an ounce to the baseboard with screws, doesn't it?)

Naturally, that enterprising concern, Telsen, were not likely to overlook the attractions of the wire end. I have already reviewed the Telsen Small Tubular Condensers which follow that design, and it is now my pleasure to introduce to you the Telsen Resistors with wired ends.

These are available in an extremely wide range of values. With a power rating of ½ and 1 watt there are no less than twelve values from 250 to 500,000 ohms each at the extraordinarily reasonable price of 1s.

And there are ten from 250 to 100,000 ohms in the 2-watt class, these retailing at 2s. each.

Robust construction is a feature of this Heayberd mains transformer. It is designed for the Westinghouse H.T.12 rectifier, and has an L.T. winding.

But even if this very comprehensive selection does not fulfil all requirements, there are still the 3- and 6-watt types which can be supplied on demand.

We have already used numerous of the Telsen wire-end resistors for many different purposes, and have found them to be accurately rated and thoroughly reliable in all respects.

NEW HEAYBERD TRANSFORMER

Messrs. Heayberd have been very quick, in their usual enterprising manner, to produce a transformer especially suitable for the new H.T.12 Westinghouse Metal Rectifier.

This, as readers probably know, is a voltage-doubling type giving 30 m/a at 200 volts—an extremely popular size.

The Heayberd transformer, which is styled the W.41, has H.T. tappings of 110 and 140 volts, and an L.T. 4-volt 4-ampere supply for A.C. valves. The retail price is 22s. 6d.

It is a very well-made component, and is imbued with that comforting substantialness to which undoubtedly Heayberd largely owe their success.

It is also very efficient in operation, the voltage control—that is, its freedom from marked voltage variations at differing loads—being particularly good.

A NEW HIGH-VOLTAGE OUTPUT VALVE

Details of a Mullard valve with an output around seven watts and a four-volt filament.

SOME of the technical terms employed in radio, though readily understood by engineers, are very apt to be misconstrued by listeners. A case in point is the term "maximum undistorted output" as applied to a valve. When it is stated that an actual output of about a quarter of a watt will give sufficient domestic volume listeners may be pardoned it they wonder why modern mains sets employ output valves capable of giving two or three watts undistorted power, or even more.

Effect of Loud Passages.

The explanation is, of course, that while over a very large proportion of programme time a certain programme strength is radiated, this strength is greatly increased (perhaps to five or six times the average) when specially loud passages occur in the items being broadcast. In other words, while the radio-frequency power transmitted from a station is constant, the audio-frequency modulation varies in accordance with the programme.

It is therefore important that the output valve in a radio set should be able to handle these extra-loud passages without introducing distortion.

For all normal purposes the usual triode or pentode output valves provide ample "overload capacity" for domestic reception; but those listeners who require super-excellent quality, combined, perhaps, with rather more volume than that given by the average set, can use in the output stage of an A.C. mains receiver or radiogram one of the larger valves giving maximum undistorted outputs of 5 watts and upwards. These valves, it should be noted, require anode voltages ranging from 400 to 500 volts.

A popular valve of this type was the Mullard D.O.25, which has been a firm favourite with advanced amateurs. This valve, however, requires a low-tension supply at 6 volts, which might be inconvenient in

(*Continued on page* 893.)

There is no longer any need to feel discouraged when you are faced with the problem of working out the effective values of resistances in parallel. The simple graphical method described by our contributor, S. R. Raffan, B.Sc., does away with troublesome calculations and enables the correct answer to be obtained in a moment.

MOST constructors at some time or the other have found themselves stumped for an odd value of a resistance, and have resorted to the use of two or more in series or parallel. With resistances in series it is quite straightforward to work out their effective value, for in this case it is only necessary to add the separate resistances together and the answer is the value we require. Supposing, for example, that a resistance of 1,000 ohms is in series with one of 200 ohms, then the value of the total resistance will be 1,200 ohms.

Working Backwards.

It does not always happen, however, that the exact sizes needed are ready to hand, and in such cases expense can often be saved by using the parallel arrangement. In this case, it is not so easy to work out the effective value, for if two resistances having values r_1 and r_2 ohms are in parallel, then if they are equivalent to a resistance of R ohms, we have to solve the equation $\frac{1}{R} = \frac{1}{r_1} + \frac{1}{r_2}$.

To see how this works out in practice, take the 1,000 ohms and the 200 ohms resistances again, but this time consider them in parallel. If their value is R ohms, then $\frac{1}{R} = \frac{1}{1,000} + \frac{1}{200} = \frac{6}{1,000}$; $R = \frac{1,000}{6} =$ 167 ohms. This is quite easy; but if we try working backwards to find out two resistances which in parallel will give some particular value we need, then the problem is more complicated, and it will usually be necessary to make several attempts before the right value is arrived at.

Dispensing with Calculations.

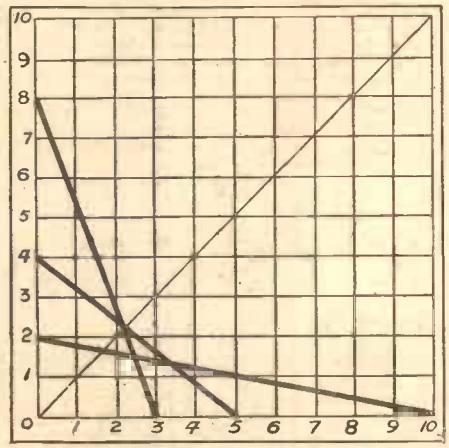
A much simpler way to solve a problem of this sort is to use as weapons a piece of squared graph paper and a ruler, without the need of calculation of any sort. Moreover, there is no necessity for any particular chart to be drawn out on the paper.

Special ready reckoners have a habit of being missing when they are most wanted, but you can usually manage to find a piece of squared paper or, at the worst, you can draw out a few squares yourself in a minute or two. On the squared paper three lines should be drawn, two at right angles and one half way between them—that is, the 45° line.

These three lines should now be marked off in units. In the figure they are shown marked off from 1 to 10. These units can be taken to represent 1 ohm each or 10 ohms each, or say 10,000 ohms, according to the particular problem in hand. Let us first of all take each square to represent 100 ohms, and see how to find the answer to the problem we have just worked out by calculation.

The problem is to find the value of a 1,000 ohms resistance and a 200 ohms resistance in parallel. On the scale we are

PERFECTLY SIMPLE.



A piece of squared graph paper and a ruler are all that are required to find the desired resistance value.

taking these will be represented by 10 squares and 2 squares. Lay the ruler across the point 10 on one of the right-angle lines and the point 2 on the other right-angle line.

A line is drawn in on the figure to show this position of the ruler. Now notice the point at which this line cuts the 45° line—the point 1·7. Now we know that 1·7 units represent 170 ohms, which is near enough to the answer we got by calculation, and so this point on the 45° lines actually shows the value of the resistances in parallel. What could be simpler?

And now let us tackle a problem that is not so easy to solve by calculation. Assume that a resistance of 2,200 ohms is needed (for an anode-feed resistance, for example) and that resistances of 1,000 ohms, 2,000 ohms and so on, up to 8,000 ohms, are available, and that the resistance of 2,000 ohms is not sufficiently close for our purpose.

What two resistances, when in parallel, will give the nearest value to 2,200 ohms? Take each square to represent 1,000 ohms, and mark off the point 2·2 on the 45° line. We know that the ruler must pass through this point, so swing it round and notice the different pairs of resistances which will give about this value.

It will not take very long to see that 3 and 8 units or 4 and 5 units are two pairs which give a value very close to the one we require. The values that these represent are, of course, 3,000 with 8,000 or 4,000 with 5,000 ohms. To reassure ourselves that these values are the right ones, let us check the results by calculation. For 3,000 and 8,000,

$$\frac{1}{R} = \frac{1}{3,000} + \frac{1}{8,000} = \frac{11}{24,000};$$

$$R = \frac{24,000}{11} = 2,182 \text{ ohms};$$

while for 4,000 and 5,000,

$$\frac{1}{R} = \frac{1}{4,000} + \frac{1}{5,000} = \frac{9}{20,000};$$

$$R = \frac{20,000}{9} = 2,222 \text{ ohms}:$$

both of which are quite close. These two positions are again drawn in on the figure. The accuracy with which the values can be read off will, of course, depend on how finely divided is the squared paper used, and the more divisions there are to each square the better it is. With 10 divisions to the square, for example, the readings would be more accurate than could be obtained with the 2 divisions shown in the figure.

"WIRELESS" 500 YEARS AGO.

WIRELESS as an idea was suggested over five hundred years ago. Two men were discussing the merits of a piece of mineral substance. One suggested that, with this and the aid of a needle, persons might communicate with each other, although separated by prison walls. Little did these gentlemen know to what vast extent their idea would eventually be developed.

About the year 1880 the Skerries Lighthouse communicated with the mainland by a "wireless" system. Both stations had some sort of aerial erected on telegraph poles. This really consisted of miles of telephone lines which ran parallel to each other. The signals were received by induction.

Then there were some ships which had huge plates fitted to each side of their hulls. Through these, and using the water as a conductor, they transmitted messages to shore stations.

Flag-wagging, semaphore, beacons, drums and even whistling, shouting and yodelling are all "wireless" means of communication, of course. The heliograph can also come under this category by which messages can be read over fifty miles.

The MOTHER of the MICROPHONE

By J. F. STIRLING.

An interesting explanation of how the carbon microphone is arranged. The article also tells you how an experimental model may be made with easily obtainable materials to demonstrate the working of the principle.

AS, no doubt, you will have guessed from the title, these columns have nothing at all to do with the technics of the up-to-date super-sensitive and non-distorting microphones which are employed by the B.B.C. and other broadcasting organisations the world over.

I want to deal solely with the old *carbon microphone*, the microphone which was in use when broadcasting began: the microphone which you and I make use of from time to time during the course of our various experimental endeavours in radio and electrical work.

It is Really a Relay.

The carbon microphone, like any other type of microphone, is really a relay which is operated by the voice. That is to say, it is a device which passes varying amounts of current through an electrical circuit, the flow of current being very minutely controlled by the voice, or by whatever type of sound waves are allowed to fall on to the instrument.

However, what I want to draw your attention to is the fact that the true nature of the microphone's action is still more or less a mystery.

Any—or almost any—loose contact can be made to acquire microphonic properties. But by far the best microphonic material is carbon, and it was with this material that Professor Hughes, the originator of the microphone, conducted his new classical pioneer experiments in the seventies of the last century.

Making One at Home.

You can readily make one of Hughes' simple microphones for yourself. The photo depicts the arrangement. A battery carbon is fixed by means of wax, or some other adhesive material, to a hollow box which rests upon a piece of spongy rubber. A small carbon rod makes very light contact with the fixed rod, the degree of contact being adjusted, so far as possible, by means of the little coil of wire above it.

The two carbon rods are connected in series with a flashlamp battery and with the primary winding of a telephone transformer. (The transformer is not *absolutely* necessary, but much better results are obtained with it.) A pair of headphones are connected to the secondary of the transformer, thus completing the transmitting-receiving circuit.

It will take some patience to get the right adjustment of the smaller carbon rod, but once you have obtained this the improvised instrument will function as well as any post-office telephone transmitter. Speak to it, sing to it, play a musical instrument in front of it. The sounds will all be transmitted to the distant receiver.

RECREATING AN HISTORICAL INVENTION

A working version of the original Hughes' carbon microphone, constructed from materials possessed by every radio amateur, is shown in the centre picture.

Below is a portrait of the great American inventor, Thomas A. Edison, who utilised the carbon microphone principle in his strikingly successful early telephones.

Naturally, this type of microphone is of no practical value, for the slightest disturbance will send it out of adjustment. Hence it is that the various carbon microphones which are so well known to experimenters at the present day have been evolved from this original type of microphone. In all cases the working principle is the same—that of the variation of contact resistance between carbon rods, grains or granules.

A Remarkable Effect.

Now, why does carbon alter its electrical resistance so extraordinarily under the influence of very small variations of pressure? It is really a question which has never been satisfactorily answered. Indeed, if this remarkable effect were thoroughly understood it might be possible to develop a material many times more sensitive than carbon, a microphonic material which, by detecting sound impulses totally inaudible to our unaided ears, would enable a real "ultra-microphone" to be constructed.

It is very strange that a solid mass of material should alter its electrical resistance under the influence of sound-wave pressure. Probably, indeed, the microphonic effect is not due to any peculiarity existing in the carbon atoms or molecules. Rather we may look for the explanation of the microphonic effect in the minute films of air which intervene between the contacting surfaces of the carbon microphone.

Formation of Small Arcs.

It has been supposed, in explanation of the carbon microphone's action, that small electrical arcs (not luminous ones, even in the dark) are formed between the majority of the carbon grains in a microphone, and that the effect of the impinging sound vibrations is to alter the length of these minute arcs and, consequently, to vary their resistance. Hence, in these circumstances, the resistance of the system of minute, non-luminous carbon arcs will vary as a whole in fairly accurate sympathy with the frequencies of the sound waves.

This being the case, it will follow that all conducting materials are microphonic; and this is correct, although of all known materials carbon is the only one which possesses microphonic properties capable of practical use. Of all the elements carbon is, in many aspects, one of the most mysterious, and the microphone magic which it has carried out since the time of Hughes, the discoverer of its microphonic properties, in no way lessens its reputation in this respect.

The P.W. "VALVONIUM"

ABSOLUTELY NOVEL

By G. V. DOWDING, Associate, I.E.E.

Here is something for the constructor which is entirely unique. Employing one valve and a few ordinary wireless components, it is a complete musical instrument of immense potentialities. Read our Technical Editor's description of this remarkable and fascinating device.

NEARLY everyone has the urge to "make a tune." In some cases it may be only a tiny urge, and it might even be stifled under a load of bitter annoyance and resentment because so many others "make tunes" of a disagreeable kind.

But the urge is there, and is nearly always given its expression in the bathroom. Why is it that bathrooms have this effect? I suppose it is because, being comparatively small and nicely resonant, they bring out one's voice or whistle to the best effect (at least, as judged by one's own ears!).

There would be millions more pianos and violins and saxophones played in the house if (1) they were not so expensive to buy and (2) they didn't take such a darn long time and so much practice to play.

The Ambitions of a Beethoven.

No, it's not the radio that's killing home-made music. It may have killed the domestic Sunday-evening concert, and good riddance to that, I say. But not many of us have enough money or time these days to equip ourselves with "baby grands" and the skill with which to play them.

If there is a piano in the house already there will be plenty of people to tap it with one finger in the hope of being able to wring a tune out of it (when they think there is nobody else about to hear!).

But if one-finger execution were recognised as a proper and dignified method of playing, that wretched piano would be hammered at night and day by all who could get near it. Unhappily it isn't. And in any case it is not a fully satisfying technique.

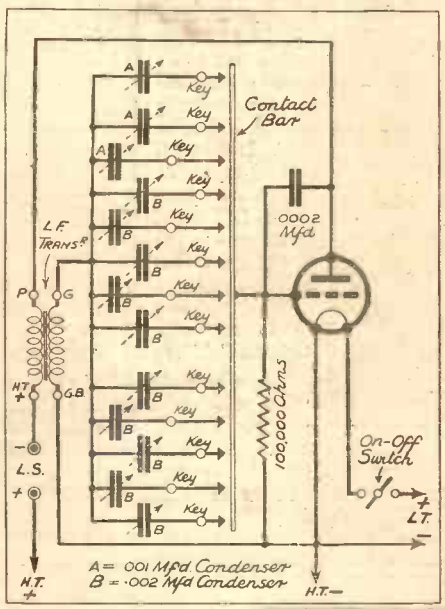
Now, I myself have got the ambitions of a Beethoven, although my skill at the keyboard and powers of composition are less than the dust on his most carelessly disposed manuscripts. Further, I've had the pleasure of studying the reactions of a relation who has developed as something of a one-finger expert.

So I can sympathise with all whose music-making desires are frustrated by lack of opportunity and skill, and it was inevitable that I should turn to wireless to see if something could be done about it.

Anyone Can Play It.

And after considerable thought and experiment I discovered a complete solution to the problem. You now have it before you in the form of the P.W. "Valvonium," an instrument that costs very little, which anyone can play at once after hardly any practice and which, moreover, has no overshadowing, highly-developed technique to humiliate those who haven't devoted a lifetime to its mastery.

Nevertheless, it is not an electronic version of a one-string fiddle or a "musical saw." I'd never inflict *that* on the "P.B.P."



CONDENSERS THAT STRIKE A NEW NOTE!

The principle on which the "Valvonium" works is that of the oscillating valve, and the note emitted depends upon the capacity in circuit. The amount of this capacity is controlled by the operating keys, and when the condensers have been adjusted by anyone, a range of notes are available at the keyboard. The instrument is thus a kind of electrical organ, from which extremely pleasing tunes can be obtained.

"P.W." AGAIN FIRST

Of all the torturing sounds manufactured by man I give the palm, biscuit and medal to those mournful devices.

There is no other way to play them easily except to go wailing from note to note like a tuned ghost.

No, the "Valvonium" has got keys which you tap just like you tap the keys of a piano. In fact, you "strike a note" with a clean, healthy snap, although you can rest on any one note as long as you like.

The tone is not a thin, clear, piping tone without "body." There is plenty of colourative individuality, rather like the flute stop of a cinema organ.

An Instrument to be Proud Of.

And I assure you that you get much more "change from it" than you do from single-note piano-playing. Also, of course, you can vary the volume within extremely wide limits, so that you "swell" from a whispering murmur to a stentorian roar, and there's great satisfaction in that.

Indeed, when, next week, I describe the manipulation of this apparently so-simple instrument you will appreciate that, although only one finger is required to play it, you need not be apologetic to your friends on that account. The "Valvonium" compensates entirely for that deficiency.

(*Continued on next page.*)

THE "P.W." "VALVONIUM."

(Continued from previous page.)

All who have heard my original model in operation have been surprised. Knowing what it purported to be, they came to scoff and left with profuse expressions of admiration.

As you will see from the theoretical diagram, the circuit is remarkably simple. Just one valve which is made to oscillate at low frequencies. (The colouration is supplied by harmonics due both to circuital circumstances and to the reproducer—of which more next week.)

The note can be as sharp as a piano note with good damping or as sustained as an organ note.

About the Components.

But be careful with those preset condensers. Don't think any old make will serve. The "Valvonium" cannot fail to work if you build it as directed; but if those presets aren't up to scratch you'll not find it possible to tune to the right notes. A batch of one make I had were nearly all 50 per cent out in regard to their capacities!

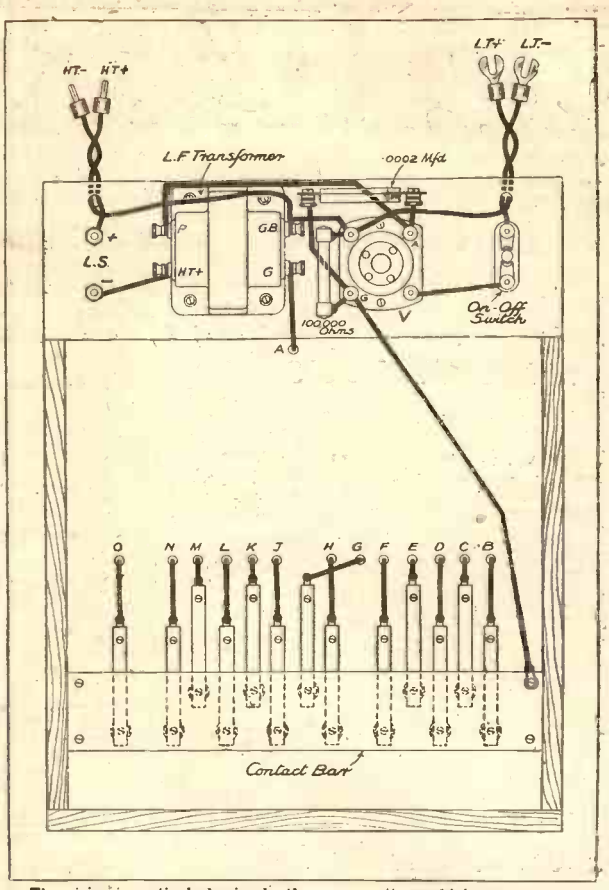
As for the L.F. transformer, you can *try* any make. It is not by any means a critical component.

Valve holder, grid leak and condenser and a switch complete the shopping list, except for odds and ends. And I will insert, rather out of their place, the facts that from 60- to 100-volts H.T. is needed and a 2-volt L.T., and that your radio L.T. and H.T., and even one of its valves and its loudspeaker, can all be used if you don't feel inclined to invest in an all-in "Valvonium" kit.

The whole of the body of the "Valvonium" is made of $\frac{3}{8}$-in. plywood. And it is easy to make, too. Elementary carpentry, in fact. All the measurements are clearly shown in the diagrams.

The making of this body or frame and its lid and the placing of the components are all so well illustrated that I need not waste space in describing them in words. You can supply the lid with small hinges if you like, though, as it is not likely you'll ever have to retune, it can be held in place with screws.

The little keys should be made from $\frac{3}{8}$-in. dowel rod in either beech or birch. You can buy exactly this size all ready for use for a few pence



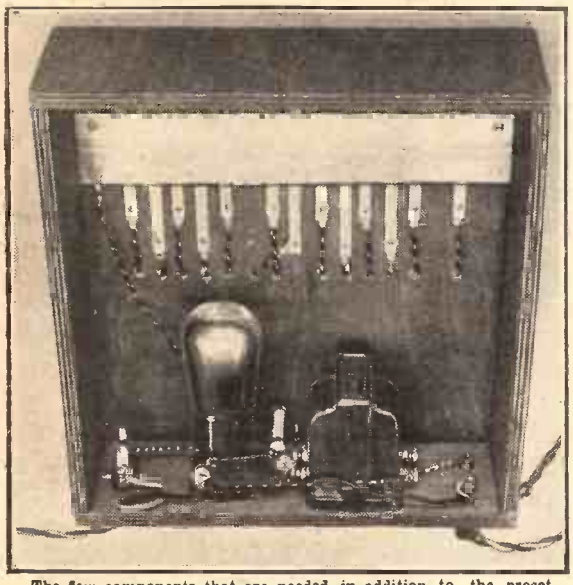
The wiring is particularly simple, those connections which pass through the holes in the keyboard going to the various preset condensers. These leads can be easily identified by the lettering, which corresponds with that on the diagram on page 879.

Each key is $\frac{5}{8}$ in. long. The holes for them are $\frac{7}{16}$ in. These are spaced by exactly 1 in., and the line of the back row is $\frac{3}{4}$ in. behind the line of the front row.

You will note that a blank is left between the second and third ones. You need not make a hole there if you don't want to alter the scale from "C" to "F." I'll discuss that point next week.

(Continued on page 879.)

UNDERNEATH THE KEYBOARD

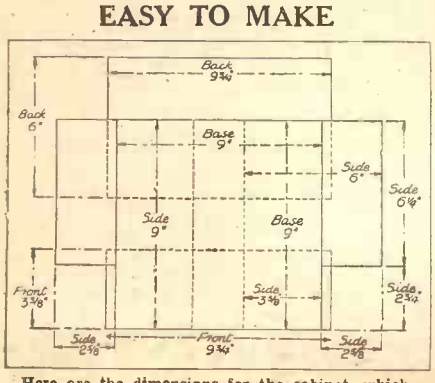


The few components that are needed, in addition to the preset condensers, are arranged in the bottom of the cabinet, as shown.

The pitch of the L.F. oscillation is varied by switching in different capacities. These capacities are supplied by preset condensers, and it should be mentioned that tuning is extremely easy.

There isn't a sustained note that laboriously switches up and down the scale. All is silence until you tap a key, and then the particular note is emitted for just as long as the key is kept down, for it is only then that the circuit is completed, as you can see.

EASY TO MAKE



Here are the dimensions for the cabinet, which, as can be seen, presents no constructional difficulties whatever.

EVERYTHING THAT YOU WILL NEED

Component.	Make used by Designer.	Alternative makes of suitable specification recommended by Designer.
1 L.F. transformer	Telsen "Ace"	Varley, Lissen R.I.
1 4-pin valve holder	Benjamin "Vibroldder"	W.B., Telsen, Ferranti, Lissen, Benjamin
1 ·0002-mfd. fixed condenser	Dubilier 670	—
1 100,000-ohm resistance with terminals or wire ends	Dubilier	Graham Farish
10 ·002-mfd. max. preset condensers	Polar	—
3 ·001-mfd. max. preset condensers	Polar	—
1 two-point on/off switch	Lissen	Telsen, Bulgin, W.B., Goltone
10 ft. connecting wire	Radiophone "push-Back"	—
9" hardwood dowel rod, $\frac{3}{8}$-in. diameter	(See text)	
3 ft. phosphor bronze $\frac{1}{4}$-in. strip, ·012-in. thick	(See text)	
1 9-in. length strip brass, $1\frac{1}{2}$ in. by $\frac{1}{16}$ in. thick	(See text)	
Cabinet	(See text)	
Screws, flex, etc.	Peto-Scott	

OSCILLATING VALVE.—Cossor 220P.A., Mullard P.M.2A, Mazda P.220, Marconi L.P.2, Osram L.P.2, Eta B.X.604, Hivac P.220.

BATTERIES.—H.T. 99 or 108 volts: Pertrix, Ever Ready, Lissen, Drydex, Ediswan, Marconiphone, Siemens, etc. L.T. 2 volts: Ediswan, Exide, Oldham, Block, Lissen, Pertrix, etc.

LOUDSPEAKER.—Atlas, Amplion, W.B., Magnavox, Blue Spot, Celestion, R. & A., Ferranti, Marconiphone, Rola, H.M.V., Epoch, etc.

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CONTAINS 1 Q.P.P. Transformer, Q.P.P. Output Choke, 4 Non-Inductive Resistances, 1 Potentiometer, 2 Mansbridge Condensers, 2 Valve Holders, 1 Tone-Compensating Condenser, 1 H.F. Choke, G.B. Plugs, Wires, Screws, Flex, etc.

Cash or C.O.D. **32/6** or 7 monthly payments of 5/-.

With FULL SIZE diagrams and constructional notes.

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TELSEN 325 STAR KIT, less Valves and Cabinet. Cash or C.O.D. Carriage Paid, £1/19/6. Balance in 7 monthly payments of 5/3. — Send 5/3 only

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TELSEN D.C. MAINS H.T. UNIT W.348, with 3 tappings, each adjustable for High, Med. and Low voltages. Output, 28 m/a at 150 volts. Cash or C.O.D. Carriage Paid, £1/15/0. Balance in 6 monthly payments of 5/6. — Send 5/6 only

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"KIT A" Parts as detailed below, less Valve. Cash or C.O.D. Carriage Paid £2/15/0. — Author's Kit of First Specified — YOURS FOR 5/- and 11 monthly payments of 5/-

"CLASS B" Valve if required add 14/- to Cash Price or 1/4 to each monthly payment.

These are the Parts the Author Used

	£	s.	d.
1 PETO-SCOTT "Class B" Permanent Magnet Moving-Coil Speaker, with wooden chassis	1	6	0
1 LISSEN "Class B" Input Transformer		12	6
1 TELSEN "Class B" Output Choke		8	6
1 W.B. Seven-pin Valve Holder		1	6
1 DUBILIER 1-or-mfd. Fixed Condenser No. 670		2	0
1 GRAHAM FARISH Ohmite Resistance, 10,000 ohms		1	6
1 BULGIN Q.M.B. Snap Switch		1	6
PETO-SCOTT Connecting Wire, Screws, Flex, etc.		1	6
KIT "A" Cash or C.O.D.	£2	15	0

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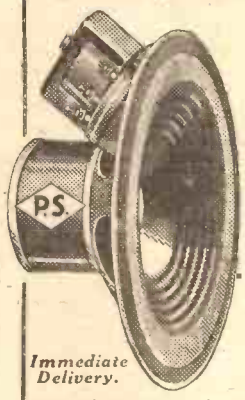

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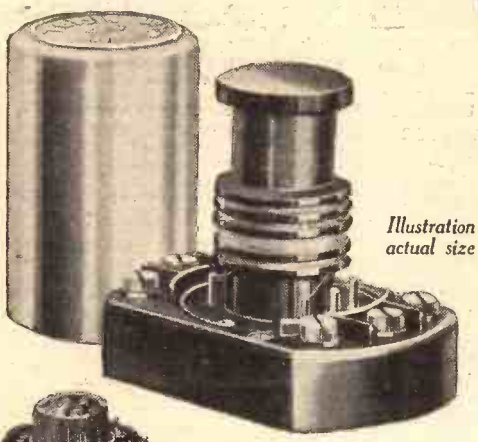


Illustration actual size

At the new reduced prices, the wonderful Telsen range of components represents more than ever radio's finest value. Whatever your coil requirements, be sure and insist on Telsen for lasting efficiency at the lowest cost consistent with quality.

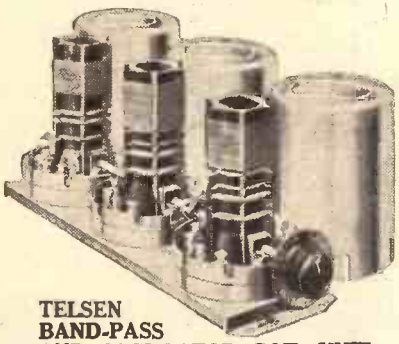
TELSEN IRON-CORED SCREENED COILS

The result of extensive research, these Coils employ an iron-dust core, achieving greatly reduced size, with considerably higher efficiency than that of the majority of air-cored coils. Magnification and selectivity are correspondingly improved, the metal screening also preventing inter-action. For use either as aerial tuning coils or H.F. transformers, a reaction winding being included.
They do *not* incorporate switching (since incorporated switching has proved to be much less efficient than a well-designed external switch, in addition to increasing the size, and restricting the symmetrical arrangement of controls, and consequently take the fullest advantage of *all* the benefits that the "Iron-Cored" principle provides.

		Price
No. W.349	Single Coil	8/6
No. W.422	Twin Matched Coils	17/-
No. W.423	Triple Matched Coils	25/6

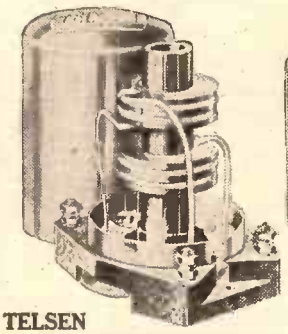
TELSEN DUAL-RANGE AERIAL COIL.

Incorporates a variable selectivity device, making the coil suitable for widely varying reception conditions. This adjustment also acts as an excellent volume control, and is equally effective on long and short waves. The wave-band change is effected by means of a three-point switch and a reaction winding is included.
Price 5/6



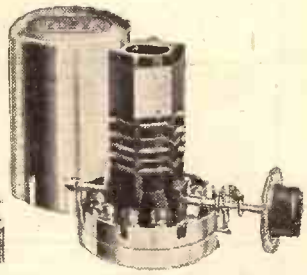
TELSEN BAND-PASS AND OSCILLATOR COIL UNIT

Comprises the Band-Pass Coils and Oscillator Coil combined into a single compact unit. All wave change switches are ganged, with single knob control. Ideal for any Superheterodyne circuit.
Price 21/6



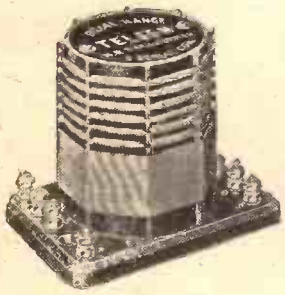
TELSEN INTERMEDIATE FREQUENCY TRANSFORMER COIL

Consists of two tuned circuits comprising a Band-Pass intermediate frequency filter tuned to 110 kc. by two pre-set balancing condensers. Adjustable for different values of stray capacities, with variable filter coupling. Price 7/6



TELSEN SCREENED TUNING COILS

With separate coupling coils for medium and long waves. Highly suitable for use as aerial coils or as anode coils following a screened grid valve, giving selectivity equal to that of a well-designed band-pass filter. Price 7/-
Twin Matched 14/6
Triple Matched 21/6



TELSEN H.F. TRANSFORMER COIL

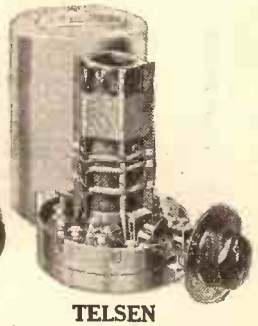
May be used for H.F. amplification with Screened Grid Valve, either as an H.F. Transformer, or, alternatively as a tuned grid or tuned anode coil. It also makes a highly efficient Aerial Coil where the adjustable selectivity feature is not required. Price 4/6

TELSEN SUPER-HET. COILS (TYPE No. S 330)

For Superhets which do not employ band-pass tuning in their pre-detector H.F. stages. Mechanical construction and wave-change switch assembly almost identical with standard Telsen Screened Coils .. .. .. Price 21/6

TELSEN BAND-PASS COIL UNIT

Comprises two accurately matched Screened Band-Pass Coils, on a single rigid plinth base. The coils are independent of each other and can be wired for any of the three types of Band-Pass Filter to give exceptional quality with selectivity. Price .. 14/6



TELSEN OSCILLATOR COIL

Particularly suited to Superheterodyne circuits in conjunction with the Telsen Band-Pass Coils. Operates at a frequency separation of 110 kilocycles from the Band-Pass tuning range. Price .. 7/6

TELSEN FOR EVERYTHING IN RADIO.

ANNOUNCEMENT OF THE TELSEN ELECTRIC CO., LTD.. ASTON, BIRMINGHAM

THE "P.W." "VALVONIUM"

(Continued from page 876.)

The contact bar comprises a piece of $\frac{1}{16}$-in. brass measuring $1\frac{1}{2}$ in. by 9 in. It is raised $\frac{1}{4}$ in. by means of blocks of wood at each end.

The key-springs can be of spring brass. I used ·012-in. thick phosphor bronze. It is harder to work, but it is infinitely better, and I strongly advise you to use it.

Arrangement of the Key-Springs.

Each spring measures $2\frac{1}{2}$ by $\frac{1}{4}$ in., and it is screwed to its key-peg at one end and secured to the baseboard at the other by $\frac{1}{4}$-in. No. 2 round-headed brass screws.

The circuit connection is best made with each key-spring by means of a soldering tag. The key-spring must lie flat against the wood so that the head of the screw which holds the peg well clears the contact bar. The note is played by these two being made to touch.

A little care is needed in fixing these key-springs and pegs, because the latter must ride in their holes easily and without restraint. You should be able to depress them with a light touch, and the moment pressure is removed they should spring back to their normal positions.

ALL READY TO PLAY.

As the front keys correspond with the white notes on the piano and back ones with the black, you can, if you like, enamel them in appropriate tints.

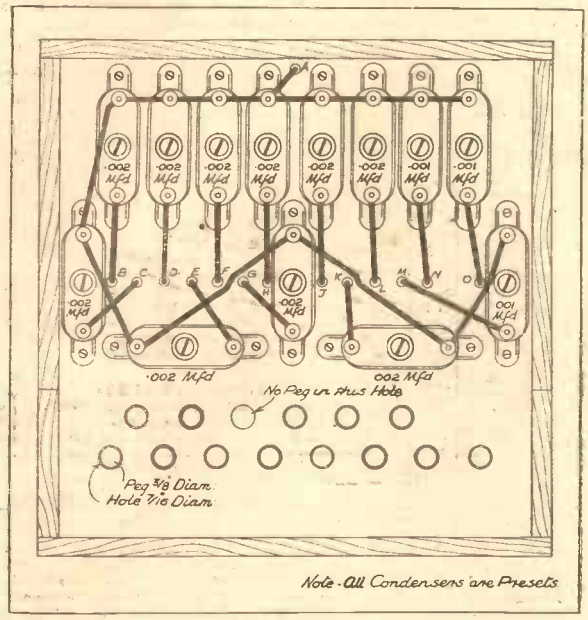
Simple Wiring.

Well, I don't think there is anything more to say about the construction of the "Valvonium," for the wiring is simplicity itself and is clearly shown in the illustrations.

But there is a great deal to be said about the playing of the instrument, and that is what I am eager to get to, for it is full of fascinating possibilities.

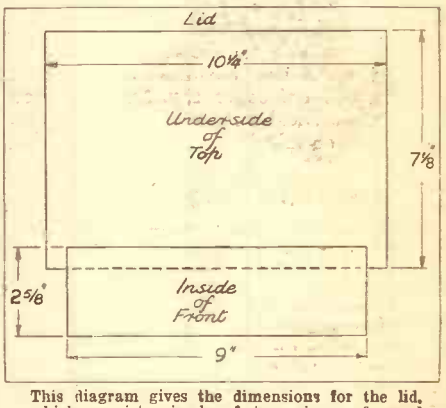
However, I fear I shall have to leave that until next week, when I shall explain, among other things, how the note range may be extended.

PRESET CONDENSER CONNECTIONS



How the presets are wired. It will be observed that the lead A is joined to one terminal of each condenser, and also to G on the L.F. transformer (see diagram on page 876).

THE LID IN PLAN



This diagram gives the dimensions for the lid, which consists simply of two pieces of wood hinged at the back.

CATHODE-RAY TELEVISION

Notes on an interesting and authoritative book which every experimenter should read.

THE cathode-ray tube is still a comparative newcomer, and its use in radio research and in television is still in its infancy. That being the case, all interested in this marvellous valve are naturally anxious to collate all the information they can on the subject, whether or not they wish to apply the knowledge to cathode-ray oscillographs or to the use of the tube for the reception of television.

So far not very much has been written on the subject, and text books are few, so that the arrival of an official handbook on the subject, issued by H.M. Stationery Office, will be welcomed by all radio investigators.

The book retails at ten shillings, and contains nearly 300 pages of the most interesting data on research work carried out on, and with the cathode-ray tube.

Data of Great Value.

Entitled "Applications of the Cathode-Ray Oscillograph in Radio Research," the book is written by R. A. Watson Watt, Superintendent of the Radio Research Station at Slough, and two of the scientific officers there, Messrs. J. F. Herd and L. H. Bainbridge-Bell.

The actual use of the tube for television is not discussed, but a very full selection of chapters on all sorts of applications of the cathode ray for measurement purposes is given, and the data provided is of the greatest value to all radio investigators who are likely to use cathode-ray tubes, whether for measurements or for television.

The question of oscillograph photography is dealt with, together with such advanced applications of the cathode ray as frequency conversion and direction finding. For the television investigator the chapters on the "Study of Variation with Time," "Linear Time-bases," "Locking Time-base Frequency," "Single-Stroke Time-sweeps" and so forth will be of the utmost interest, for they enable a very full practical knowledge of the cathode-ray tube to be obtained.

Money Well Spent.

I cannot but advise all who are seriously interested in the subject of television, as well as the less picturesque aspects of cathode-ray oscillography, to get hold of this book. It represents money well spent, for the information it gives is excellent and copious. All suspicion of "padding" or frills has been omitted, and the book is chock full of "meat."

K. D. R.

Do you know how to ensure a long and trouble-free life for your L.T. battery or H.T. accumulator ? If not, you hould make a special point of reading this authoritative and highly interesting article.

By S. H. PARSONAGE.

NOWADAYS even the small boy of the house generally knows that, as a rule, accumulators contain lead plates, which are in the form of grids, holding paste (the active material) immersed in the electrolyte. A new accumulator may be a thing of beauty and something to be proud of, but, in time, its uninitiated owner does, on occasion, come along with remarks such as "Look, the paste is dropping out!" or "I say, these plates are swelling and bending! Why is it?"

Consequences of Over-Charging.

Any reputable text-book on the subject will give detailed technical information; but it will suffice to say here that, on charge, electrical energy is converted into potential chemical energy, whilst during discharge the reverse action takes place. It should be noted, therefore, that the action within the cell is purely a chemical one, the cell neither "accumulating" nor "storing" energy in the real sense of the words.

The process of charging by passing a specified current is accompanied by minute bubbles, which are often confused with the convulsions known as "gassing," occurring on full charge of a healthy cell. While the passage of an excessive current shortens the duration of charge, the consequent gassing may be so violent that it not only loosens the paste but the heat developed becomes very appreciable and unevenly distributed, resulting in irregular plate expansion, which, in turn, inevitably causes bending and buckling, with a further tendency to loosen or shed paste.

Generating Heat.

At first it may be wondered why heat is developed, but one does not have to look far for the answer. The action during charge is such that acid is produced at the plate surfaces.

As is well known, the mixing of acid and water develops heat; and, moreover, this heat will obviously be greater at the centre of the plates than around the edges, owing, of course, to its being more easily dissipated there. Therefore we have the uneven heating resulting in irregular expansion and plate distortion.

Incidentally, it is opportune to note at this juncture that as acid is produced on charge and water on discharge, it illustrates that the density on specific gravity (S.G.) falls as the cell is discharged.

Fig. 1 gives an impression of how the S.G. changes with cell voltage. The hydrometer now commonly in use for indicating the S.G. of the electrolyte does, therefore, show fairly accurately, on a new cell at least, when the charge is completed.

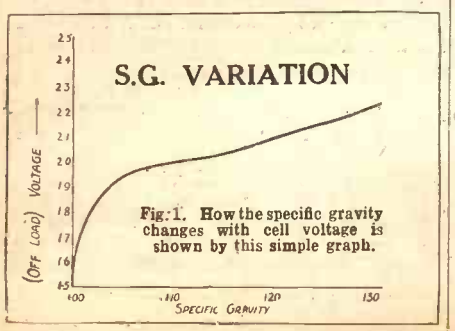
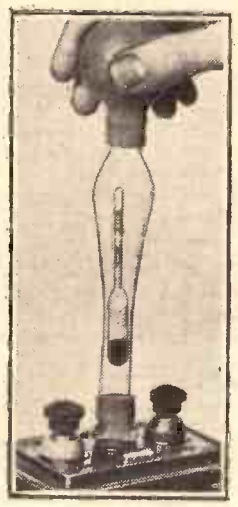


Fig. 1. How the specific gravity changes with cell voltage is shown by this simple graph.



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AN ACID TEST

The hydrometer test provides one of the methods of checking up the condition of an accumulator. The specific gravity of the acid shows the state of charge, but unless the cell is new a voltage reading should also be made as an additional check on the condition of the cell.

★

In the event of there being particles of paste, etc., in the bottom of the cell, after having been shed from the plates, however, the S.G. is no true criterion, for the "give-and-take" acid action is of necessity incomplete.

With the advent of the multitude of "tinpot" charging stations, the utmost caution should be exercised to ensure that a reliable and capable person of understanding supervises the welfare of one's cells.

It is by no means an exaggeration or even a rarity to come across large cells connected in series with very small ones, the latter having to withstand the charging current suitable only for the former. Such circumstances obviously spell ruination for the small cell, which is seen to foam and bubble violently as if on the verge of boiling over.

Now for a few thoughts on discharge conditions.

When a cell is normally discharged, lead sulphate (the well-known white substance) is formed on the plates. If, however, a rapid discharge (for example, a dead short circuit) occurs, this sulphation is enormously increased and, if prolonged, takes the form of granite-hard crystals effectually armouring the plates from the electrolyte.

Bad Effects of Sulphation.

Now, it will be easily seen that the more of this sulphate there is present the smaller is the active area of the plates. Consequently, a normal charging current does, in effect, constitute an overload for the cell, because, to all intents and purposes, it is decreased in capacity; and, furthermore, for reasons already explained, heat is developed with its disastrous results.

This effect is unfortunately much more pronounced, as, in the normal course of events, the plates always expand slightly when discharged, and, owing to their being supported at the edges, expansion causes the bowl-shaped formation very frequently met with.

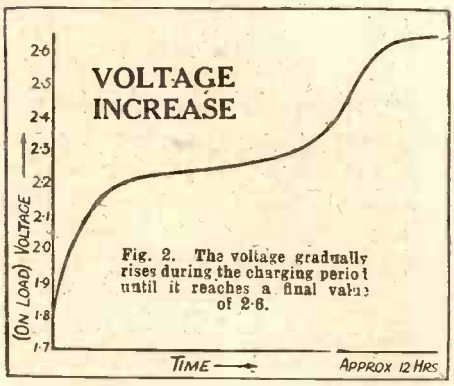


Fig. 2. The voltage gradually rises during the charging period until it reaches a final value of 2·6.

Quite often the question is raised as to when the charge is completed. Briefly speaking, it may be said that much depends on the condition of the cell, but the safest guide is to be led by the indications of both voltage and S.G. Fig. 2 depicts the curve of voltage variation during charge, and from which it will be learnt that it would be quite in order to remove the cell after the voltage had remained constant at 2·6 volts for, say, 30 minutes. A good average value of S.G. is 1·25 at full strength; but, as can be seen from Fig. 1, this value is not nearly so critical as is the voltage.

Beware of Evaporation.

Finally, the question of evaporation. After a long spell of hot weather the level of the electrolyte must be examined in order to ensure that evaporation has not made the tops of plates stand out of the liquid. Evaporation can be made good with distilled water.

That the accumulator is at times regarded as a bugbear of the radio installation is an established fact; but care and attention do much to alleviate the troubles which otherwise are almost certain to occur.

BEHIND THE SCENES AT DAVENTRY

Short-wave listeners should read this authoritative article on the experiences gained with the Empire broadcasters.

BY OUR SPECIAL CORRESPONDENT.

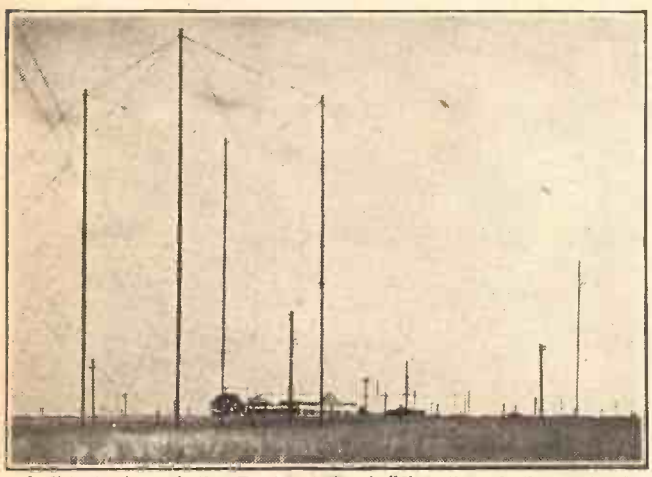
THE Daventry short-wavers have been broadcasting long enough now to give some vital facts about short-wave work.

First let me tell you how the two transmitters are made up.

With the exception of the master oscillators and their associated equipment, each of the two transmitters is contained in four separate cubicles.

The framework of the cubicles is constructed of duralumin. The backs and sides consist of removable metal panels or doors, and as a safety precaution these are so interlocked with the power-supply switch gear that the cubicles cannot be opened without switching off all dangerous voltages. The front panels of the cubicles are of polished black slate, and on them are mounted the various adjustment controls and meters.

DIRECTED ON WEST AFRICA



A distant view of the Empire station building through the masts of the West African aerial array.

The panels are screened from the transmitter components in the cubicles by duralumin screens fixed to the back of each panel.

This is in order to prevent dielectric losses in the slate panels and to localise the strong electric fields produced by the transmitter components.

Quartz Crystal Control.

In Empire broadcasting you must stick right on the wavelength. To obtain the necessary high degree of accuracy the frequency of each master oscillator valve is controlled by a quartz crystal, *a separate crystal being employed for each wavelength.* This apparatus is housed in a small unit which stands alongside the first cubicle.

With the crystal method of control the crystal itself has to be ground to such a size that it will oscillate at the required frequency or a submultiple of it.

With a disc-shaped crystal (which is the form used at Daventry) the higher the frequency required the thinner will be the crystal. It is impracticable to grind crystals to such a size that they will oscillate at the very high frequencies (short wavelengths) employed by the transmitters, and for this reason crystals with much lower natural frequencies are employed, and the required frequency is obtained by means of a series of frequency-doubling stages.

Actually on wavelengths below 17 metres the crystal frequency is doubled three times, thus giving an overall multiplication of eight times, so that the crystal used for any particular wavelength oscillates at one eighth of the transmission frequency. On wavelengths above 17 metres one or two doubling stages are used.

Constant Temperature.

As the frequency produced by a crystal is governed by its physical dimensions, it is essential to avoid expansion or contraction due to changes in temperature, and for this reason *each crystal is housed in an asbestos insulated box, the interior of which is kept at a set temperature by means of an electric heater controlled by a thermostat.* By this means the temperature inside the crystal box is kept constant within a fraction of a degree.

All of the crystals are mounted in their boxes next to their associated circuits, and any particular crystal can be connected to the transmitter by means of switches. The master oscillator unit provides a very flexible form of drive unit, which can easily be made to provide high-frequency energy on a number of prearranged wavelengths.

The output of the oscillator unit is connected to the input of the first transmitter unit which contains the frequency-doubling stages already mentioned, the modulating stage and the first modulated amplifier. It should be explained that what is known as the low-power system of

(*Continued on page* 884.)

CONTROLLING DAVENTRY'S POWER

Control of the power to the transmitters at Daventry is effected at this giant switchboard.

TRANSMITTERS ON PARADE

The imposing array of amplifiers and oscillators in the Transmitter Hall at the Empire Station.

BEHIND THE SCENES AT DAVENTRY

(*Continued from page* 882.)

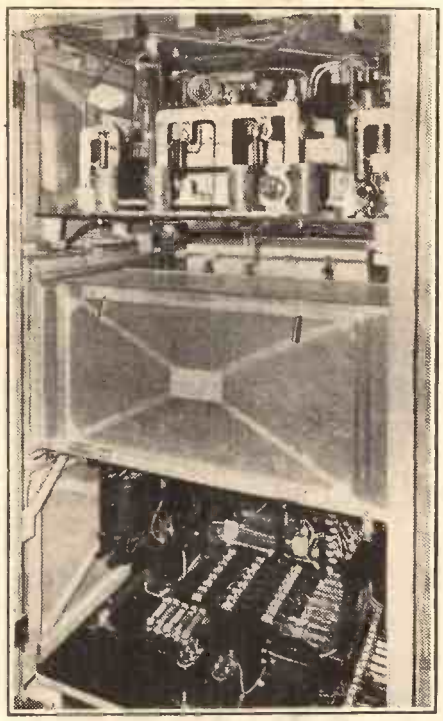
modulation is employed. The output of this first transmitter unit is, therefore, a completely modulated carrier wave suitable for transmission, but of insufficient power. Amplification is carried out in the second and third transmitter cubicles, of which each contains a stage of push-pull high-frequency amplification, the first amplifier employing two 2-kilowatt water-cooled valves and the second two 10-kilowatt water-cooled valves.

Stabilising Precautions.

The fourth cubicle of the transmitter contains the final amplifier or output stage, which consists of four 15-kilowatt water-cooled valves connected in push-pull, the output circuits of which are coupled to the aerial feeder. The circuits of the last three "stages" (the intermediate amplifier, first-power amplifier and main-power amplifier) are of the balanced-bridge type, which is now almost standard in high-power transmitters. Needless to say, the circuits are more complicated in detail than those used in transmitters working on relatively long wavelengths, because special precautions have to be taken to stabilise the circuits and to lay out the components in such a manner that spurious inductances and capacities are either made use of or eliminated entirely. *The necessity for avoiding stray capacities and inductances and for keeping the circuits quite symmetrical cuts out the possibility of using spare valves in situ, as in the B.B.C.'s regional transmitters.*

Wave-changing requirements mentioned earlier also necessitated very careful design in order that the balance of the various circuits may be maintained. The design of the tuning circuits is such that the values of inductances can be changed very quickly, in some cases by altering tappings, and where large changes are required by changing the coils. In every case identical changes must, of course, be made on both sides of each balanced circuit.

BACK-OF-PANEL VIEW



An unusual view of a modulator-amplifier unit, showing the intricate assembly of apparatus behind the panel.

The outgoing feeders from the power stage in each transmitter are connected to an aerial-changing panel mounted above each transmitter. On each panel is mounted a form of selector switch gear of special design, by means of which either of the transmitters can be connected to any one of the number of aerial systems which will be described later.

Fully Modulated Carriers.

Low-power modulation has several advantages as compared with the old system of high-power modulation. What is more important from the listeners' point of view, however, is the maximum depth of modulation of which the transmitter is capable, as what may be termed the "receptability" of the transmission depends not only upon the power of the carrier wave which is radiated, but also upon the percentage to which the carrier wave is modulated. If a weakly modulated carrier wave is radiated from a station it may be quite impracticable to obtain a useful volume of reproduction with given apparatus, even though the carrier wave is easily receivable.

It is essential, therefore, if the maximum service is to be obtained from a broadcasting transmitter that it should radiate a carrier wave modulated as nearly as is practicable to the full extent.

During the course of a programme the sound intensity in the studio, and therefore the output of the microphone, varies within

(*Continued on page* 895.)

WHAT CAUSES ATMOSPHERICS?

The summer's good weather brought the usual crop of atmospherics to worry the wireless listener, and this interesting article explains their origin and causes.

ATMOSPHERIC disturbances are still fairly prevalent about this time of the year, since the electrified condition of the cloud particles producing these disturbances is brought about by evaporation and condensation. Hence, a long spell of hot weather when the process has been rapid usually heralds exceptionally bad reception conditions.

Quite a number of readers still have some difficulty in understanding just why atmospherics should be so troublesome: why, with all the special ultra-selective tuning devices which we now have, it is still impossible to eliminate the irritating frying-pan noises that impinge on the top of broadcast programmes.

No Particular Frequency.

Unfortunately, electro-magnetic waves which arise from electrical upheavals of the atmosphere have no particular frequency like the carefully adjusted radiations of an ordinary transmitter. They start off with a bang, as it were, dispersing immense energy into the ether in a fraction of a second, like a much-magnified edition of the old, untuned spark transmitter of prehistoric wireless days.

In the same manner, all the aerials in the neighbourhood are set into oscillation by shock excitation at the particular frequency to which they happen to be tuned. Of course, the area over which an atmospheric disturbance can make itself felt is much greater than that of the comparatively feeble spark transmitter.

Various ingenious schemes have been conceived, ever since the inception of wireless, to overcome the bugbear of atmospherics. But usually the success has been of little practical value. One or two simple methods may be employed to reduce interference.

For example, the use of a small aerial or a buried aerial is sometimes advocated. But in practice these merely reduce the overall sensitivity and cut down the strength of the desired transmitting station as well as the undesired interference. Something of the same effect may be attained by connecting a fairly high resistance between aerial and earth terminals of the set.

Not Designed for Frames.

In certain cases it actually has been possible to reduce atmospherics, if they were local, in a greater ratio than signal strength, by a suitable buried aerial, but in a very wet or a very dry soil the experiment is almost invariably unsuccessful.

The directional property of a frame aerial may sometimes be used to advantage, but here again the extent to which it may be used is limited, since the majority of receivers are not suitably designed for frame working.

It is simply no good expecting to get the same results in summer as in winter months from distant stations, or grousing because a new set doesn't come up to expectation, for, apart from the higher level of interference, the average of signal strength of any particular station reaching one's aerial during the hours of listening is bound to be less, since these are principally in daylight at this period.

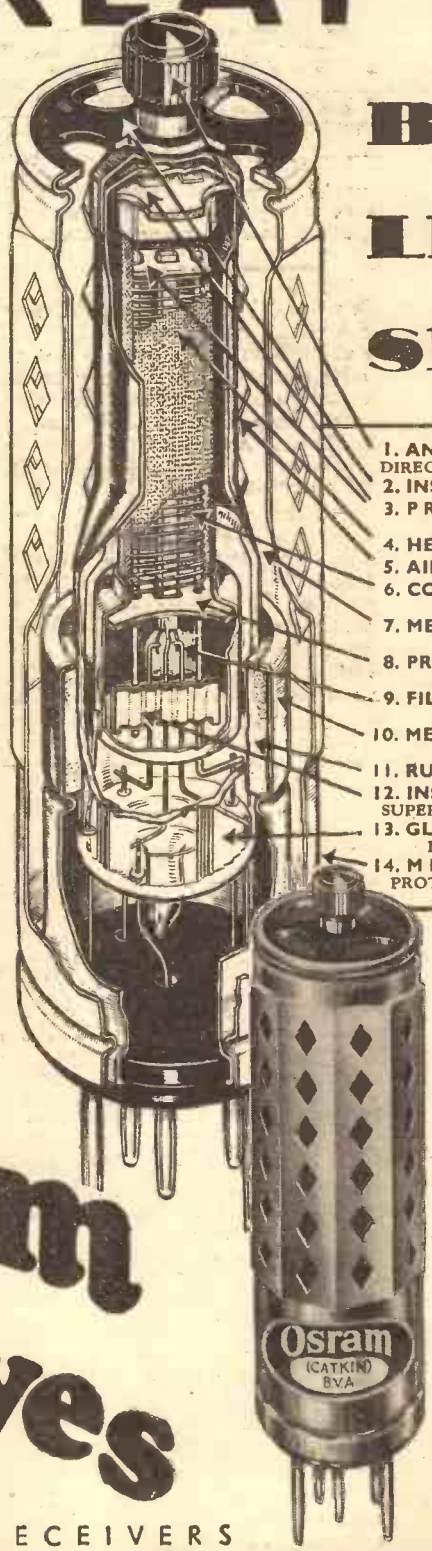
Inconsequence of Nature.

The absorption of the wave is notoriously greater in daylight than at night, and since the absorption arises indirectly from the sun's ray, it is particularly noticeable during summer. Moreover, the higher level of static interference discounts the practicality of extra amplification in the receiver, for if the station level is increased the interference level is increased with it.

It seems that at present, at any rate, we must resign ourselves to this particular inconsequence of nature. But it is, perhaps, some consolation to remember that if you yourself can't get Timbuctoo on the speaker because of atmospherics, the fellow next door can't, either!

H. C.

# of GREAT strength BUT LITTLE SIZE



1. **ANODE TERMINAL** DIRECTLY CONNECTED—LOOSE CAP IMPOSSIBLE
2. **INSULATION** BETWEEN ANODE & SHIELD
3. **PRECISION INSULATORS** LOCKING ELECTRODES
4. **HEXAGONAL SCREEN GRID**
5. **AIR COOLED ANODE**
6. **CONTROL GRID** STRAIGHT WIRE CONSTRUCTION
7. **METAL ANODE TO GLASS** VACUUM TIGHT JOINT
8. **PRECISION INSULATOR** LOCKING ELECTRODES
9. **FILAMENT CONNECTIONS** THE ONLY WELDS IN THE ELECTRODE SUPPORT SYSTEM
10. **METAL CAPPING SHELL** GIVING MINIMUM GRID—ANODE CAPACITY
11. **RUBBER MOUNTING** ANTI-MICROPHONIC
12. **INSULATED STEEL CLAMP** SUPERSEDING DELICATE PINCH OF GLASS VALVE
13. **GLASS CIRCULAR SEAL** GIVING MAXIMUM INSULATION SPACING BETWEEN WIRES
14. **METAL SHIELD** GIVING MECHANICAL PROTECTION AND ELECTRO STATIC SHIELDING

OSRAM "CATKIN" VALVES are essential for modern receiver practice. Immensely strong yet compact in design they are constructed to microscopically precise limits and therefore allow for greatly improved set performance. A set equipped with OSRAM "CATKIN" VALVES gives the highest quality reception.

The all-metal construction of OSRAM "CATKIN" VALVES is a radical departure and results prove beyond dispute that they definitely give more uniform results, complete freedom from microphonicity and more effective screening. A change to OSRAM "CATKIN" VALVES is a change to faultless radio reception.

TYPES AND PRICES

MS4B High Efficiency Screen-Grid A.C. Mains Valve - **17/6**

VMS4 Improved Variable Mu Screen-Grid A.C. Mains Valve - - - - - - - - **17/6**

MH4 High Magnification Detector A.C. Mains Valve - **13/6**

MPT4 Power Pentode A.C. Mains Valve - - - - - - **18/6**

(Other types to follow)

Sold by all Wireless Dealers

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FOR A.C. MAINS RECEIVERS

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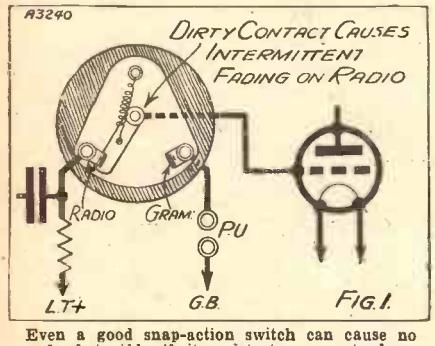
SOME UNUSUAL FAULTS

BY Krypton

A useful survey of some of the causes of poor reception, and details of how to remove them.

IN nine cases out of ten, when the receiver goes wrong, it is not something that causes a complete breakdown which is most puzzling and hard to trace, but some defect which mars reception, such as a noisy background, uneven volume, or perhaps insidious and intermittent distortion. More often than not the least expected fault turns out to be the real cause of such troubles, as happened quite recently in the case of a receiver on which I was asked to pass judgment.

A POINT TO WATCH



Even a good snap-action switch can cause no end of trouble if its contacts are not clean.

This set, a popular H.F.-det.-L.F. arrangement, put up a really good performance, excellent volume and quality on local reception, and more than average selectivity and sensitivity for distance-reception. The only blemish on an otherwise perfectly good set was a faint irregular spluttering, audible during silent intervals and periods of low volume.

Narrowing the Field.

It was easy enough to eliminate the possibility of outside interference, for on disconnecting the aerial and earth leads the trouble persisted. On test, filament and grid-bias batteries and their leads were found above suspicion, while substituting an H.T. battery for the mains unit used with the set had not the least effect.

This narrowed the field of inquiry to the receiver itself, where the quickest way of "getting warm" was to pull out each valve in turn with the set switched on, commencing with the H.F. valve. Removing the S.G. valve did not stop the spluttering but the detector—complete silence!

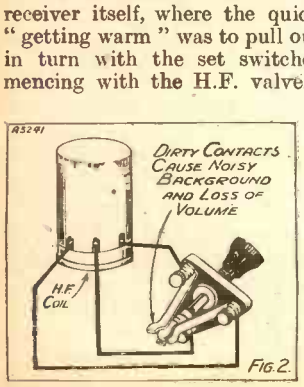
This was certain proof that the seat of the trouble was to be found somewhere in the detector stage, because that irritating noise would have persisted if the output stage had been at fault.

Discovering the Culprit.

The next step was to test likely components for possible defects. The shunt-fed transformer coupling after the detector proved quite free from faults, as did the grid condenser. After substituting a new grid leak, the same old spitting and spluttering went on just as merrily as before!

This left little else but the detector valve holder and the valve itself. In spite of the fact that the latter was a relatively new one with a blameless record, another valve was inserted, when that irritating background disappeared entirely!

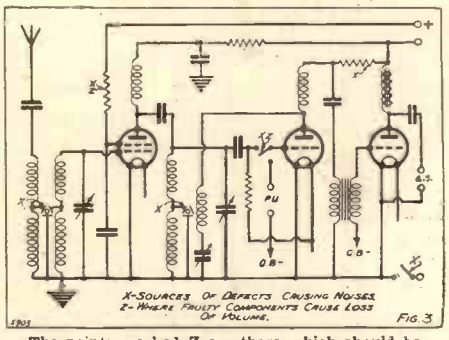
Here the cause of the trouble had been all along a defective valve, possibly erratic filament emission (rather an unusual valve fault), but it goes to show that it is never safe to take your valves absolutely for granted, especially those that have already seen good service.



THE SWITCH

Many of the troubles put down to "fading" are really caused by inefficient switches.

LOSS OF VOLUME



The points marked Z are those which should be checked most carefully when the fault takes the form of loss of volume.

Causes of Fading.

Although it is no uncommon experience to find the volume level of reception changing perceptibly when you are situated some considerable distance from a main transmitter, it is quite a different matter in the case of a receiver in the "swamp area," where such trouble cannot be blamed to natural fading of the transmitted wave.

I came across a very interesting and intriguing case of this latter type recently, where the receiver had previously shown no sign of fading on the "local." Gradually there had developed a slow intermittent fade, occasionally to inaudibility, without any distortion, and recovering as mysteriously to full volume.

The first clue was got when I noticed that there was no fading at all on the gramophone side. This eliminated from the area of search all that part of the receiver after the detector-grid circuit.

A milliammeter inserted in the anode circuit of the detector showed that fading corresponded with a gradual increase in anode current, a dead fade-out bringing the latter up to the normal reading when no signal was tuned in. (Remember that, with the grid detector, the steady anode current is *reduced* appreciably when a strong station is tuned in.)

Traced to a Switch.

It was then noticed that snapping the radiogram switch to and fro a few times effected a cure—but, unfortunately, only a temporary one.

Being now so hot on the scent, you can guess that it was not many minutes before that switch was out of the set and completely dismantled! Although it was an excellent snap-action design, I was rather surprised to find the pivot of the moving blade, to which contact with the detector grid is made, smeared with an evil-looking grease.

This was cleaned off entirely, the contacts brightened, the switch reassembled and then remounted. On switching on the receiver functioned perfectly without a trace of fading, and has done so ever since.

In general, it is a paying idea to examine periodically all switches for dirty and defective contacts.

"CLASS B" TONE CORRECTION

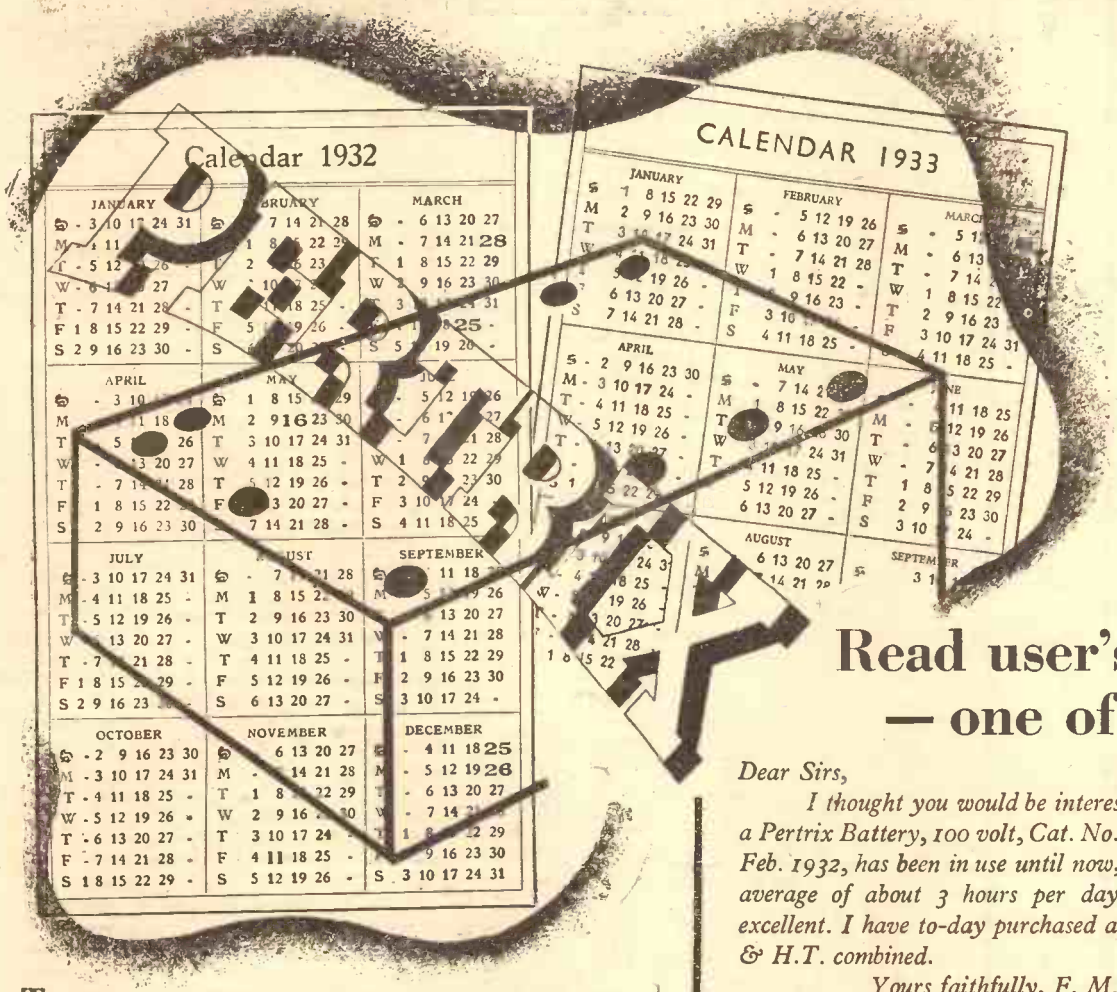
The best way to avoid high-pitched reproduction with positive-drive output.

IT is usually found that the reproduction given by a "Class B" set is inclined to be slightly high pitched.

Connecting a ·001-mfd. fixed condenser between each anode of the "Class B" valve and H.T.+ or L.T.— corrects this tendency; but it should be noted that this causes a slight waste of H.T. current. It is preferable to incorporate a tone control with the L.F. transformer which couples the detector to the driver valve. This may be effected by using one of the special tone-control transformers or by connecting a ·01-mfd. fixed condenser in series with a 50,000-ohms variable resistance across the transformer primary.

C. R.

His PERTRIX lasted *EIGHTEEN MONTHS!*



Read user's letter — one of scores

Dear Sirs, *July 29th, 1933*

I thought you would be interested to know that a Pertrix Battery, 100 volt, Cat. No. 272, I purchased Feb. 1932, has been in use until now, being used on an average of about 3 hours per day, which I think excellent. I have to-day purchased another one, G.B. & H.T. combined.

Yours faithfully, F. M. U., Bellingham.

The above letter can be inspected at the offices of Britannia Batteries Ltd., 233 Shaftesbury Avenue, London, W.C.1

Three hours a day for eighteen months. In cold figures, over 1,500 hours of active service! Yet this is no unusual feat for a Pertrix — almost every post brings a letter from some member of the public whose Pertrix has lasted a year or more! Only a Pertrix High Tension Battery could give such service, because Pertrix is the only battery that uses a patent *neutral* electrolyte. There is no constant corrosive process going on inside any Pertrix. Its power is not turned against itself. There is no 'shorting' between the zinc cells. A Pertrix will give the same number of hours' service, whether you use your set every day or intermittently. These amazing batteries recover power overnight — preparing for the next day's programme. H.T., L.T., or G.B. — *there is a Pertrix that fits your set.*

FIT PERTRIX *FOR GOOD*

MADE BY BRITANNIA BATTERIES LTD., REDDITCH, WORCESTERSHIRE

RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos.

Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article.

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

All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

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

QUESTIONS AND ANSWERS

WHAT IS A DRIVER VALVE?

P. R. (Uckfield, Sussex).—"As I now understand it, a complete two-valver, with its small power valve, can be used in front of a 'Class B' stage to get really large volume on batteries. But if I get only the new 'Class B' valve and its input and output transformers, etc., as recommended for the new arrangement, the old power valve will have to do the 'driver's' work. "Is this in order, or do I really need a special driver valve?"

No, the old valve is quite suitable for use in the driver stage, as the characteristics required for this are those possessed by the ordinary small power valve.

A SIMPLE CURE FOR THRESHOLD HOWL.

P. K. (Wanstead).—"I was never really lucky with short waves before, but this time I have struck a winner. The curious thing is that it was quite by accident I got it to go, the first attempts being completely spoilt by a low threshold howl.

"To cure it I was going to put a spaghetti across the transformer secondary, as recommended in 'P.W.' some time ago, but it was obviously of too low a value, and cut the volume right down (I think it is a 20,000 ohms.)

"So I wondered if it would be any good trying across the primary, and found that was no good either. But whilst it was still connected on primary at one end I happened to join it up in a way which works finely.

"No trace of threshold howl, and certainly no drop in volume. It is fixed as follows:

"Formerly one side of H.F. choke went to A on the transformer, and the latter's H.T.+ terminal went to the H.T.B.

"As I have got it fixed now, the H.F. choke goes to A, but the transformer's H.T.+ terminal goes to the spaghetti. Then the other side of this goes to H.T.B.

"It is a perfect cure, and if you will pass on the tip it may do others a bit of good who find threshold howl impossible to cure. But I should like to know why it helps to make the set stable if there is an explanation?"

Threshold howl is notoriously "tricky," but one of the often-advised cures is a resistance in series in the detector's anode lead, which is what your modification amounts to.

The idea behind this is that if we can maintain a more constant voltage it will assist a detector to keep smoothly oscillating or nearly oscillating in

(*Continued on page* 890.)

IS YOUR SET BEHAVING ITSELF?

Perhaps your switching doesn't work properly? Or some mysterious noise has appeared and is spoiling your radio reception? Or one of the batteries seems to run down much faster than formerly?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers its unrivalled service.

Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do. On receipt of this an Application Form will be sent to you post free immediately. This application will place you under no obligation whatever, but, having the form, you will know exactly what information we require to have before us in order to solve your problems.

LONDON READERS. PLEASE NOTE: Inquiries should NOT be made by 'phone or in person at Fleetway House or Tallis House.

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 888.)

contrast to the threshold howl condition, in which the valve oscillates, stops itself by virtue of some circuit condition, and immediately re-starts oscillating, only to stop again immediately, and so on. (The frequency with which this happens is an audible one, and so we get the howl.)

Normally, the anode current drops sharply in the oscillating condition, but if there is a resistance in the anode circuit the voltage drop across it will then decrease accordingly, and thus the actual anode voltage at that instant will rise.

Therefore, the tendency of the valve to continually stop oscillating is reduced by the higher voltage on its anode.

In practice, of course, it is not so much oscillation that is needed as stability when near the oscillation point, and the above arrangement tends towards such stability.

USING A ROOF AERIAL.

F. C. B. (Harlesden, N.W.).—"I find a roof aerial gives me ample strength on the London stations, but it has one fault when it comes to foreign reception, and that is that the weather affects it.

"Whilst it is raining the reception is never so good as when the roof is dry. Is there anything I can do to overcome this?"

You could try the effect of spacing the aerial wires farther away from the slates or tiles, but very often this alteration has no beneficial effect.

The trouble is that the wet makes the large roof surface conductive to some extent, and thus it acts like a screen, shutting off the aerial wire beneath from the waves which would otherwise reach it.

An outdoor wire does not suffer from this drawback; indoor aerials, on the other hand, though they differ a good deal, are generally liable to variations from this cause.

A GOOD TWO-VALVER FOR A SHORT-WAVE NOVICE.

H. L. (Bideford, Devon).—"I am expecting to go abroad towards the end of next year, when I have passed the exam., but I haven't the faintest idea where I shall be sent. The only thing I know is that it will be for three years or thereabouts.

"Aware that the Empire programmes now sent out from Daventry are being picked up all over the world by those who have taken short-wave receivers abroad with them, I think I might as well be prepared for when it comes to my turn.

"I have never tried my hand at short waves, so I should like to make one set, preferably a two-valve, and possibly launch out into three or four valves later on. Can you put me on to a good up-to-date description of a special short-wave set suitable for the novice at that branch of radio?"

You could not do better than try your hand at the one described in the July 22nd issue of "P.W." (No. 581). It is easily built and operated, full details for the whole process being given under the title "How to Make a Short-Wave Two," by W. L. S.

The circuit is an interesting and very effective one, employing a screened-grid valve as detector, and following this either a small-power valve or a pentode.

Having been designed especially for the novice, this set is exceptionally easy to construct and operate.

TESTING FOR H.F. OSCILLATION IN L.F. AMPLIFYING STAGE.

"VALVO" (Coventry).—"The trouble was found to be H.F. oscillations in the L.F. stage and it was cured by the simple expedient of placing a 100-ohms wire-wound resistance between the anode terminal of the valve holder and the wiring which previously went direct to this.

"I did not see the tests by the expert who called, but they tell me he used a flashlamp bulb held near the valve, and the oscillation was shown by the glowing of the bulb. Is this the usual test, and does it need any special apparatus in addition to the flashlamp bulb?"

The glowing flashlamp bulb method is frequently used to discover H.F. oscillations in an L.F. amplifier, and all that is needed for the test is the bulb itself, joined in series with a loop of wire, the ends of which go to the respective terminals of a variable

(*Continued on page* 892.)

DO YOU KNOW—

the Answers to the following Questions?

There is no "catch" in them; they are just interesting points that crop up in discussions on radio topics. If you like to try to answer them you can compare your own solutions with those that appear on a following page of this number of "P.W."

1. Does a coating of insulating enamel on the aerial wire affect reception?

* * *

2. What is the fundamental difference between the "Class A" and "Class B" methods of amplification.

* * *

3. How can you test if a valve is microphonic?

"P.W." PANELS, No. 135. MORAVSKA-OSTRAVA.

This famous Czecho-Slovakian station is well received in Britain at times, although it is about 820 miles from London. The wavelength is 263·8 metres, immediately above that of the London National.

* * *

Moravska-Ostrava employs a power of 11 kilowatts, and announcements are made in Czech, Slovak, Hungarian, French and German.

* * *

The call is "Radiojournal Moravska-Ostrava," and good-night is given as "Dobrou-Noc."

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 890.)

condenser having a small maximum capacity of the order of ·00005 mfd.

In effect this amounts to wiring the bulb across the variable condenser, the short leads forming a loop, which is then lowered over each suspected valve in turn.

By adjusting the variable condenser a wide range of different high frequencies is covered, and when the circuit is brought near to the valve it will, when "in tune," indicate the oscillating condition by the glow of the flashlamp bulb.

CONNECTIONS TO A DIFFERENTIAL CONDENSER.

W. B. (Saxmundham, Suffolk).—"The wiring of the differential condenser is the only thing that is puzzling me, the terminals of this being different from the one given in the diagrams.

"It is the correct kind, ·0003 mfd., and it has two sets of fixed plates and one set of moving. But there are *four* terminals altogether, instead of three.

"One connects to one set of the fixed plates, another to the other set of fixed plates, and *two* terminals are joined to the spindle of the condenser—that is, to the moving plates. Does it matter which of these I use?"

"(The diagram shows one fixed plate terminal to L.T. —, the other fixed plate terminal to R on coil unit, and moving plates to H.F. choke and A on valve holder.)"

The two terminals fixed to the moving plates of the condenser are, in effect, only one terminal, because they are *permanently joined together*. Anything that is connected to the one is thus automatically connected to the other at the same time.

THE ANSWERS

TO THE QUESTIONS GIVEN ON PAGE 890 ARE GIVEN BELOW.

1. **No, there is no measurable effect. So in seaside districts or near factory chimneys enamelled wire is often employed because it protects the copper from the atmosphere.**

* * *

2. **In "Class A" amplification a steady H.T. current flows irrespective of programme strength but in "Class B" the average H.T. current varies in direct proportion to the volume.**

* * *

3. **Tap it lightly when it is working. A microphonic valve gives rise to a very loud resonant note in such cases.**

So you can use either of them, and it will not make the slightest difference in operation which one you choose. (The maker's reason for providing two terminals instead of only one is merely to give the set-builder a choice of connecting points to this set of plates. He can use whichever is more convenient.)

STEPPING ON FLOORBOARD CAUSES CRACKLING NOISES.

G. L. (Richmond).—"During the past month or so we have been annoyed by harsh crackling sounds in the loudspeaker, and we have lately noticed the curious fact that these will nearly always occur when anyone is walking on a certain floorboard.

"I have examined the leads to loudspeaker, wall-plug, etc., but these appear to be in good condition. And, in any case, they are at the other end of the room from the floorboard which is causing the trouble.

"Would it be something to do with the electric-light wiring from which the set is run? It is a new house, and the wiring is all laid in metal pipes, so it should not be going wrong; but that is the only reason I can think of why one part of the floor should be associated with the crackles, which it undoubtedly is."

You are probably right in your supposition. We expect there is a wire with faulty insulation in the pipe near the spot in question, and if the board is just a little loose it may, when walked on, bend the adjacent metal pipe just enough to cause sparking at the badly-insulated point.

If you explain the symptoms to an electrician he will probably be able to put the trouble right straight away.

ECKERSLEY EXPLAINS

(*Continued from page 859.*)

experimenter who held this theory used, for his tests, a necessarily bad loudspeaker. This, then, did not give the required uniform response—and so one evil added to a grosser does not detect the added sin!

No! I cannot say I am terribly convinced; but hearing is believing, and I did hear, just once in my life, quality, real quality, and that was achieved largely owing to a uniform response of amplifiers and good response of loudspeakers over a very wide band of frequencies.

What a pity I cannot say to you: "Go on, design (resistance-capacity is easier) amplifiers which do not forget to amplify until 20,000 vibrations a second are passed, and then listen for quality"! But where is the input? For no fault of the B.B.C.'s, wireless broadcasting has forgotten how to be a quality standard. Too many, too powerful, and too many, and too-too powerful stations simply forbid the reproduction of anything above about 8,000 cycles/second in the general case. You'll never get people to bother about top while top is jammed. In America, now, they can: because they are a united states, and a measure of dictatorship looks after public interest. And not because we are behind, necessarily, but because they are ahead (in transmission *facility*), the American set *does* give better quality than the European.

Of course, there's the gramophone record to fall back upon, and the Americans have shown how to produce the almost perfect record (80 db. level, range 30—12,000 cycles/second gamut, and plays for twenty minutes). But there's many a fight 'twixt vested interest and new invention, and we may have to wait a long, long time for that perfection.

There, again, in wire broadcasting we are not faced by so many technical problems because we can control all the quantities, and we need no *international* agreements about wires as we have to have with wireless.

Sic transient gloria amplificatus—which means, "We can do it, but THEY won't let us!"

A NEW HIGH VOLTAGE OUTPUT VALVE

(*Continued from page 870.*)

view of the fact that most standard mains transformers give only a 4-volt L.T. supply.

It is therefore interesting to learn that the Mullard Company have brought out a new large output valve, D.O.26, which may be considered as a 4-volt version of the D.O.25. Its published data are as under:

Filament voltage	4·0 v.
Filament current	2·0 a.
Max. anode voltage	400 v.
Optimum load	4,000 ohms
Anode impedance*	600 ohms
Amplification factor*	3·8
Mutual conductance*	6·3 m.a./v.

* At anode volts 100 and grid volts zero.

With 400-volt high tension the D.O.26 requires a negative grid bias of 92 volts and takes an anode current of 63 m.a. It will handle maximum input signals of 65 volts R.M.S.

BERLIN'S RADIO SHOW

(*Continued from page* 869.)

attention on television. The step from last year's standard (90 lines) to this year's standard (180 lines) is very remarkable.

Telefunken and Loewe were showing cathode-ray tube reception of the standard picture. The Hungarian inventor, Denes von Mihaly, had on view a demonstration model of his new mechanical television receiver, a great advantage of which will be its inexpensiveness.

The Sensation of the Show.

The young Baron von Ardenne was showing his projection cathode-ray tube. Tekade had their 90-line and a new 180-line mirror-screw receiver on view, together with a superhet for 7 metres. The Fernseh A.G. had two exhibits: one, the direct scanning transmitter and mirror-screw receiver operating with 90 lines, and secondly an intermediate film television projection receiver for large halls.

This latter was certainly the sensation of the show. The method employed is briefly as follows: A continuous band of celluloid is emulsioned, exposed to a ray of light modulated by the incoming television impulses over a Kerr cell and built up by a scanning disc, developed and fixed, dried and passed through a special cinema projector and then washed off again ready for re-use.

The whole process is nearly instantaneous. It only occupies 20 seconds.

Television and the Cinema.

Telefunken were showing an application of this transmitter film system for television transmission. (It will be remembered that the Fernseh A.G. first demonstrated this last year.) By means of the intermediate film system it is now possible to televise any given scene which a modern cinema camera can handle and to receive it and project it on to a screen 3 or 4 metres in size.

The time lag between televising the scene and its reproduction on a cinema screen miles away is under 30 seconds. The accompanying sound can, of course, be recorded and reproduced in the same manner.

The German Radio Exhibition of 1933 was a very important exhibition for Germany, marking the threshold of ultra-short-wave television broadcasting. The National Socialist government has termed the exhibition the end of the democratic period in German broadcasting.

A SURVEY OF THE GLASGOW EXHIBITION

(*Continued from page* 856.)

the "Microlode" principle; Blue Spot (Stand 4) are maintaining their high reputation with several new additions to their already comprehensive range; Ferranti (Stand 38), Epoch (Stand 61) and Rola (Stand 19) are all showing special "Class B" speaker-amplifier units for the instantaneous conversion of existing sets to Class B output; Clarke's "Atlas" (Stand 44), Ediswan (Stand 37), G.E.C. (Stand 34), H.M.V. (Stand 33), Igranic (Stand 23), Marconiphone (Stand 35), etc., all have something new to offer, and prices seem to range from, roughly, 30s. to anything up to £5 or more.

What with all the new speakers, new output valves, and the new circuit schemes, there is now no excuse for anybody putting up with anything but absolute fidelity of reproduction. The battery user in particular is extremely well catered for, even to the extent of the batteries themselves.

New and improved types at, in several cases, substantially reduced prices compared with those of last year, feature in almost all the leading makes. Space will not permit of a detailed description of all the new types, but that is information that you can readily obtain from the exhibition or even from your local dealer. If you are able to get to the exhibition and are interested in batteries, make a point of visiting the stands of Block Batteries (67), Britannia Batteries (69), Ediswan (37), Ever Ready (30), and Hellesens (45). You will find more than enough to interest you, and, moreover, you will certainly not come away disappointed.

A Magnificent Response.

Undoubtedly, the present Glasgow Exhibition is the finest that Scotland has yet seen. The manufacturers, on their part, have responded magnificently to the needs of the present day, not only by producing the "goods" but by bringing them to Scotland for your examination, and now the rest is up to you. Just keep your weather eye on "P.W." for all the good things we have in store for you, and then not only will you be in keeping with, but actually ahead of, the times. Just you wait!

BEHIND THE SCENES AT DAVENTRY

(*Continued from page* 884.)

very wide limits, particularly during programmes of a "peaky" nature. The result is that the maximum possible depth of modulation can only be employed on the loudest passages of a particular transmission, the mean depth of modulation being the average between this point and the percentage modulation produced by the quietest passages in the transmission. This means that the mean depth of modulation may be quite different during a "peaky" transmission from what it is on a more level programme, such as speech. *The modulation of the two Empire transmitters is adjusted to peak at 90 per cent, which gives the maximum practicable efficiency consistent with a satisfactory linearity of response.*

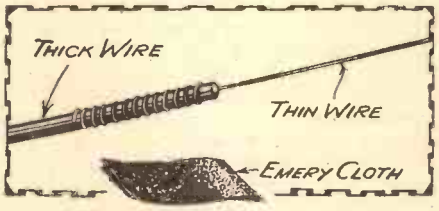
Finally, short-wave enthusiasts will appreciate what care has to be taken with power supply. The power for the master oscillators is taken from a 220-volt A.C. supply provided by a 15-K.V.A. single-phase transformer, which also supplies current for lighting purposes and other auxiliary services.

As the circuits of transmitters of the type used at Daventry are fairly sensitive to changes in voltage, automatic-induction regulators have been installed to compensate for variations in the voltage of the mains.

USING FINE WIRE

A practical hint for constructors.

REMOVING the enamel insulation from very fine gauge wire may present a problem. A very good method is to remove it with a piece of worn emery cloth. Very little pressure should be used, otherwise the wire will break.



The illustration shows how a piece of thin gange wire should be wrapped round a thicker piece before soldering the two together.

If it has to be soldered to a thicker wire, the best way is to bind the fine wire round the thick wire as in sketch.

The enamel can now be removed with emery cloth, with little fear of the wire breaking.

THE LISTENER'S NOTEBOOK

(*Continued from page* 862.)

But for Dorothy Ward, I would have said without hesitation that Henry Hall was the most popular of all the stars, if applause is any criterion of popularity. But on this score Dorothy must be considered, for she ran Henry Hall pretty close. This is entirely satisfactory, especially to those of us who are a bit jealous of the supremacy of the crooner and his pseudo-songs.

Henry Hall deserves his holiday. But it is rather frightening to know that he has gone to America both for a holiday and also to study American dance-band methods. All I hope is that he won't find time for study. We already know so much about American methods that one often doubts whether there is a spark of originality left among some of our dance-band leaders.

MIRROR OF THE B.B.C.

(*Continued from page* 860.)

The Weekly Welsh Interludes.

You may or may not have noticed it, but the weekly Welsh interludes during the summer months, which have been included in the programmes from all stations, except Scottish, which have had their own interludes, have consisted entirely of music. No talks whatsoever, but recitals of folk songs, part songs and instrumental music.

On Saturday, September 23rd, the feature goes back to talks, and then, no doubt, Wales will be able to keep its interludes, because other stations will offer their own alternatives. These remarks are written in no spirit of criticism, because Welsh listeners appreciate these interludes of talks.

There is proof of this in the fact that since January of this year no fewer than nineteen broadcast talks have afterwards been reproduced (by permission of the B.B.C., of course) in Welsh weekly and monthly publications.

Brass Band Contest—Winners from the North Regional.

On Sunday, September 10th, six days after the great championship brass-band contest at Belle Vue, Manchester, North Regional listeners will hear a concert by the winning band from the Manchester studio. Meirion Morris, who has won umpteen prizes at musical festivals, will be the solo artist, but neither he, nor you, nor us knows which band will be with him when he sings.

THE LINK BETWEEN

(*Continued from page* 860.)

A.V.C. for Existing Sets.

I am interested to learn that Messrs. Wearite have recently introduced an automatic volume control unit which can be fitted to any set employing high-frequency screened-grid amplification, whether of the "straight" or superhet type.

There are only three connections to the unit, and in order to fit it to an existing set, only one alteration has to be made to the wiring. It certainly seems an excellent scheme, and if it is up to the usual Wearite standard, I am confident that it will enjoy considerable popularity among the home constructing public.

"P.W." readers who would care for further details can obtain them by making application in the usual way through our postcard literature service. (No.48)

Universal Mains Valves.

A.C.-D.C. valves, which are suitable for operation on either A.C. or D.C. mains circuits, are becoming increasingly popular.

In this connection, the range of universal valves (as they are called) which is being produced by the Tungsram Electric Lamp Works is one of the most comprehensive yet available. In fact, I believe I am correct in saying that they were the first firm to produce a complete range.

The present Tungsram range includes the following types: variable-mu screened-grid H.F., detector, low-frequency, power, multi-grid output, double-grid frequency changer, H.F. pentode, etc.

A leaflet describing these new valves is available through the postcard literature service. It is a leaflet that is likely to be of interest to all readers who are interested in mains set construction. (No.49)

TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio.

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

Aerial Constants.

ALTHOUGH we are always told to examine the aerial every now and again, to make sure that there is no corrosion or bad contact anywhere about, many of us, I am afraid, pay little heed. But it is really worth while to make a periodical inspection of the aerial, because not only are you liable to get a loss in its efficiency as a pick-up of signals, but also, what is not so commonly known, if the electrical constants of the aerial are changed even slightly, this interferes with the loading conditions in the aerial tuning circuit.

Adjusting Trimmers.

In the old days of independent condensers this was not perhaps so important; but in these days of ganged condensers it may mean that the ganged condenser will need the trimmers re-set. This is a nuisance, and therefore it pays you to keep the aerial as far as possible in the same electrical condition.

Of course, it is a good plan to make sure occasionally that the trimmers are correctly adjusted, because no matter how careful you may be with the aerial it is liable to go out of electrical condition—that is to say, its electrical constants may change slightly through no fault on your part. But a general caretaking of the aerial will reduce the amount of attention you have to give to adjustment of the ganged condenser, and will help to keep the set up to concert pitch.

Screen-Grid H.F. and Band-Pass.

When using a screen-grid high-frequency stage with a bandpass circuit you can easily get negative bias on the screen-grid valve by juggling about with the resistance which shunts the fixed condenser used in connection with the bandpass. This condenser, which generally has a value of about 0·05 microfarads, is connected to the earth end of the circuit and has the fixed resistance shunted across it, one end of this resistance going to low-tension negative.

If, however, this end of the resistance is connected instead to the negative terminal of the bias battery you will get an extra negative bias on the screen-grid valve, the positive end of the battery being connected to the L.T. negative instead.

Short-Wave Reaction.

The voltage on the detector valve, as you know, greatly affects the control of reaction. This influence becomes more pronounced the shorter the wavelength, and if you are operating a short-wave receiver, or if you have a triple-wave set, you will find it very convenient to provide yourself with some means for adjusting the detector voltage fairly accurately.

(*Continued on next page.*)

TECHNICAL NOTES

(Continued from previous page.)

One very obvious means is to use a potentiometer for the detector tapping on an H.T. battery; with a mains unit it is quite likely that you will have a control already provided for you for adjusting the voltage of the detector tapping.

In this way you can get quite a fine adjustment of the reaction effect simply by controlling the detector voltage, and this method has the great advantage that it is free from hand capacity.

Howling Troubles.

In a short-wave set you often get trouble with what is called threshold howl, but the above dodge should enable you to use reaction to the full without trouble. It is very difficult, when you are relying upon any method of control which involves hand capacity, to get any very accurate adjustment, because you have more or less to guess what the result will be after you have taken your hand away and keep on trying until you get things right.

Making Screens.

A reader wants to know if there is any simple way of taking the sharp edges off home-made aluminium or copper screens. He says he has tried using a file, but this causes a jagged edge and distorts the screen.

The simplest way is to cut the screen to the desired size with scissors or snips, and then to flatten out the screen very carefully on a flat plate or surface plate (taking care not to hit it hard in any spot, but just gently all over), and then to rub the edges on a piece of sandpaper, the sandpaper being laid flat on a wooden bench and the metal sheet held in the hand.

If the screen is made from a very light-gauge metal you can hold it between two flat pieces of wood, just leaving the edge protruding and rubbing it quite gently on the sandpaper. If the sandpaper is of fairly fine grade you will get a beautifully smooth rounded edge even on quite thin aluminium or copper.

Transformer Tone.

The tone of a low-frequency transformer can be controlled to some extent—hence the name tone-control transformer—by the simple process of connecting a suitable resistance across two of its terminals. Apart from this resistance the component is an ordinary L.F. transformer.

Sometimes this tone-control effect with the L.F. transformer is very useful for counteracting loss in some part of the audio range. For instance, high-note loss often occurs in sets which are very selective, and in such a case this loss can be largely made up by a suitable value of resistance across the L.F. transformer. In many types of tone-control transformer at present on the market the transformer itself includes a special choke, the two being combined together in the transformer case.

Flat Tuning.

In the old days, when there was not the pressing need for selectivity which exists to-day, it was a simple matter to connect the aerial to the grid end of the tuning

(Continued on next page.)

TECHNICAL NOTES

(*Continued from previous page.*)

coil. Nowadays, however, the flatness of tuning which results from this arrangement puts it out of court for most purposes, not to mention the fact that it also gives only a restricted wavelength range.

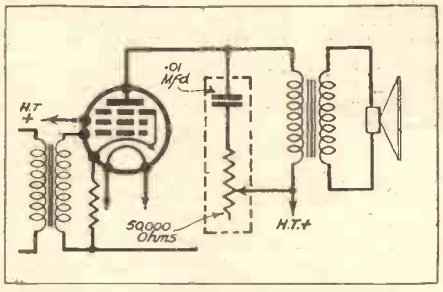
With a single-circuit tuner you can get over this trouble of flat tuning by connecting the aerial to a tapping on the coil, whilst another dodge is to insert a small condenser in series with the aerial. In this latter method the condenser should be variable, but, as it does not need to be adjusted very often, it need not be an ordinary variable air condenser, but should preferably be one of the pre-set variety.

You will thus be able to sharpen the tuning and increase the selectivity of the set, and at the same time increase the wavelength range that you can get with the same tuning condenser, coil and aerial.

Pentode Tone Control.

With a pentode output it is very useful to employ a tone control, owing to the fact that this valve tends to emphasise the higher notes and so produce a tone which

SIMPLE TO CONNECT



A suitable tone control for use on the output of pentode valves. The values shown are usually satisfactory.

some people regard as "squeaky" or high pitched. If a variable resistance and a condenser of suitable values are connected in series with one another, and the combination is then connected across the primary of the output transformer, the tone can be adjusted by varying the resistance.

If the resistance is reduced the higher notes will be weakened so that the lower notes will be relatively strengthened. This tone-control arrangement is shown in the accompanying figure connected across the output transformer primary, and it can, if desired, be connected across an output choke or across the terminals of a loudspeaker which is directly fed.

Detuning Effects

Everyone knows that with many sets you get very bad distortion if you detune ever so slightly, especially when the reaction is pushed pretty well up to the limit. For this reason it is important to have a good slow-motion adjustment with the tuning condenser if you want to get tone and quality.

At the same time, there are cases in which detuning is actually an advantage. A case in point is when you have a powerful long-range set with, say, two or more H.F. stages, when you will sometimes find that

(*Continued on next page.*)

TECHNICAL NOTES

(Continued from previous page.)

on detuning slightly from the exact position you will get an improvement in quality.

This is really a spurious effect, because it generally means that overloading is taking place on one or more of the valves when the desired station is accurately tuned in. In other words, it means that the set is already working under a disability, and the second disability—that is, detuning—tends to counteract the first one.

Overloaded Valves.

If this is the case the proper thing to do is to introduce a suitable form of volume control at some early part of the circuit, and in any case before the detector stage is reached, so as to get rid of the overloading. I should mention that it is not a good plan to use the reaction for the purpose of a volume control in a case like this, nor, for the matter of that, in a good many other cases.

Some people think that reaction only affects the volume, but it can also affect the selectivity. So that if you rely upon the reaction to get rid of the overloading in the sort of case mentioned above you may reduce the selectivity and flatten the tuning at the same time.

It is far better, therefore, to use an independent volume control so that you are free to adjust the reaction on its own.

Using Components Correctly.

I have often referred to the importance of employing a valve—or any other component for that matter, but particularly a valve—under its proper operating conditions. People often use valves for different purposes with little or no regard to their suitability for the purpose in question and without paying any special attention to whether the valve is working under its right conditions. It is really worth while—in fact, it is almost essential—to study the conditions under which the valve is working, because otherwise you cannot expect to get anything like the best performance out of it.

Matching Impedances.

For one thing, the question of the relationship between the impedance external to the valve—that is, in the anode circuit—and the impedance of the valve itself is a very important one, and you will not get the best output from the valve unless these two impedances bear something like the right ratio to one another.

The internal impedance of the valve—that is, the impedance between the anode and the filament—should not be greater than the impedance of the anode circuit, and in actual practice it is found best if the impedance in the anode circuit is at least twice the internal impedance of the valve. When I speak of the impedance in the anode circuit I should say at a *medium frequency*, because if this is a transformer or other inductive component the impedance, as you know, will vary according to the frequency of the currents applied to it.

Low-Note Loss.

You will easily see the importance of this if you consider a transformer in the circuit. If the transformer is a poor one, with too small an inductance in the primary circuit,

(Continued on next page.)

TECHNICAL NOTES

(Continued from previous page.)

the relationship between this impedance and the impedance of the valve will be all wrong—the impedance of the transformer being too small as compared with that of the valve—and you will get a poor output. This will be worse the lower the frequency. It is a well-known fact that a transformer with too low an impedance in the primary will fail badly on the low notes.

Cheap components, especially coils and transformers, are never worth while and should never find a place in a decent circuit layout. The strength of a chain is that of its weakest link, and in the same way the overall performance of the receiver will be limited by the weakest component in it.

Condensers and Frequency.

Talking about impedance reminds me that I have been asked several questions following what I said the other week about the impedance of condensers. You will remember that the impedance of a coil (whether it be a tuning coil, transformer primary, or choke) increases as the frequency of the current increases, whereas the impedance of a condenser does precisely the opposite. If you apply direct current to a choke, no matter what the impedance of the choke may be, it will make no difference to the direct current; and two coils of the same ohmic resistance, but of totally different inductances, will act in the same way so far as direct current is concerned. In fact, direct current may be regarded as alternating current of zero frequency.

Separating Currents.

A condenser on the other hand, acts as an infinite resistance to direct current, but as soon as the current starts to alternate the condenser allows it to pass through. The impedance of the condenser is inversely proportional to the frequency of the current and also inversely proportional to the capacity of the condenser.

Perhaps I should explain that when one quantity A is *inversely proportional* to the other quantity B, it means that as A goes *up* so B goes *down*, and in the same ratio.

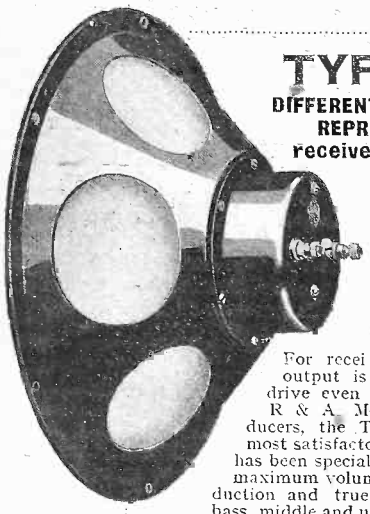
ED LAST!

There is an R & A Reproducer for *your* receiver

day

Separate Models for the most popular output stages have been produced, each of which is fitted with the Transformer specially designed to operate with maximum efficiency. As a result the finest possible quality in reproduction combined with maximum volume is assured.

Choose an R & A and be SURE of success.



TYPE 60

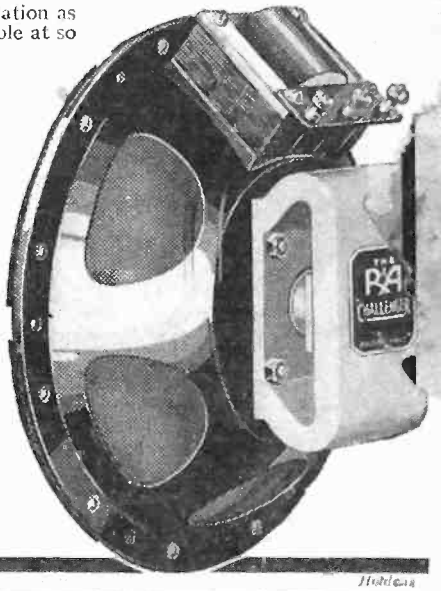
DIFFERENTIAL ARMATURE REPRODUCER for receivers employing small power valves.

PRICE **21/-**

For receivers in which the output is not sufficient to drive even the super-sensitive R & A Moving Coil Reproducers, the Type 60 offers the most satisfactory alternative. It has been specially designed to give maximum volume, purity of reproduction and true balance between bass, middle and upper register when used in conjunction with even the smallest output valve.

The famous 'CHALLENGER' series of P.M. Moving Coil Reproducers.

This reproducer has a world-wide reputation as the finest instrument of its type obtainable at so low a price.
Quality of reproduction leaves nothing to be desired and its robust construction ensures a long life of trouble-free operation.



Standard Model for use with Super Power and Pentode Outputs. Includes 3 ratio Transformer.

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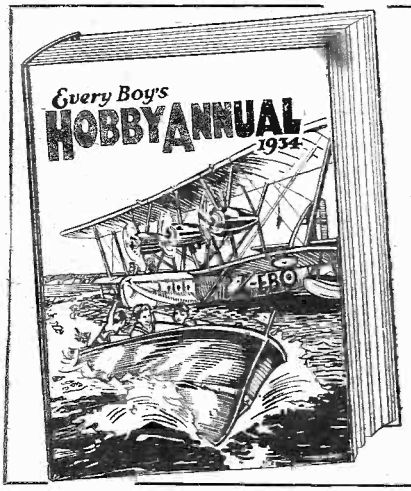


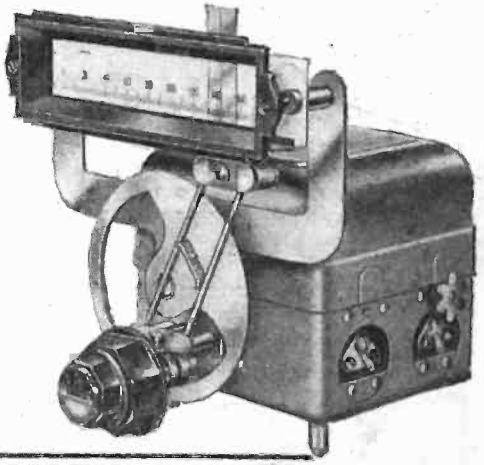
The Most Up-to-Date Book for the Boy with a Hobby!

If you've a hobby—and who hasn't?—there's no better book for you than EVERY BOY'S HOBBY ANNUAL. It's simply crammed with "How To Make" and "How It Works" articles. There are talks about mechanical marvels and hobbies, and hundreds of illustrations including two large photogravure plates.
Model railways, wireless, woodwork, ships, aeroplanes, motor-cars and stamp-collecting are just a few of the many subjects which are dealt with.

Every Boy's HOBBY ANNUAL

Now on Sale at all Newsagents and Booksellers - - - - - - - 6/-

Whatever the circuit, the experienced constructor will always choose "J.B." For tuning iron-cored coils, in particular, the accurate matching found in J.B. Gangs becomes imperative; and the mechanical rigidity of "J.B." *ensures the permanence of this matching.*



Illustrated is the new J.B. LINATUNE with one trimmer panel—operated by a knob concentric with the main tuning control. It is fitted with the new J.B. Straight-Line Dial, the whole scale being always on view and illuminated by a lampholder which travels with the cursor.

Prices (with cover) 2-Gang . . . 22/6, 3-Gang . . . 27/6

PRECISION INSTRUMENTS

THE NEW J.B. LINATUNE GANG

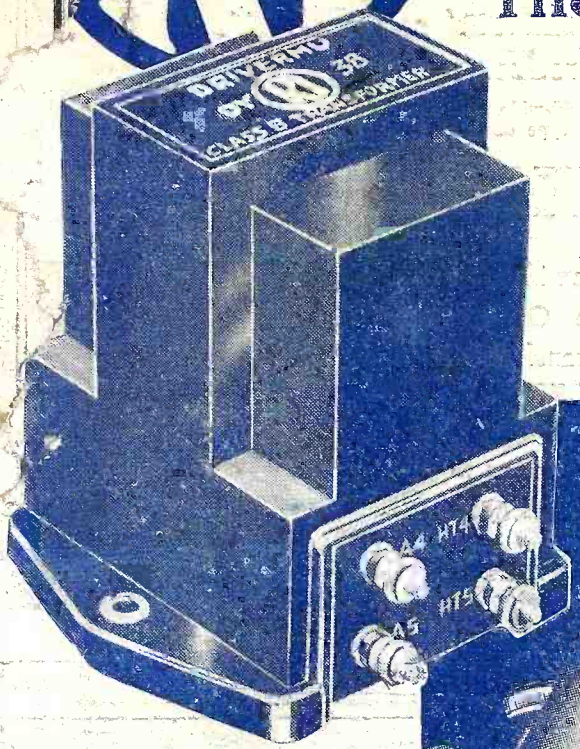
Advertisement of Jackson Bros. (London) Ltd., 72, St. Thomas' Street, London, S.E.1 *Telephone: Hop 1837*

R.I. BIG THREE for 1933-1934

The Something New—

The Something Better in Radio

In the L.F. and H.F. stages, R.I. have developed components that are literally miles ahead in design and general efficiency. They cover the important fields in radio in which real progress could be made. The introduction of Quiescent and "Class B" components, the Auto-Parafeed transformer and the Micrion coil comes at the crucial moment when tuning and amplification efficiency together with increased selectivity are most needed.



DRIVERMU CLASS 'B' COMPONENTS

The "Class B" system of amplification has been more fully developed by R.I. as far as suitable components for the particular valves are concerned. This fact, and the lucidity with which R.I. have described the system and made it exceptionally easy to understand in their brochure, have made R.I. "Class B" components the inevitable choice of the experienced constructor and the best for the beginner.

With the correct R.I. "Drivermu" Transformer and the R.I. "Class B" Output Choke, perfect reproduction with all-mains quality from your existing or new battery set is both inexpensive and easy. With R.I. components, you know you will get the best results for the least expenditure.

R.I. "Drivermu" Transformers are priced at 15/- and 11/- (plus 1/6 royalty) and the choke at 12/6.

MICRION COIL

Employing the new **POWDERED IRON CORE**, the "Micrion" has revolutionised tuning, and so much does it improve range and selectivity that every existing dual-range coil is superseded.

The "Micrion" is the only dust iron-cored coil with Micrometer adjustment on both medium and long waves and it enables replacement of the existing coil without interfering with calibration.

List No. B.Y.36. Actual size 2¾ x 2¾ x 3 ins. high. **12/6**

AUTO-PARAFEED

This latest development of the famous R.I. Parafeed System is an amazing transformer giving increased connection facility and efficiency in Parallel Feed Amplification.

The maximum variation of L.F. gain produced by this transformer as measured by the new Decibel method is about 2 Decibels only—**a variation inaudible to the human ear.** This means that every note and every sound may now be reproduced more perfectly than ever before with a complete absence of distortion.

Primary inductance 84 henries. Ratio 1 to 4 (auto-connection). List No DY.45. **6/9**

The literature for all these components are masterpieces of simple explanation and clear instruction: Ask your dealer for them or write direct to R.

The Advt. of Radio Instruments Ltd., Croydon, Surrey. 'Phone: Thornton Heath 3211.

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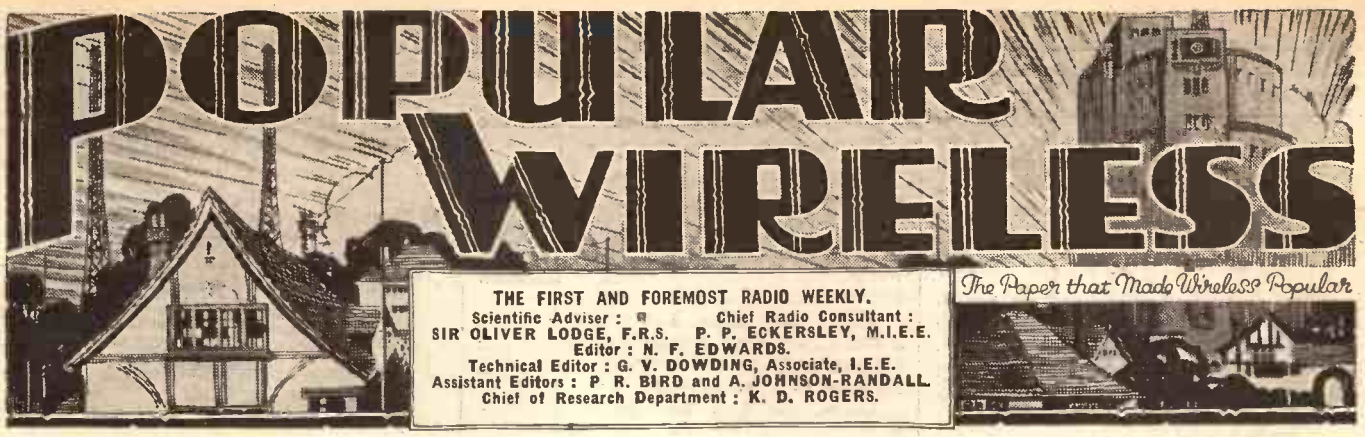


VETERAN OF RADIO JERUSALEM "ON THE AIR" A SIXTY-TON AERIAL SEASONAL POINTERS

RADIO NOTES & NEWS

CROSS-TALK COMEDIES COST OF THE B.B.C. ORGAN IMITATING ANIMALS RADIO REALISM

The Oldest Announcer.

WE have all heard about those claims to be the world's youngest licensed radio amateur—the latest favourite, I believe, being a nine-year-old American youngster. But who is the world's oldest announcer?

The manager of the San Francisco station, K F R C, is one claimant. He broadcast telephony from his own home-built station as far back as 1920, and he says there is nobody now broadcasting regularly who was on the air before him. Any contradictions?

On Five Metres.

DR. CECIL G. LEMON, of Hammersmith, tells me that he has been experimenting with 5-metre telephony and would welcome reports.

His station is G 2 G L, situated at 72a, North End Road, W.14, and tests are also carried out on 42·2 metres.

A schedule on 5 metres was kept between 11.00 and 11.30 a.m. on Sunday, September 3rd.

Did any reader of these notes receive Dr. Lemon's signals?

A Station for Jerusalem.

"IS it true that there is to be a broadcasting station at Jerusalem in the near future?" asks a Kensington reader.

Surprising as it may seem to think of the Holy Land as a broadcasting centre, the answer is "Yes." Jerusalem is to work on 449 metres, and although the station is not yet built the plans were sufficiently well advanced for the wavelength to be allotted under the Lucerne Plan.

Will They Co-operate?

ONE of the most interesting little behind-the-scenes dramas of broadcasting in Europe is that in connection with that last Wavelength Conference at Lucerne.

It will be remembered that, although most of the countries signed on the dotted line, several—including Luxembourg and Holland—shrugged their shoulders and refused.

So the Conference closed under a bit of a cloud, though everyone was very sure that these Bad-Boy countries would soon come round and join in the new Plan. But will they? Rumour is very busy about it, but time is getting on, for the Plan is supposed to come into operation on January 15th.

On 517 Metres.

A READER sends me from Vienna some interesting particulars of the new Bisamberg station in that city, now heard regularly on 517 metres.

It is one of the first stations in Europe to follow the American plan of using a huge metal mast or tower to form the aerial, the height being calculated to give the desired wavelength.

Bisamberg's "aerial" weighs about sixty tons, and on the top are rotating light beams which serve as a warning to night-flying airmen.

News in Brief.

THE Monte Ceneri station (Switzerland), which had been borrowing Kalundborg's wavelength, 1,153·8 metres, has temporarily suspended operations at the time of writing.

"B.B.C. song-and-dance girls in uniform are a certain development of vaudeville of the near future."—Official B.B.C. announcement.

The League of Nations radio equipment is proving a great success, for not only is it reliable but the cost compares very favourably with that for communications on the old system.

It's a Gift.

TO receive a present consisting of a complete broadcasting station must surely be a unique experience.

It happened recently to the Queen of Bulgaria, and the donor was the city of Rome, which has always had a warm corner for the Queen. She is a daughter of the King of Italy.

"Sensitive Brazilian Police."

TWO or three weeks ago I lightly mentioned the "bobbies" of Brazil in these Notes under the above heading; but now I see that levity might have been a little misplaced, for it appears they are a remarkably up-to-date and alert body of public servants.

Rio de Janeiro thinks so, anyway, for news has got round that the central police station there is now in constant wireless touch with the marine police, vessels in the harbour, provincial police stations and motor patrols. Escaping malefactors had better think twice before attempting to dodge the law "way down Rio."

The Signs of Autumn.

"KONKERS" on the ground and falling leaves are not the only signs of autumn which I notice. Invariably at this time of the year I get amongst my letters a big Tick-Off!

This year's comes from Aldershot, and it rather resembles the livelier parts of an Aldershot Tattoo. Sparks and flashes and crashes and all that, emanating from an irate gentleman who signs himself "M. D."

An Unexpected Tribute.

THE chief trouble with "M. D." is that he doesn't like radio plays and writes very clearly, so his inmost thoughts about them are revealed with crispness and startling clarity. (He uses a lot of those good old-fashioned English words that are too well known to put in the dictionaries!)

Having worked off all his venom, he very

(Continued on next page.)

WHAT THEY ARE SAYING—

Static, by the way, should be quieting down a little by now. (See page 4.)

* * *

The properly designed permeability-tuning circuit gives . . . . . the same substantially constant performance . . . . . as a superheterodyne. (See page 7.)

* * *

I also throw "hot breaks" . . . . . into the jazz, harmonise with crooners and, in general, thoroughly enjoy myself. (See page 10.)

* * *

. . . . . even the "Ghost in Goloshes" cannot hide the defect. (See page 13.)

* * *

. . . . . with the ridiculously inefficient aerial in the car, telephony . . . . . could be perfectly well followed while driving through thick traffic. (See page 24.)

ARIEL CONTINUES HIS RUNNING COMMENTARY ON RADIO

unexpectedly adds this postscript: "P.S.—That 'Airsprite' was a good set." Very handsomely said, considering his worked-up state of mind. And about the only sentence of an interesting letter than can be reproduced without censoring!

She Should Go Far!

BILLY MERRIN, who has been broadcasting with his Commanders lately from Nottingham, says that he received a letter from a lady who enclosed a bill for four and a kick. This business woman explained that in his haste to switch on to B. Merrin's Commanders her son upset a cup of cocoa over the best tablecloth. The four and sixpence was for cleaning.

Yes, she should go far—even on cocoa! I never heard of such a chap as Billy. He answers personally every blessed letter he gets, and has sent out over 20,000 photographs of his band. Colossal! How the P.M.G. must love him!

A Broadcast Mix-up.

WHEN Radio Paris was broadcasting a commentary some weeks back listeners were surprised to hear a strange voice butt in and order some wine, owing to a telephone line mix-up having occurred at the Exchange.

The most famous case of this kind was in America several years ago. On that occasion a children's programme got mixed up with a crook drama, with the result that when somebody piped, "Why did the fairy prince disappear, then?" a deep voice answered, "Ha! He knew I'd sock him under the jaw if I caught him hanging around, the big stiff!"

Photo-Electric Cell Devices.

TWO new uses for photo-electric cells have just come to my notice. After January 1st, 1934, all lorries in Paris are to carry a selenium cell at the rear, connected by an amplifier to a bell near the driver. When a motorist wishes to pass the lorry he shines his headlight on the cell and the lorry gets out of the way.

Again, an enamelling firm in the States has equipped with a photo-electric relay control a conveyor which carries the prepared ware to and through the enamelling furnace. As the ware travels the operatives apply a beading, and if they miss a piece, or if the beading happens to fail, as soon as it reaches the control the current is cut off and the conveyor stopped.

Five Thousand to Four!

THEY say that Reginald New, who now broadcasts on the Regal organ from Kingston-on-Thames, has received from listeners only four letters of criticism to five thousand of appreciation!

He was organist and choirmaster at the age of fifteen, got a cinema job when he was sixteen, and played his first electric organ long before he was twenty.

Listen for him on Tuesdays from Kingston, and you'll hear why they generally gave Reginald the jobs he asked for.

Those High Frequencies.

ACCORDING to a report from the States, a New York radio engineer who was standing near a transmitter found his ring getting uncomfortably hot on his finger, and investigation showed that this was due to eddy currents!

It is well known that metals will melt in a high-frequency "furnace," where they come under the influence of the powerful, rapidly-changing magnetic fields. But it has been rather overlooked that a similar effect might be experienced with ultra-short-wave wireless.

SHORT WAVES

"Over £26,000,000 worth of orders were taken at the Radio Exhibition," we read in a daily newspaper.
Very "sound" business.

* * *

ENDURANCE TEST.

Following the suggested broadcasts by party leaders, it is proposed that the Parliamentary debates should be broadcast.
If wireless can stand that, it can stand anything.
"Birmingham Daily Mail."

* * *

"And what kind of radio do you call this?"
"Scotch, of course. You simply can't get anything out of it."

* * *

"Radiolympia breaks all its records," runs a headline in the "Evening News."
We only wish the people next door would follow the example.

* * *

HE'S GOT IT.

"Dear, I believe I've got sciatica."
"I can't see what fun you find in getting those foreign stations."—"Yorkshire Evening News."

Broadcasting House "Extravagance."

TALKING about organs, that rumour about the Broadcasting House new organ having cost £20,000 of listeners' money is still going round. But it is quite unfounded, and the B.B.C. has officially contradicted it.

Progress at Belfast.

I HEAR that the B.B.C. have engaged the services of a well-known Irish architect to assist in preparing the plans for the extension of the B.B.C. premises in Linenhall Street, Belfast.

The extension is to be a most ambitious affair, too, I believe, and will be used in connection with the proposed high-power regional station for Northern Ireland.

How this B.B.C. does grow! It doesn't seem long ago when I was being conducted over what was then a "large new extension" of the studios at Belfast by a proud official.

Not News.

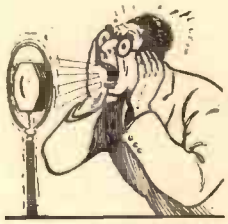
FROM America it is reported that a man has equipped his bicycle with radio.

He is, however, by no means the first to do so. Some ten years ago we published a photo of a "P.W." reader who did that.

But I haven't yet heard of a centenarian riding a scooter fitted with wireless!

The New Profession.

ADVICES from America show that, with their characteristic impetuosity, would-be American radio favourites are making an intensive study of the art of imitating animal, bird and other sounds. After mastering the noises of some twenty living things a student complains that his observation of a lion's roar is rendered difficult because when one lion roars the others join in and jam him.



Another aspirant, who was evidently near success, was heard to boast that he was going to have an audition on his No. 9 wolf howl!

Many Thanks!

THE radio correspondent of the "Hunts. Post" say: "We shall presently retrace the journey until, without any set whatever, we listen to the gambols of the planets and the whisk of inter-stellar spaces. But to think what has been done in *popular wireless* affords admiration enough without jumping into the future."

My italics. I like to believe that the absence of capitals in those two words is a printer's error!

One Heart that Beats for Millions.

WHEN they broadcast E. A. Poe's thriller, "The Telltale Heart," in America they actually amplified the sound of the heart-beats which were the private property of an announcer—a bit of finished American showmanship which must have fully conveyed the horror of this classic of the macabre.

A more prosaic and useful thing is being done by the Marconiphone Co., which is supplying records of characteristic heart-beats to hospitals for use as standards.

This idea came to them after they had designed an apparatus for transmitting patients' heart-beats over the telephone to the doctor.

ARIEL.

The IMPORTANCE OF THE ANNOUNCER

The recent appointment by the B.B.C. of its first woman announcer has focused public attention on the owners of those familiar voices which keep us informed of the programme's progress. Our distinguished contributor here champions the cause of the announcer and firmly establishes him (or her) as "the pivot upon which the whole of the programme mechanism turns."

A FEW nights ago I had the pleasure of listening to the B.B.C.'s woman announcer, and I recalled with some amusement the time when I pleaded for this innovation—and was denied!

Two reasons were given for this refusal. It was thought unsuitable that a woman should be employed late at night in the lonely studios and dreary corridors of Savoy Hill. There is an element of humour in this excuse!

But with the other reason I was obliged to feel a certain sympathy. It was the difficulty of finding at that time a woman with the necessary qualifications who was free to take up the work.

MRS. GILES BORRETT

whose appointment as the B.B.C.'s first woman announcer is responsible for the present interest in the job of broadcast announcing.

I had to admit that most of the voices of the women employed as speakers by the B.B.C. were dull at the best, and at the worst so unpleasant as to excite derisive comment.

Harsh and strident, over-modulated, terribly affected, patronising and didactic in tone when not dull and commonplace, I agreed with most critics in those early days that it was difficult to give ear to a woman speaker. Indeed, I can remember only one woman's microphone voice with pleasure—I mean of those regularly engaged—and from it I learnt very much about a garden!

Impossible to Criticise Immediately.

I will not express a too-definite opinion about the new woman announcer until I have heard her often. One must live with a "voice" for some time before one can appreciate all its worth; but I must say this: that unless practice makes a difference the much-advertised woman announcer is not likely to be anything like as good as at least three of the anonymous male voices to which we have now become happily accustomed.

Qualification Alone Should Count.

My advocacy of a woman announcer for the National programmes was not due to feminist bias. During the days when I was a peripatetic apostle of the gospel of woman suffrage I never used the argument of WOMAN QUA WOMAN. I am not now for opening doors to women because they *are* women, but I am against closing them to women because they *are* women.

In other words, if amongst women there are some with gifts for a particular service as good or better than those of men I am all for these gifts being used, even in those spheres which have been the close preserve of men.

I wish the new announcer well. At the same time, I hope no man was displaced to make room for her, and I hope that she came to the B.B.C. with the goodwill of the general body of announcers after they had been informed of the Board's new policy.

An Apprenticeship.

It was the custom in my time to give the new announcers a trial trip of some months before definitely appointing them, and the salary was much less until the appointments had been made. This was perfectly right and reasonable, and I presume that some such apprenticeship is being required of the newcomer. There was no special quality in the announcement I heard her make which would warrant exceptional treatment. Jack and Jill should be served the same way, and it is surely not possible that the B.B.C. should do otherwise.

I have often wondered if listeners really appreciated how important is the work of the announcer. Some people seem to classify him with the showman and the auctioneer, or even the railway porter shouting the names of the stations. He is, as a matter of fact, the pivot upon which the whole of the programme mechanism turns.

I never was satisfied with the way he is treated, nor am I now with the status accorded him.

Just think for a moment of the qualifications required of the perfect announcer. He must, of course, be well educated and a gentleman—by which I mean a man full of gentleness and courtesy, with infinite patience, tact and charm.

Coolness An Essential Attribute.

He must not only possess a personality pleasing to the vast public he addresses, but be forceful enough to keep on good terms with his colleagues and to carry on imperturbably under the many harassing mischances of his particular job.

A singer comes late, or forgets to come; a manuscript is lost at the critical moment; an artiste collapses through nervousness; the type of a notice is blurred or incorrect, and he must interpret or correct it at once; the wrong programme is picked up—all these and a score of other accidents which call for swift decision and cool handling on the instant are the business of the announcer, who must keep his listeners

(*Continued on page* 30.)

A LAST-MINUTE MESSAGE

The reading of the news bulletin in such a way as to invest every item with interest and attraction can justly be called an art. Especially, as is happening here, when the announcer is interrupted by the News Editor with "a late news item which has just been handed to me."

Short-Wave Notes By W.L.S

WHEN I described the now-famous single-valve short-wave set, quite a long time back, I did not dream for a moment that it was destined to become so popular. I had always held the view that a single-valver was a beautiful receiver for headphone use, especially when one was keen on the reception of all these tiny little signals that mean real DX records.

But I have *never* said—either verbally or in print—that the single valve was the one-and-only all-purpose short-wave receiver that was any good! That is what I am accused of believing—if not saying—by a reader who disagrees most violently with my supposed hypothesis.

It must be clear to all listeners, even if they have had no previous experience of short-wave work, that headphone reception and loudspeaker reception are two things quite apart. For loudspeaker reception on short waves we want *volume*, pure and simple, allied, naturally, with selectivity and ease of operation.

The Guilty Component.

For headphone work this volume is the last thing that we want. The main requirement, after ease of operation, is silence of background. If we use a noisy two-valver with headphones we invariably find that signals are easier to read, and stations easier to listen to, with the volume control slacked back quite considerably.

Why use a noisy set and throttle it down with a volume control? Surely it is nicer to use a single-valver going "all out." Those were my ideas when the single-valver first saw the light. They are still my views, but I am always working hard at the problem of increasing the strength of the stations without increasing the background. Experiments during the past week have absolutely convinced me that the L.F. transformer is one of the chief causes of our "background" trouble.

Dealing With "Mush."

The designer of one of the best-known high-quality transformers on the market told me that he realised this. It is no slur on the transformer—strangely enough, it is a proof of its excellence. Its response curve, if not flat, is at any rate "alive" over such a huge range of frequencies that our "mush," which is a composite mixture of practically every frequency that one can think of, is amplified beautifully.

By means of "faked" transformer or resistance coupling one can cut off a lot of the mush without apparently spoiling the quality of the station one is listening to.

The method I prefer is the installation of some form of "tone control" across the primary of the L.F. transformer. Resistance-capacity coupling can easily be "faked" by changing the values of the three variable components—anode resistance, grid condenser and grid leak.

As a matter of fact, however, I am rather apt to sympathise too much with the amateur who has cultivated a knowledge of Morse code and spends a lot of time listening to amateur C.W. signals. The "mush" problem, for him, is far more serious than it is for the short-wave broadcast listener.

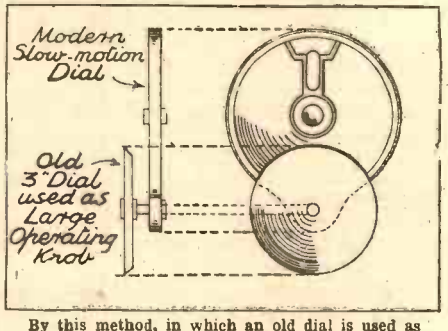
Our popular short-wave expert deals with the current topics of this fascinating band, and gives the latest news about stations, conditions, wavelengths, etc.

The ideal C.W. receiver and the ideal telephony receiver are two things as far apart as the Poles; but unfortunate people like myself have to try to make one set do both jobs as well as possible.

MAKING TUNING EASIER

EVEN the modern slow-motion dial is not always good enough for really easy tuning on short waves. Luckily, there is an easy method of increasing the apparent step-down ratio on most of them, simply by removing the actual tuning-knob and substituting something much larger for it.

AN OLD DIAL IS USED



By this method, in which an old dial is used as a large tuning knob, the dial ratio is apparently increased.

One of the old-fashioned 3-inch knobs and dials does very well, the dial only being used, with the flange turned *inwards*. Most of these old dials were designed for use with threaded spindles, and will often screw directly on to the spindle on which the knob of the modern slow-motion dial is mounted. A lock-nut and some form of packing may be necessary, but this is easily arranged.

This week I have been trying out no fewer than four receivers. The single-valver was an easy winner for C.W. work; but the best of them all for broadcast was a two-valver which was, in effect, the "single" followed by a resistance-coupled pentode. More of this later, when I have settled one or two small points in my own mind.

"Filling" the Headphones.

The letters that I receive regularly, giving reception details of all sorts of new stations, are still showing a pronounced "holiday" atmosphere. People are just beginning to think, however, of settling down to short waves again for the autumn, and it is just as well, for this reason, that conditions are so good at present.

Last night I logged W 8 X K and W 1 X A L on 25 metres at better strengths than I have ever heard them before. W 8 X K, on one valve, "filled the headphones"; two valves really made them rattle. I noticed, too, that G S B on 31 metres was enormously strong for some reason or other. The Empire stations all seem to be modulating very fully indeed nowadays.

An Excellent Log.

"A. M." (Glasgow) wants identification of a station heard between 8.30 and 9 p.m., just above Zeesen (19·73 metres) and talking in Spanish. I can only presume that this was the Mexican station, X D A, on 20·5 metres. It might conceivably have been the low-powered T I–4 N R H at Heredia, Costa Rica, but I should think X D A the more likely of the two.

T.S. (Staffs) informs me that C T 1 A A is going strong on about 19·85 metres on Saturday afternoons. I haven't heard him yet, as Saturday afternoon is a time when I am usually "off the air."

"W. G. M." (Southampton) sends in an interesting list of stations. He finds W 8 X K on 25·27 metres the most consistent of them all, with W 2 X A D on 19·56 a good second. Like myself, he finds W 8 X K on his other wave of 19·72 rather disappointing.

An excellent log from "H.B." (Hull) seems to include almost anything that one *can* hear nowadays. He asks for my confirmation of "almost continuous static" on 40 metres. I can't give it, because that has not been my experience, although on one or two thundery days during the last heat-wave but three (unless I have lost count!) I certainly did note a lot of noise on that band.

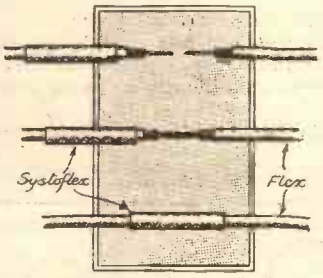
Good-bye to Static.

Static, by the way, should be quieting down a little by now. We have had rather a lot of it this summer, although we short-wave fans are quite "spoilt" by the relative absence of *real* static in our particular preserves. Go up on 1,600 metres now and then if you want to realise just what we miss.

There is no doubt about it, we short-wave listeners *do* score from the point of view of atmospheric disturbances. That is, of course, one of the reasons why commercial communication systems have almost universally adopted the short waves. They used to work on 20,000 metres or so, and if ever you get the chance, try "copying" Rugby up there on a hot summer's evening!

A NEAT JOINT.

TO make a neat joint in flexible wire, especially if adequate insulation is required, is not quite so simple a job as it appears at first sight.

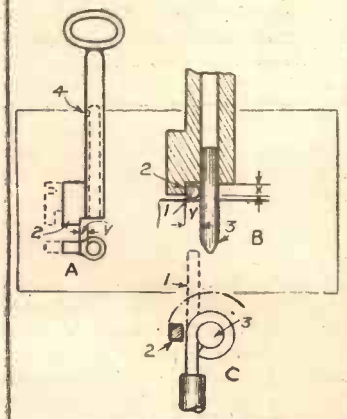


A joint that won't cause shorts.

The illustration shows a neat and effective method which has the advantage of simplicity. After baring the wires which are to be joined together, a piece of systoflex about 1½ inches long is slipped over one piece. The wires are then joined, either by twisting together or soldering, and the systoflex "sleeve" is pulled over the joint. Choose a piece of systoflex that fits fairly tightly over the flex, so as to prevent any possibility of its moving after it has been drawn into position. If a choice of colours is available, a coloured systoflex that matches the flex wire will be found to make the joint remarkably inconspicuous.

A NOVEL LOOP-MAKER.

HOW often do the minutes lost take a large slice out of an evening when building a new set, and all because a simple operation will just not go right first time and every time! How many names have the pliers had, and how often is the right gadget at hand!



Ensures non-slip connections.

Here is one that solves the difficulty once and for all, and you may carry it on your key-bunch for all emergencies.

The essential part of an ordinary key required is shown full in Fig. A and in section at Fig. B (the remainder shown dotted need not be discarded unless in the way). Part X is filed away to a depth slightly less than the diameter of the wire. Distance Y is just a shade more than the diameter of wire, and (2) is slightly rounded to give easy sliding.

The pin (3), Figs. B and C, may be a small nail slightly greater in diameter than the terminals to be fitted, and should be a good fit within the key. It can be knocked into a bench or a block of wood, or held in a vice. When not in use it may be pushed up the keyhole and kept in place with a small plug of cork or wood, etc. A small hole (4), Fig. A, is required to allow the air within keyhole to escape when pin (3) is inserted.

(1) Figs. B and C show the wire held in position for looping (a mark being made to indicate required length), and, with a slight, even, downward pressure of key on wire, twist, and there is the loop in a moment.

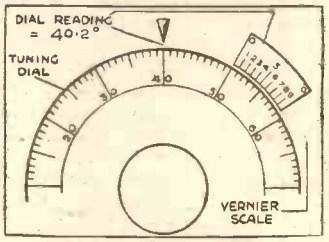
FIXING ANODE TERMINALS

I AM sure many readers have had the misfortune at times to find that the anode terminal of their screen-grid valve has come loose. I have found that a successful way to fix it on again is to mix one part of gum arabic, which has been previously powdered well, with about two parts of plaster of paris, and make into a paste with water. The top of the valve should be well cleaned with either methylated spirits or turps and the paste applied pretty thickly. On allowing to stand, the top will adhere quite fast and the excess paste can be chipped off carefully. The paste forms quite a good adhesive for most polished surfaces such as glass or ebonite.

VERNIER READINGS.

FOR receivers, especially short-wavers, fitted with large circular dials, an ideal vernier can be made as follows:

Cut a piece of paper or white ivorine the exact size or length of *nine* divisions of the main tuning dial. Divide this into *ten* equal divisions and number them 1 to 9. Mark each end line 0.



Scientifically accurate calibration.

Now set the dial to some number (it does not matter which) and fix the vernier scale to panel, very close to dial, with the first line, marked 0, dead in line with another number on tuning dial. Again it does not matter which number is chosen.

If a station is now tuned in at a position between any two divisions of the tuning dial, refer to the small vernier scale and it will be found that one of the *numbered* lines will be in a direct line with one of the marks on the tuning dial. The reading can now be taken to one decimal point. In the sketch the dial is set at 40·2°.

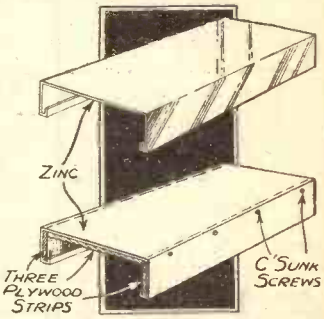
CHEAP SCREENS.

IT is not generally known that sheet zinc can be used in place of aluminium for screening purposes with good results.

Unlike foil, it is rigid enough to stand unaided, yet can be easily bent to the desired shape; it can be soldered, cut with a pair of scissors, and is cheap.

Zinc can also be used in place of copper foil over or under a baseboard with equally good results.

To improvise a metal chassis, a piece of ¼-in. three-ply wood is screwed to each side of a baseboard (screw heads countersunk) and covered with zinc bent to shape (see sketch).

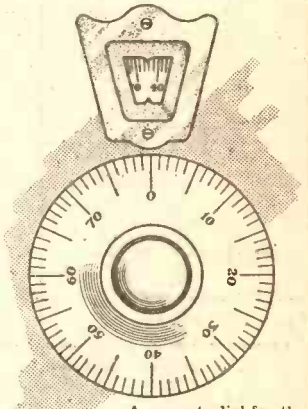


As good as an expensive metal chassis.

To bend the zinc straight, clamp between two pieces of wood with straight edges. Screws fixing the components will hold the zinc in place. A coat of aluminium paint may be given to improve the appearance.

MAKES LOGGING EASY.

DIAL figures, generally, are so cramped together that it is sometimes hard to distinguish between the readings of neighbouring stations, even with a "hair-line" sight.



A separate dial for the slow-motion control.

However, if a non-slip slow-motion drive is employed, this can be provided with a dial of its own, to analyse, vernier fashion, the reading of the other. The dial may be made from a disc of pasteboard or drawing-paper; glued on the back of the control knob. The larger the radius, the better.

Get a reading within one degree on the original dial or drum, then note the setting of the supplementary dial when the station is sharply tuned-in. Some point of the escutcheon will readily serve as a mark for the secondary reading; if not, a pointer can easily be fixed under the plate or under the screwhead.

ONE GUINEA FOR THE BEST WRINKLE!

Readers are invited to send a short description, with sketch, of any original and practical radio idea. Each week £1 1s. will be paid for the best Wrinkle from a reader, and others will be paid for at our usual rates.

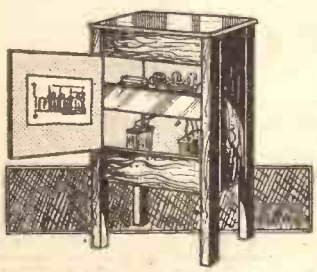
Each hint must be on a separate sheet of paper, written on one side of the page only. Address your hints to the Technical Editor, "Popular Wireless," Tallis House, Tallis Street, E.C.4, marking the envelope "Recommended Wrinkles."

Will readers please note that the Editor cannot, in any circumstances, guarantee to return rejected Wrinkles, and that payment for published hints is not made until ten days after they appear.

The best Wrinkle last week was sent by Mr. A. Hepworth, 57, Brunswick Street, Wakefield, Yorks, to whom a guinea is being awarded.

EVER-READY WIRING GUIDE.

THE home constructor, when making up a new set, usually works from a circuit and wiring diagram. When the set is working satisfactorily, the circuit from which it was wired is all too often put away somewhere "for safety" and promptly forgotten! Consequently, when the time arrives to alter or repair the set, the necessary wiring guide is not easy to discover.

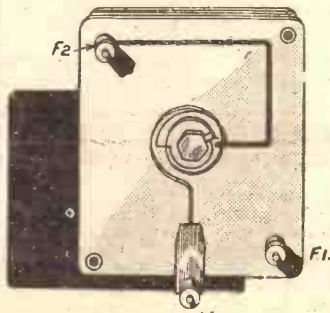


A guide to home servicing.

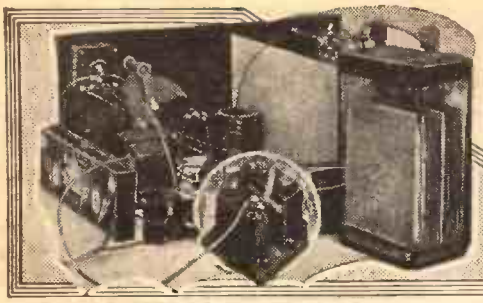
A good idea, therefore, is to cut the circuit out of the periodical in which it was published and pin or paste it on the back of the cabinet—inside if it is possible. In the event of the set not having been made from a published design, it is a simple matter to draw an intelligible circuit on thin paper, preferably with Indian ink and paste it in position.

MODIFICATION FOR A.T.B.

THE piece of stiff wire is shaped as shown and fastened firmly under the nut of F.2 terminal and adjusted so that the bottom bent portion just makes contact with the tongue on the moving plates, care being taken to see that the pig-tail is always clear, otherwise the "short" will take place before the desired point is reached.



The condenser is not damaged in any way.



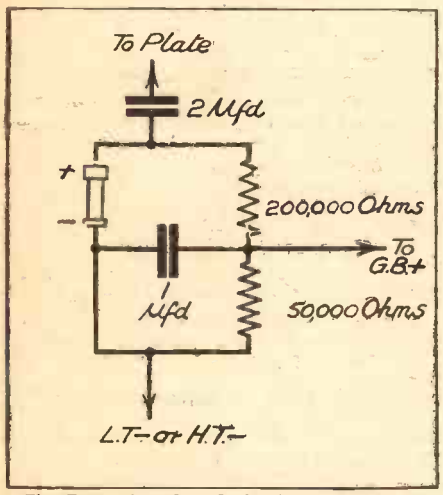
AN H.T. ECONOMISER

In this article we show you how to construct an inexpensive, money-saving unit which can be added to any normal battery set, enabling full programme volume to be obtained with remarkable economy in H.T. consumption.

YOU can add this little gadget to practically any battery set and save H.T. without in any way affecting either the quality or volume. Sounds too good to be true, doesn't it ?

Yet it is an absolute fact. And the saving is not a mere fraction of a milliampere, either ; with a fair-sized power or pentode valve it may be as much as five or six milliamperes, and even with a small-power valve it will certainly be three or four, if not more.

VERY INGENIOUS



The Economiser depends for its success upon the ingenious use of the Westector "cold valve," which rectifies a small proportion of the plate-circuit energy, this afterwards being applied to the grid of the valve.

The principle which enables this wonderful economy to be achieved is a quite new one, and depends for its success upon an ingenious use of the Westector "cold valve."

As you will see by the accompanying theoretical diagram, the Economiser unit is connected between the plate of the output valve of the set and L.T. negative, with a branch going to the positive terminal of the grid-bias battery.

The operation of the device is very pretty. A small proportion of the energy is diverted from the plate circuit through the 2-mfd. fixed condenser and rectified by the Westector.

The voltage thus obtained is then applied to the grid of the valve in opposition to the grid-bias battery.

How the Unit Works.

Now you will note that the greater the volume the more the energy which is diverted through the unit (although it is never enough to affect the volume) and the greater the opposition grid bias provided by the Westector.

The valve is originally over-biased. That is to say, much more grid bias is applied with the grid-bias battery than normally.

The effect of this is greatly to reduce the H.T. current. And while there are no signals during programme intervals, or only very weak ones during quiet passages of music, this over-biasing has no effect on quality.

But the bias is reduced automatically in proportion with the strength of signals by the increasing opposition voltage of the Westector as signals increase in loudness.

So, like "Class B," only in a different manner, the H.T. current consumption keeps pace with the volume.

The Economiser can be added to any normal battery set, as we have said, and it need not necessarily be connected up as a unit. Its component parts can be tucked on to the baseboard at convenient points and connected permanently.

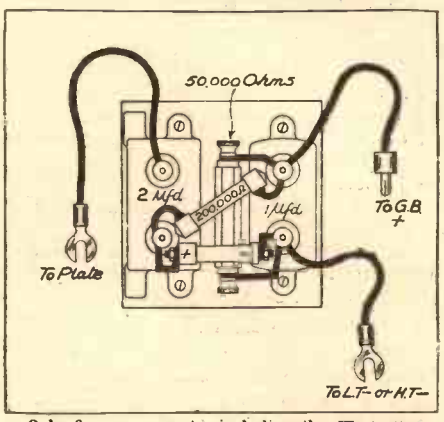
So we feel it unnecessary to give detailed constructional details, and in any case there are only the two condensers and two resistances and the Westector to be wired up.

But join that 2-mfd. fixed condenser direct to the plate terminal of the power valve holder just in case you have a filter choke or transformer output that might be overlooked !

And make certain you connect up the Westector the right way round. The scheme

(*Continued on page* 29.)

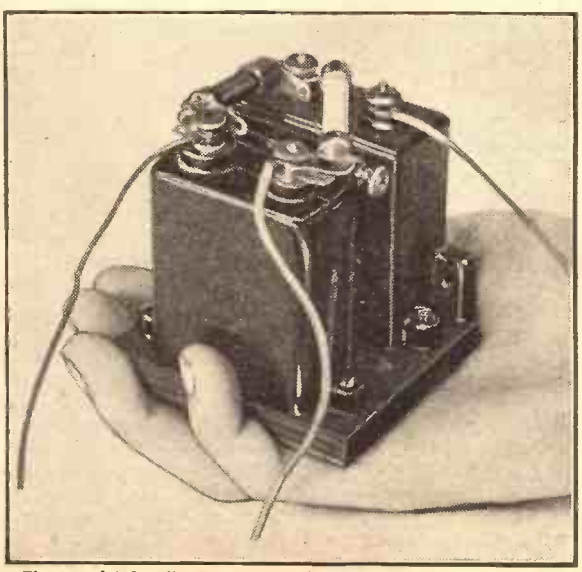
EASILY CONSTRUCTED



Only five components, including the Westector, are required for the construction of the unit, and the connections are simplicity itself.

THE PARTS YOU WILL NEED

Component	Make used by Designer	Alternative makes of suitable specification recommended by Designer
1 "Westector" metal rectifier	Westinghouse W.4	—
1 2-mfd. fixed condenser	T.C.C. Type 50	Ferranti, Telsen, Lissen, Dubilier, Igranic
1 1-mfd. fixed condenser	Dubilier Type BB	Lissen, Igranic, Telsen, T.C.C., Ferranti
1 200,000-ohm resistance with terminals or wire ends	Dubilier 1 watt	Graham Farish
1 50,000-ohm resistance with terminals or wire ends	Graham Farish "Ohmite"	Dubilier
Wooden base 3" x 3", connecting wire, screws, flex, etc.	Peto-Scott	—



The completed unit takes up very little space and can be screwed down to any convenient point on the baseboard, and then connected permanently in circuit.

ECKERSLEY EXPLAINS-

"There is no doubt that permeability tuning is a real challenge to the superheterodyne." Our Radio Consultant-in-Chief rounds off his contribution with these words, after explaining the new system and pointing out the difficulties of maintaining constant selectivity.

TERMS and phrases get used loosely. "I am pleased to meet you," for instance, or, again, "Permeability tuning."

The "tune" of a circuit containing inductance and capacity or its natural period of resonance, or *inversely* its wavelength, is given, by the square root of the product of the *effective* inductance times, the *effective* capacity.

When picking up different stations having different wavelengths we have to tune circuits (having inductance and capacity) to these wavelengths by varying either inductance or capacity or both.

Modern Circuit Requirements.

Which to vary? And how? There are a great many factors to consider when designing an ordinary wireless set, both mechanical and electrical.

In the first place, in designing a modern set one has to use a lot of circuits in cascade, and these must be variable at the same time and yet "match" exactly whatever frequency (or wavelength) they are tuned to.

In the second place, one is practically forced to include tuning circuits in the anode circuits of the high-frequency valves, and these are at high potential, and yet the handle changing the tuning must be earthed.

In the third place, a given angular movement of the tuning handle should give the same change of frequency in the tuned circuit over the full range of tuning—at least, this is desirable, if not essential.

Ways of Varying Inductance.

A variable capacity is easy to construct, and, moreover, it is not terribly difficult to "match" each unit of a ganged condenser. One set of vanes and the frame of the condenser can be conveniently earthed. Moreover, by clever shaping of the vanes of the condenser one can get "straight-line" tuning.

A variable inductance for high frequency has in the past depended upon some "variometer" principle in which one coil turns within a fixed coil, both coils being in series. Or some inductances have been designed with "sliders" tapping on to the turns, whereby more or less inductance is included in the circuit. But both these methods have disadvantages, inasmuch as matched variometers or sliders would be extremely difficult to construct and, moreover, their variation with given turning motions would not be linear. Thus, inductance tuning has been abandoned in favour of capacity tuning because of both mechanical and electrical reasons.

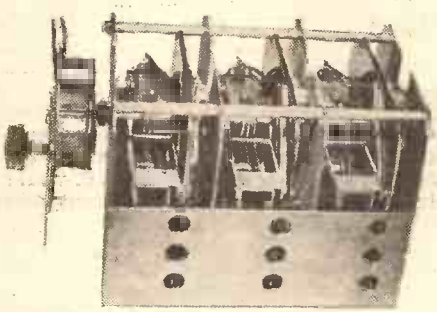
Now, there is another way of varying inductance, and that is to have an air-core coil, but slide iron into the magnetic field created by that coil. This increases the permeability in the magnetic circuit, and this, from first principles, increases the inductance.

After Years of Research.

So anyone wanting to vary the inductance, but keeping the capacity in a tuned circuit constant, would have to slide iron cores in and out of ordinary coils. Each iron core would have to give exactly the same magnetic behaviour, and would have to slide in and out the same amount on each similar coil for a given turning of one handle.

These problems have, in fact, been solved. After years of patient research Mr. Polydoroff, of America, has not only constructed homogeneous iron so that each

A PERMEABILITY TUNER



This three-gang permeability tuner was the original Varley working model. A similar component was used in the first home-constructor's receiver to use permeablity tuning, which was described in "Popular Wireless" for July 8th.

piece behaves alike, but has perfected a movement which slides these cores equally in and out of equal coils. So he has a ganged-inductance tuning. Moreover, the effective permeability of his iron is, so far as I know, higher than any other iron used for this type of work.

Because, of course, you have to have a very special sort of iron when you use frequencies around the million mark. You have to laminate even "low"-frequency transformer cores to overcome losses. We need not go into this very deeply; suffice it to say that Mr. Polydoroff has got an iron which is suitable—highly suitable—for high frequencies.

But, now, what is the supreme advantage—or is there any advantage?—in tuning by inductance rather than by capacity?

You must have noticed how, with capacity tuning, the selectivity of a straight-tuned receiver falls off badly as you tune to the lower wavelengths (high frequencies). With inductance tuning, provided the circuits are properly designed, not only the selectivity but the sensitivity of a receiver is substantially the same whatever the station tuned to. The properly designed permeability-tuning circuit gives, in respect of selectivity, the same substantially constant performance over the waveband as a superheterodyne.

Shortcomings of Condensers.

Face a little simple mathematics. Tuned circuits are inserted in the anode circuit of a valve. If the impedance in that circuit is constant over a range of frequencies, then the *sensitivity* is constant. Now, the impedance of a (parallel) tuned circuit is $\frac{L}{CR}$ or $\frac{1}{C} \times \frac{L}{R}$ Therefore if L (the inductance), divided by R (its resistance), is constant and C is obviously kept constant, then L/CR is constant and the sensitivity of the circuit is independent of the value of L, and hence the "tune" of the circuit.

Moreover, the *selectivity* of a circuit is constant within limits if $\frac{L}{R}$ is constant. So that, provided always $\frac{L}{R}$ can be kept constant, both selectivity and sensitivity remain constant.

This is not so with capacity tuning, because, although in reducing C you increase R, the product CR does *not* remain constant, and that is why you get variable sensitivity with the ordinary (capacity) straight-tuned set. This is not very important; but $\frac{L}{R}$ varies a lot with capacity tuning, and so selectivity varies, and this is *very* important. As you have observed, the selectivity of the ordinary set is either too good at low or too poor at high frequencies.

A Warning Note.

And now a word of warning. The term "permeability tuning" has been slackly used. Any old chunk of stuff shoved crudely in and out of a coil may *not* keep a constant selectivity and sensitivity, although it apparently tunes the circuit. It may do this by varying the self-capacity of the

(*Continued on page* 29.)

THE MIRROR OF THE B.B.C. By O. H. M.

INTERNAL CHANGES CONTINUE

A Ban on Matrimony—The Theatre for Broadcasting—Backing Youthful Enterprise—Fisherman's Yarns at the Microphone.

THOSE internal changes already exclusively announced in POPULAR WIRELESS and subsequently copied elsewhere are but the first batch of far-reaching changes which will be made within the B.B.C. during the next two years. It is no exaggeration to prophesy that by August, 1935, the B.B.C. will be an entirely different place from what it is to-day. The next considerable batch of changes will take place towards the end of the year, when Colonel Dawnay will be ready with his "weeding-out" report.

Married Women Doomed?

As a result of the unfortunate attempt to discriminate in the treatment of married women, it is possible that the B.B.C. will shortly decree the dismissal of all married women engaged on the staff. The difficulty became acute when a comparatively junior official in Birmingham found that she could not retain her job after becoming a mother, whereas a more senior official in London was able to combine her domestic duties with her work for the B.B.C. The ill-feeling caused by the discrimination is so deep seated that a wholesale clearance of married women is now on the cards.

Pro-Nazi Gestures.

It is not known for certain what influence at Broadcasting House is responsible for the growing number of pro-Nazi gestures which can be brought to the door of the B.B.C. It is considered unlikely that the Board of Governors is responsible; but if they are not, then they should make it their business to find out who is, and put a stop to a tendency so repugnant to the main body of British listeners.

The Post Office and Television.

The Post Office has of late been taking a more definite part in the television struggle. The Post Office view is naturally regulated to a certain extent by political considerations, and this is probably why the B.B.C. was influenced at least to postpone the application of its intention to throw out "thirty-line" television. As things stand, "thirty-line" television will go on for at least another year or so.

Outside Performances.

The success of the B.B.C. Show at Olympia was misinterpreted in some circles at Broadcasting House, where the hope began to grow that the B.B.C. would break into the regular entertainment field with its own theatre and music-hall interests. No doubt the lukewarm reception of the subsequent music-hall appearance of the Radio Show did something to damage this hope. It is obviously a dangerous tendency to encourage broadcasters to begin to think primarily of a direct audience. The very success of the Show at Olympia, in terms of the audience there, was a measure of its deficiency as a broadcast entertainment.

The Young Governors.

Mrs. Mary Hamilton and Mr. Harold Brown, the two youngest members of the B.B.C. Board of Governors, are reputed to champion the cause of youth, enterprise and progress in so far as these can be championed in the subdued light and dignity of the B.B.C. Board Room. More power to their elbows! Theirs is no easy task.

A West Regional Feature.

Broadcasting has brought to light many interesting facts of which the general public had very little knowledge. Another instance of this occurs in connection with the harvest festival service which is to be relayed from Box Parish Church, Wiltshire, for West Regional listeners, on Sunday, September 17th. Box Parish Church was built in the year 1200, probably on the site of a Roman temple.

The only part of the original structure still surviving is the Hazelbury Chapel, which was largely rebuilt in 1713 and added to in 1840 to accommodate the greatly increased population which followed the opening of the Box tunnel.

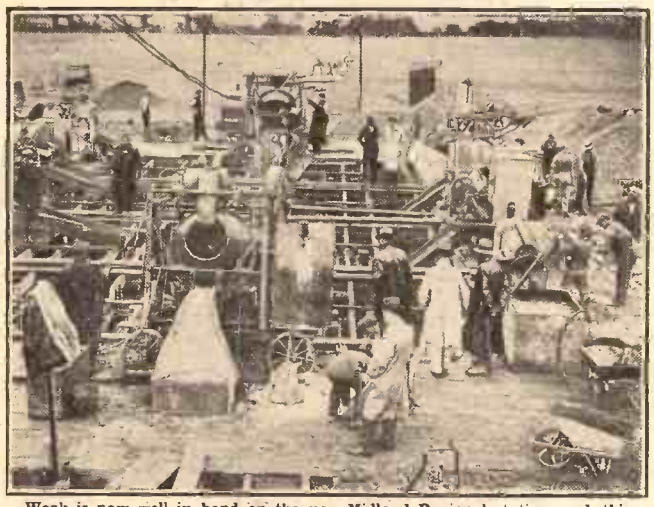
The chapel owes its name to the fact that it was offered to the people of the parish of Hazelbury when their own church was burnt down many centuries ago. There is still a rector of Hazelbury who has no church, no house, no parish and no duties. Whether he has a stipend we cannot say, but it is laid down that on his retirement his successor must say his prayers in the manor house of Hazelbury and receive a sod of earth from the old church field.

A Midland Discovery.

Wireless has been responsible for "discovering" many talented and successful artistes, but hardly in the same way as it "found" George Taylor, a baritone singer who is to take part in the Midland Studio Orchestra's concert on Monday evening, September 18th. It was while conducting

(*Continued on page* 30.)

MAKING A 900-TON CONCRETE BLOCK



Work is now well in hand on the new Midland Regional station, and this scene shows the making of a 900-ton block of concrete to form a foundation for the four Diesel engines.

THE LISTENER'S NOTEBOOK

Frank comments on recent programmes and on microphone personalities of the moment.

IT is surprising to hear of the B.B.C.'s decision to restrict its S O S service. More surprising still is the alleged reason.

This is a humanitarian work requiring only the smallest success to justify it. But a 20 per cent success is, in my opinion, magnificent for a work of this sort. The B.B.C. must set itself a high standard of attainment to consider a 20 per cent success sufficient reason for discontinuing an undertaking. A 100 per cent or nothing policy will never get anywhere.

* * *

If time is so valuable at Broadcasting House I could suggest several ways of saving the minutes. One will suffice for the present. Let the B.B.C. discontinue forthwith its weekly practice of advertising its own publications. Not that I personally object to hearing the week's contents of the "Radio Times," etc. Nor did I mind the nightly S O S messages, for that matter. On the contrary, I always appraised the B.B.C. for this service.

* * *

The B.B.C. mind works in a mysterious way sometimes. The discontinuance of the French talks of an evening, if only for a time, is a striking example of this. To take up the threads again after an enforced spell of idleness will be irksome to a number of students. And the B.B.C. may be considered by others too unreliable a tutor to begin study with, if for a session it doesn't "turn up."

* * *

I am always pleased whenever a music-hall item of definitely English flavour is put on. We have been far too tolerant of the American invasion in the past. That's why I enjoyed Christopher Stone's recital of old recordings of old favourites the other evening. It was a treat to hear Florrie Ford sing "Down at the Old Bull and Bush." And when I say sing, I mean sing. More of these recitals, Mr. Stone, please! We don't mind the old recordings, and no apology is necessary. Reserve all your apologies for your ultra-modern numbers.

* * *

I feel certain that Mr. Stone doesn't always sit with his headphones on during his recitals. Otherwise he wouldn't have passed without comment what seemed a dud record the other Monday afternoon. For flatness this record took the biscuit.

* * *

In "The Mulberry Bush" I seemed to receive an almost immediate response to my appeal for humour in radio plays. This comedy was specially written for broadcasting, like a good many others, but it approached more nearly the ideal, as I conceive the ideal broadcasting play, than any of them.

* * *

It lasted only one and a quarter hours (an ideal length); it has a small cast (only seven in number); there were only two scenes (compare this with the far-flung episodes of "The Game"); there was a minimum of music (used with very telling effect), and the comedy was brimful of humour. Every character in turn produced a remark that

(*Continued on page* 29.)

How to Tune YOUR VALVONIUM

"P.W." again leads the way! This time with the first "radio" musical instrument with keys for home constructors. Last week full how-to-make details were given for this simple-to-build and unique device, and on this page you are told how the notes are adjusted and the instrument played.

By G. V. DOWDING, Associate I.E.E.

YOU have no doubt noticed that the positions of the preset condensers approximately correspond with those of the peg-keys. It is important that they should, because when you are tuning the instrument you must be able to see at once which peg-key is controlled by which preset condenser.

You will know, for example, that the pitch given by the second peg-key in the front row can now be adjusted by varying the adjustment of the second preset in the straight row of eight. But this useful co-relation will be lost if you make a mistake in the wiring.

I would advise a small-power valve, such as the P.2, and with this 60 volts of H.T. will give a quite good volume, although you can use up to 120 volts if increased loudness is desired.

Suggested Speaker Arrangement.

Any loudspeaker can be employed, and it must be remembered that, when the instrument is tuned on any particular loudspeaker, to change the loudspeaker may throw the tuning out slightly, though it doesn't take long to retune. To obtain great volume the loudspeaker terminals can be connected to the pick-up terminals of a radio set.

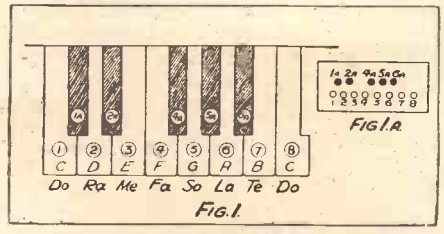
On my original model I have fixed an ordinary electro-magnetic loudspeaker unit in the base of the Valvonium itself. The unit is supported by means of a simple but stout bracket, so that its armature presses tightly against the side of the box. Quite a good volume is obtained by making the framework of the Valvonium act as a diaphragm in this way, and the tone is extremely pleasing.

Readers who care to experiment could try fixing the unit on to different kinds of sounding board, in and on resonant boxes, mounted in old violins and so on.

With your Valvonium connected to its batteries and switched on, the tuning can be carried out.

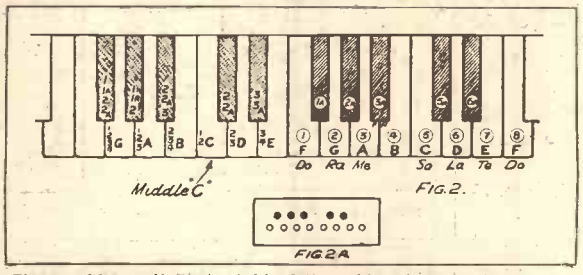
The keyboard covers a complete octave, and is arranged to take in the major scale of C because this is the easiest one for the beginner to handle.

THE EQUIVALENT KEYS



This diagram shows the notes of the piano to which the Valvonium is tuned when it is set for use in the scale of C major.

HOW MORE NOTES MAY BE ADDED



The numbers on the notes to the left in this diagram indicate the combinations of peg-keys to press in order to obtain these notes. The Valvonium is assumed in this diagram to be tuned to the scale of F major, an available alternative to the tuning shown in Fig. 1.

The eight front peg-keys correspond with the white keys on a piano and the back five with the black ones. To make it simpler for you to follow my directions I have, at Fig. 1a, numbered the peg-keys, and it might be a good plan lightly to number those on your Valvonium. I suggest you could lightly stick tiny paper labels on them.

Now press peg-key number one. If the Valvonium is working properly a clear note should result. Keep this key depressed and turn down the little knob of its preset about as far as it will go. The pitch of the note should slide down until it reaches what sounds like a good starting-point for "Do" on the Tonic Sol-fa scale.

Raising the Pitch.

I suppose most people can sing the scale Do, Ra, Me, Fa, So, La, Te, Do and hit pretty closely on the correct notes all the way up. And I can't visualise anyone having much difficulty in adjusting the eight presets so that keys 1, 2, 3, 4, 5, 6, 7 and 8 form a close equivalent to it.

You can pitch the scale just where you like—i.e. your starting "Do" can be just where it is most convenient to have it. It would naturally be lower if you were a bass than if you were a tenor.

If the Valvonium is tuned in this way instead of with the aid of a piano, the pitch of which is fixed by standards, you will make the most of your thirteen notes in the easiest possible manner. Should, for some reason, it be found that you can't go quite high or low enough (in the case of either a spectacular bass or alto!), changing the value of the gridleak will at once push the pitch right up or down. For example, a ¼ meg. will lower the whole scale quite a bit.

Getting Half-notes.

With the "white" keys tuned, the "black" ones present no trouble at all. They are pitched exactly between their adjacent white notes. Thus, 1a has a pitch lying dead in the middle of those of 1 and 2, while 2a lies between 2 and 3 and so on.

And now for the advanced student! Although the Valvonium is primarily a

(Continued on next page.)

SHARPS AND FLATS ARE PROVIDED

The arrangement of the keyboard is similar to a piano, the groups of two and three in the back row representing the black notes.

A NEON LAMP TEST PANEL.

How to make a useful tester which costs only a few shillings and which takes the place of expensive meters to a large extent.

By B. W. TURNER.

MANY amateurs would be in a position to "service" their own receivers if in possession of good-quality instruments, one of which is an A.C. voltmeter (for the A.C. main), and another a milliammeter for testing continuity in high-resistance circuits, resistances of the order of 100,000 to 5 megohms and sundry components.

The A.C. meter is an expensive instrument, and may only be needed occasionally for testing the output from a mains transformer, etc., and the test instrument described will give all the information required.

The test leads can be connected to the secondary of the transformer, and the lamp will glow to full brilliancy if the component is in order and giving an output of 200 to 230 volts. Of course, if the large centre-tapped step-up variety is in use up to, say, 500 volts, each half of the secondary can be tested in turn.

Limiting Current.

Many other uses will present themselves to the amateur for testing components associated with A.C.

Now let us examine the "general-purpose" uses for this test instrument.

The lamp itself is rated at 5 watts, at 230 volts; this, when worked out, will be seen to pass 22 milliamps. approximately, and will be too great for testing certain components such as L.F. transformers and resistances; so by means of a power resistance (which can be shorted) of about 50,000 ohms in series with the lamp, not more than 4 milliamps. is passed, a figure which is quite safe for the majority of components.

Any resistances, transformer windings, chokes, condensers, etc., can be tried for breakdown by plugging into the mains, switching on (shorting switch pushed in) and applying the test leads to the component.

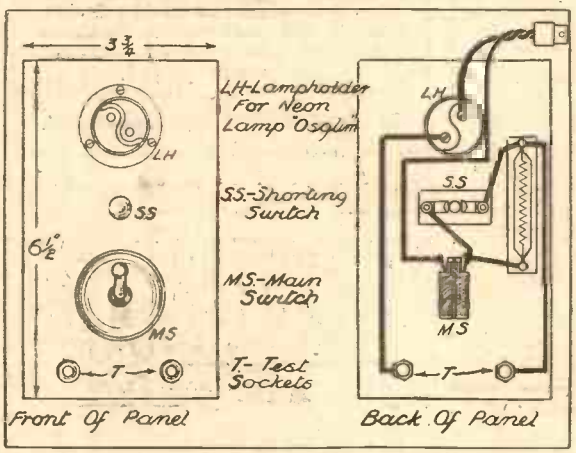
Hands Off!

Advice regarding the use of the tester here will be helpful. The bare ends of the test leads should not be held in the hands when in use. Test prods, as sold by several well-known firms, would be recommended, and would entirely eliminate any possibility of misleading results. You need not imagine there is danger attached to holding the ends; a very much more important point arises. If one holds the bare ends, the lamp will glow, proving that the body is a conductor of only some thousands of ohms, and may give a very misleading "reading."

Condensers can be tested by the instrument; and as we are dealing with A.C., and a condenser can almost be termed a conductor, in this case the lamp will glow if condenser is perfect, and, according to the capacity, so will the light be small or great. If a short has occurred, the lamp will glow at full brilliancy; if a complete breakdown, no light will be seen.

For testing A.C. mains transformers, the test leads are connected to component under test, and the end shorted by means of a lamp-holder, the terminals of which have been joined together with a short length of flex.

THE PANEL AND WIRING DETAILS



Very few parts are needed, and their wiring is quite simple and clearly shown in this diagram. Note the shorting switch across the resistance.

HOW TO TUNE YOUR VALVONIUM.

(Continued from previous page.)

"one-finger" instrument, and although the majority of tunes can be accommodated by its thirteen notes, there will doubtless be many users who, in the course of time, will feel that it has two shortcomings: (1) that it doesn't strictly follow the piano in pitch and (2) that its notes are fewer than they might usefully be.

Both criticisms can be met. Eleven more notes can be added without any structural alteration except the shifting of one of the peg-keys, and when this is done the Valvonium can be accurately brought in line with the pitch of a piano.

First of all, peg-key number 4a must be shifted down so that it becomes number 3a. There will be no 4a. The new arrangement is shown at Fig. 2a. It is a straightforward structural alteration, and the only ill-effect is that a hole in the wood will be left, although this will enable you to go back to the old arrangement easily should you find the new technique too complicated for you.

For the new tuning you will need to have access to a piano; though, so long as you can find middle C on it and at least know something about the other notes, you will not have to hire a piano tuner as well!

Peg-key number 1 should be tuned to correspond with the first F above middle C, and the other peg-keys made to continue up to the scale as marked in the thicker part of Fig. 2. But you won't find that you can trill up the Do, Ra, Me scale now merely by running up the "white" notes. You are modulated to the major scale of F. This has one flat. Instead of playing No. 4, you go half a tone lower and play No. 3a in order to obtain a satisfactory sequence.

Controlling Volume.

So your Do, Ra, Me, etc., is as follows: 1, 2, 3, 3a, 5, 6, 7, 8.

Very awkward, you say. Yes, it is a bit awkward, but we can now proceed to add a packet of eleven lower notes by pressing down combinations of peg-keys. These combinations are clearly shown in Fig. 2, where it will be seen that we can now make our Valvonium cover the best part of the centre of the piano keyboard, thus taking in a full two octaves except for one note, and even that could be added by a further multi-peg combination, though it is not likely to be needed.

Certainly a little practice is required to manage these various combinations, but don't forget that you can use two hands if you want to.

If you can read song parts you can now play your Valvonium from music; and, of course, you are pitched correctly to accompany your radio. That's great fun, by the way. I do quite a lot of it myself, and I find that I can obtain huge satisfaction by throwing a spot of counterpointing on to instrumental solos of various kinds. I also throw "hot breaks" (twiddly bits) into the jazz, harmonise with crooners and, in general, thoroughly enjoy myself.

There are just one or two more points. About volume control. If you run the Valvonium through your set you can, of course, use the volume control on this, and a very wide variation of volume be obtained. So that this is available for "playing," it would be a great advantage to bring the control out from the set in accordance with the popular armchair principle. But it should be a "last stage" control or it may affect the pitch.

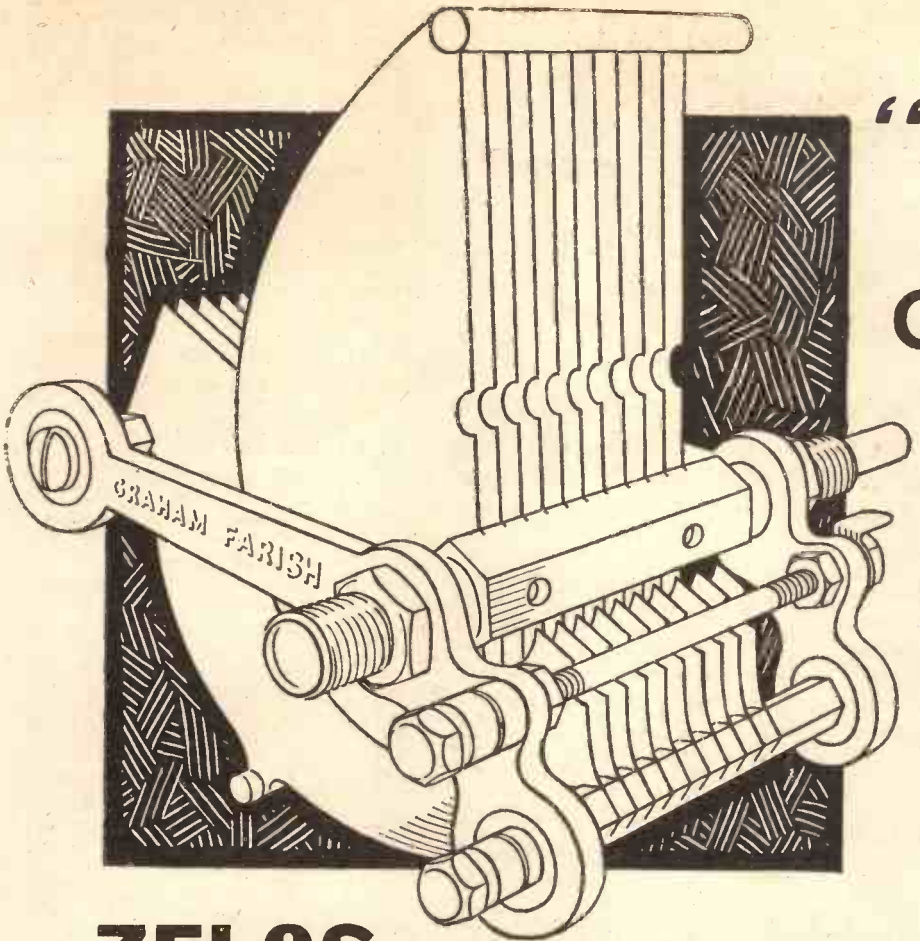
When the Valvonium is used alone the need for volume control is not likely to be felt, for the volume given is pleasantly proportioned. But those who desire to do so can easily fix up a volume control.

Making Modifications.

If any difficulty is encountered in controlling the pitch, the grid leak can be changed for a higher or lower value, but it is not a probable modification.

I hope I shall get a lot of letters about the Valvonium—at least, one from every reader who builds it. I shall be particularly interested to hear of any modifications constructors may make, and shall be pleased to pass on details of them and the benefit of other useful experiences to other readers.

For my part, realising that, in so far as the musical aspects of the Valvonium are concerned, we break entirely fresh ground, I am prepared to do my best to assist readers with any musical perplexities they may encounter in building and handling it.



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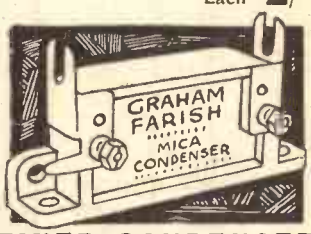

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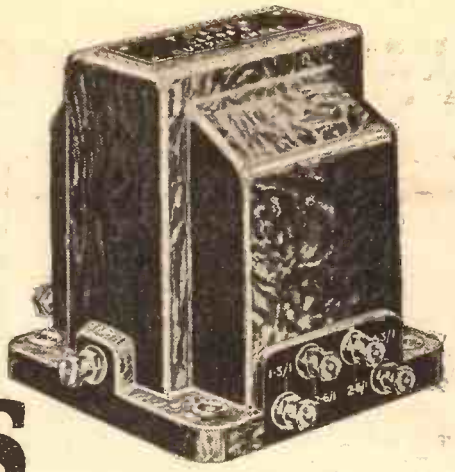
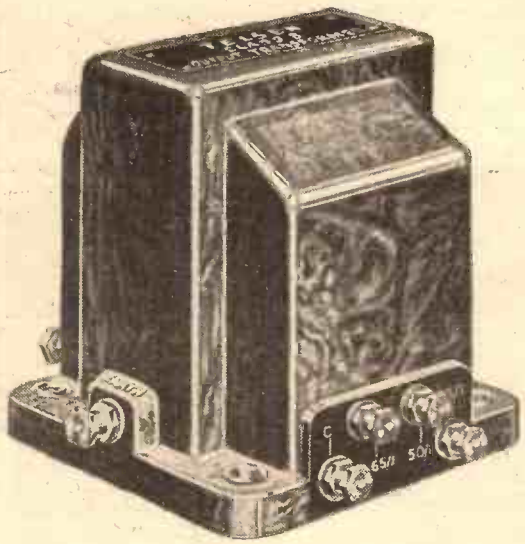
TELSEN 'Class B' COMPONENTS



THE use of the correct "Class B" valves alone is not enough to ensure perfect "Class B" amplification. You must also use the correct "Class B" components of whose perfect matching, and lasting efficiency you can be assured. That is why you should use Telsen "Class B" components. They are the outcome of long research and experiment by Telsen Technicians, representing the most enduringly perfect "Class B" components it is possible to produce. Be sure—and insist on Telsen.



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Provides ratios of 1–1, 1·3–1, 1·2–1, 2·6–1, for matching to any Moving Coil speaker having either a high resistance speech coil or a low resistance coil and input transformer. The low D.C. resistance of 220 ohms per half winding, and generous core section prevent distortion. The total inductance is 18 henries. **8/6**

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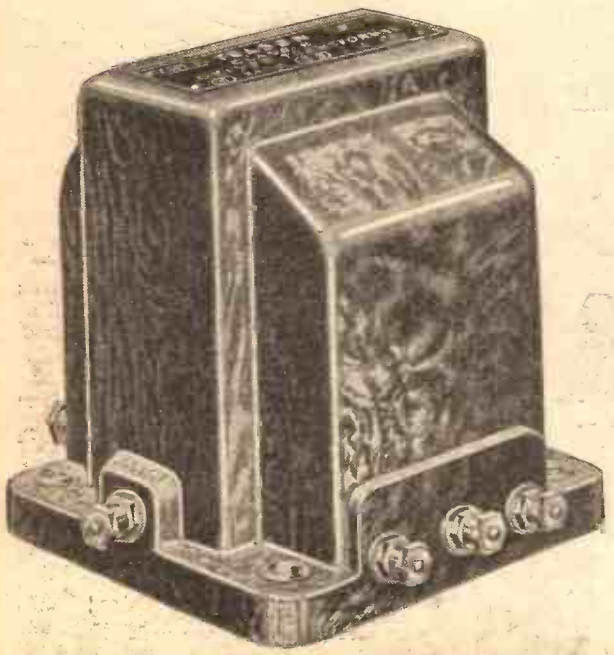
Provides ratios of 35–1, 50–1 and 65–1, ensuring correct matching to Moving Coil speakers having low resistance speech coils. Low primary resistance (200 ohms per half winding) and large core section. **8/6**



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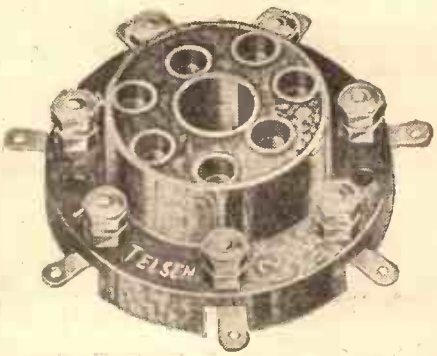
Made in two ratios covering the requirements of all the "Class B" valves available at present. Supplied with comprehensive instructions.

RATIO (Overall)	(Primary to half-secondary)	Price
1–1	2–1	**8/6**
1·5–1	3–1	



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TELSEN FOR EVERYTHING IN RADIO

ANNOUNCEMENT OF THE TELSEN ELECTRIC CO., LTD., ASTON, BIRMINGHAM

FREAKS OF FADING

By MARCUS G. SCROGGIE, B.Sc., A.M.I.E.E.

A lucid explanation of what happens when one station fades out and is replaced by another without the tuning of the set being altered—a phenomenon which every listener will have frequently observed.

WHEN listening to a station that is subject to fading, have you ever noticed how its neighbour (in wavelength) springs up and takes its place during the weak periods? Sometimes it seems almost as if somebody had turned the tuning dial round a little while you weren't looking.

"Oh, yes," you say, "that's an easy one; when the programme you are tuned to fades out, of course you can hear the interference more clearly!"

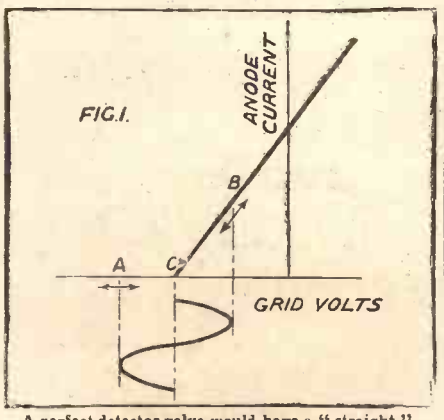
True, there is something in that. When everybody round the table stops talking, except one, that one suddenly feels uncomfortably conspicuous. A receiver that hums badly is tolerated so long as the programme is lively, but when there is an interval even the "Ghost in Goloshes" cannot hide the defect.

Try it Yourself.

But there is more in it than that. Some evening, try selecting a station that fades badly and that is next door to another fairly powerful one, and tune as sharply as possible to it.

When reception is at its best, the interfering station may be almost or quite

THE IDEAL DETECTOR



A perfect detector valve would have a "straight" characteristic curve.

inaudible, *even during pauses in the programme to which you are tuned.* But when the latter fades, up comes the interferer to take its place, perhaps as loudly as the original transmission.

The Effect of Volume Variations.

Occasionally conditions are such that a beautiful change-over takes place, and one is hardly aware that the station you are hearing is a different one from that with which you started.

It is true that the affair is complicated by variations in strength on the part of the interfering station, which may decide to "unfade" just as the desired programme fades. But having made all allowances for such coincidences, the fact remains that there seems to be some mysterious connection between the strengths of reception of the two stations.

Another thing: have you ever been listening to a distant programme until it shuts down? If so, it is very likely that the moment the carrier wave was switched off, a background of the local station, that was inaudible before, suddenly appeared.

Explaining the Reason.

The explanation is extremely interesting, and has rather an important bearing on selectivity in general. The full story is highly mathematical and difficult, but the main principle is quite simple to grasp.

The smallest acquaintance with receiving sets is sufficient to show that, whatever else is or is not included, a detector is always there. It is the one essential department.

The object of the detector is, of course, to amplify one-half of each of the incoming high-frequency waves as much as possible, and to suppress the other half as completely as possible. This is done by making the valve function at a bend in its characteristic, so that the forward and backward half-waves are unequally handled.

Perfect Rectification.

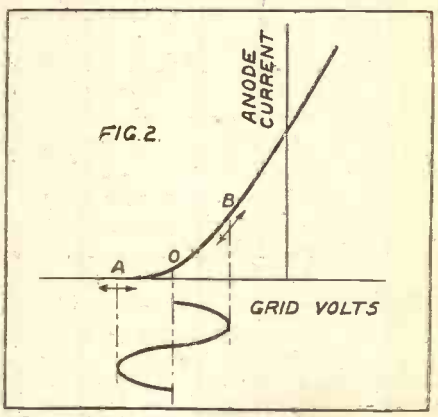
The ideal detector would have a characteristic like that shown in Fig. 1, in which the anode current is nil until the grid voltage is at the point 0, and then increases uniformly as the grid voltage is further increased.

It would be necessary to arrange the grid bias so that 0 was the working point; then the positive half-waves would be uniformly amplified and the negative half-waves would do nothing so far as anode current was concerned. This is an example of perfect anode-bend detection.

Grid-leak detection amounts to the same thing in essence, only instead of bias being supplied from a battery it is automatically provided by grid current flowing through the grid leak.

Valves being what they are, this perfect detector is denied us, and instead of the sharply defined working point there is a more or less gradual bend, causing loss of efficiency and distortion. Actually this isn't as bad as might appear, for what is

A PRACTICAL CURVE



In practice, instead of having a sharply defined working point, the characteristic has a more or less gradual bend.

amplified is the *variation* in strength of the carrier wave.

Unless this variation forms a large part of the whole (known as deep modulation) most of it takes place near the peaks of the wave, away from the point 0, and consequently the important business is done on

(Continued on next page.)

AT ROME'S RADIO HEADQUARTERS

Rome, on 441 metres, is well received in this country, but, like all distant transmissions, is liable to fade. Here is a picture of a waiting-room at the radio headquarters in Rome.

BATTERY BOOSTING

Those who obtain their high-tension supply from dry batteries often view the prospect of having to make replacements with dismay. Battery users will therefore welcome this practical method of achieving greater economy.

By C. J. DARK.

ONE of our saddest moments is undoubtedly that in which we realise that the new H.T. battery has definitely lost its first youthful vigour. We know that a large part of its useful life still remains, but the voltage has fallen to a point at which a reduction in the G.B. voltage is necessary to maintain the quality of our reproduction.

When the Voltage Drops.

Further, the volume available has probably fallen below the level of real enjoyment. Now, this is the time to introduce a boosting battery. To discard a large H.T. battery would, at such a time, be an absurd extravagance, as it is a characteristic of the dry-cell type of battery to lose voltage fairly rapidly when first placed in use, but to steady down at a figure somewhat below the nominal voltage rating of the battery.

Let us take a very common case: A new 120-volt battery is put in service with a grid bias of 9 volts, and this condition is found to give us satisfactory volume and quality without excessive current consumption.

Now, within four or five weeks, symptoms pointing to the fact that the power valve is overbiased will become apparent, an irritating buzz on a loud piano note being the most likely effect to become audible. It must then be accepted that the initial fall in voltage has taken place, and grid bias should be reduced to 7½ volts to maintain enjoyable reception.

This, then, is the moment to introduce the boosting battery. It is a great mistake to wait until the main battery has reached a decrepit condition before help is given to lift the voltage.

The Method Employed.

The boosting battery should have a voltage of 60, in steps of 6 volts or so, and be connected in this way: the 120-volt positive socket is linked to the new negative, and the power-valve plug is placed, experimentally, in the 18–24-volts tapping of the new battery.

This additional voltage should be sufficient to raise the overall voltage to a figure that will compensate for the drop in the main battery and restore the volume and tone to the required level.

If it is found that sufficient power is available with 7½-volts bias, the additional voltage required from the boosting battery may be quite small. Subsequently the H.T. positive plug should be gradually lifted in small steps—weekly or fortnightly—to compensate for the progressive fall in voltage in both batteries. During this process no change should be made in the grid-bias voltage, though, as a duty towards your set, the G.B. battery should be renewed about twice a year.

A Simple Test.

I have found that, in this way, a volume of sound, entirely satisfactory for an ordinary room, can be maintained for many weeks. Look at it in this way: If the grid bias is always at a constant figure and no distortion is audible, we know that the valve is working under proper conditions.

Further, a simple test is always at hand. It is only necessary to move the power plug down 9 or 12 volts to prove, by the reduced volume and inferior quality, that our operating conditions have been as correct as possible. And, obviously, to lift the plug above a point at which reproduction clears is an extravagance.

A comparatively cheap "booster" may be purchased, as it is not intended that it should survive the main battery. It should always be remembered that it is the purpose of the second battery to maintain a steady state of affairs in conjunction with the larger battery, and not to bring about a large increase in volume that will merely be the prelude to another and more rapid falling away.

FREAKS OF FADING

(Continued from previous page.)

parts of the characteristic that are nearly as good as the ideal.

All this is plain sailing, for it assumes only one broadcasting station in existence, or, at any rate, only one strong enough to have an appreciable effect on the detector. But now imagine a *weak* interfering transmission superimposed on that already described.

It will sometimes be in such a relation to the original wave as to assist it, and sometimes so as to oppose it, so it causes variations much the same as those indicated by the arrows in Fig. 2, which were originally put there to represent the modulation or low-frequency variations.

Superimposed Waves.

But unlike them, these are high-frequency variations, so they must be detected or rectified before they can have any audible effect, and according to Fig. 2 neither position in which they find themselves is the least suitable for the purpose. One is flat on the grid-voltage axis, where it has no effect whatever on anode current, and the other is on the nearly straight part, where the positive and negative half-waves nearly cancel out.

The result is that the strong wave (which is the one we want) makes the weak one very much weaker still so far as audible output is concerned.

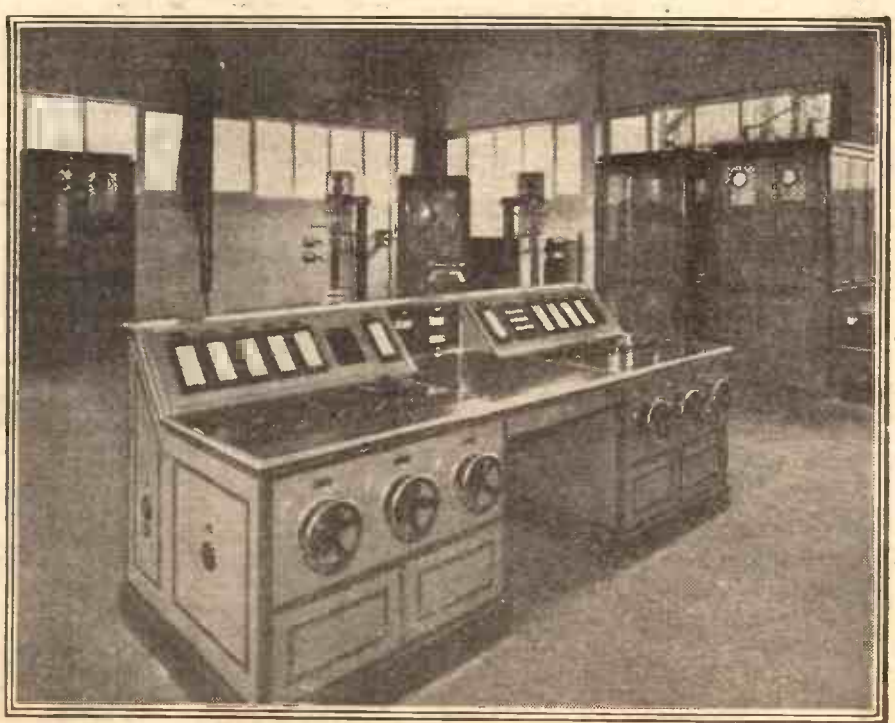
This is just what happens in practice. Now suppose the strong wave fades. Naturally it becomes weaker.

As it does so it loses its power to "swamp" the interference, which now appears, being all the more prominent on the quieter background. Not only so, but the "weak" wave may begin to swamp the erstwhile strong one, so that the ascendency of the interference is all the more overwhelming.

It is perhaps desirable to emphasise once more that this "swamping" action is in the working of the receiver itself, and is quite distinct from the natural tendency for a loud sound to drown a weak one, an effect for which the ear is responsible.

The phenomenon may be considered a disadvantage in so far as it exaggerates the fading nuisance, but apart from this it is an undoubted boon in the way it ekes out the selectivity of many receivers and prevents a background of a powerful station from being heard all over the dial.

CONTROLLING FRANKFURT'S 17 KILOWATTS



In spite of a power of 17 kw., Frankfurt's programmes on 259·3 metres are subject to fading when received outside of their normal service area. This is a view of the transmitting room at Frankfurt.

STATIONS WORTH HEARING

A review of recent conditions on the "broadcast" bands, including details of stations that are coming in well, and other information that will enable you to get the best results when searching for foreigners.

By R. W. HALLOWS, M.A.

LOOKING back over the records of previous years in my log, I find that August has often been one of the worst of months for long-distance reception. August, 1933, however, turned out to be an excellent month, for though the weather was mainly hot and fine very little trouble was experienced from atmospherics. Only on odd days were they bad enough to spoil the transmissions of foreign stations; for the greater part of the month they were completely absent.

September has made an even better beginning, and from now onwards we can look for good reception of a large variety of stations, even if small receiving sets are in use. One extraordinary feature of the summer of 1933 is that the medium-wave U.S.A. stations, as well as some of those in South America, have been receivable on any night when atmospherics were not troublesome.

Amazing Strength of Americans.

At times there has been a certain amount of fading on American transmissions, but the strength with which they could and still can be received under favourable conditions is amazing. On many occasions during the summer I have heard WPG, WCAU, WKAQ, WHAM and WTIC with all the volume that they had on the best nights of last winter.

During the coming autumn and winter American stations should be easy to receive, and I shall not be at all surprised if one of them, WLW, actually heterodynes certain European transmissions during the evenings. WLW, which is the Crosley station at Cincinnati, Ohio, is at present working with an aerial power of 50 kilowatts. Within a few months a new transmitter rated at 500 kilowatts will be in operation, using the new type of vertical aerial. The designers of the plant confidently expect that its range after dark will be 5,000 miles.

Reception of Vienna.

To return to European stations, Vienna's second aerial mast is now almost completed, and as soon as use can be made of the full aerial we are assured of a splendid service from the Austrian station in this country. Vienna is actually very well received on most nights, even though working with a temporary aerial suspended from a single mast.

The course of broadcasting is not running very smoothly in France at the moment. Under the Lucerne agreement there will be no exclusive wavelengths for the many non-Government French stations, since all are required for the great chain of PTT high-powered stations which will eventually serve France, under the General Ferrie Plan.

For some queer reason a number of private concerns have erected high-powered stations without previously obtaining the full sanction from the Government to operate them. Radio LL, for instance, has a 50-kilowatt station completely ready, though it never has broadcast a single item and probably never will.

Toulouse Midi, again, is a private station. Its plant is designed for a power of 60 kilowatts—or more if required—but it is at present limited by the Government to 8 kilowatts. "Curiouser and curiouser," the Government is constructing a 60-kilowatt station of its own just outside Toulouse, and this will eventually take over the whole of the programmes. It seems a strange waste of money to build a new high-powered station when there is already one available.

French Government and Fécamp.

Fécamp, another non-Government station, has already fallen under the ban. It has been ordered to reduce its aerial power to 700 watts; but I am quite sure from the excellent daylight reception that I obtain, that the Fécamp authorities have done something like doubling the first figure and adding on a nought. France has always found it rather difficult to reduce her private stations to order. It is one thing to command and quite another to enforce obedience.

RADIO IN THE FIELD

This is one of the latest mobile wireless stations manned by the Royal Corps of Signals, and used for communication between Army field units. The aerial mast can be seen on the side of the car near the windscreen.

Freed from Interference.

The Swiss station, Monte Ceneri, has closed down for alterations and repairs. This means that at the moment Kalundborg is free from interference, and the new transmitter has an excellent chance of showing what it can do. Though Kalundborg is rated at 60 kilowatts, and can reach this output if necessary, the Danish authorities do not intend to use any more power than is required to ensure good service in their own country. If only certain countries would follow suit!

Work on the new Witzleben station is being hurried forward. The transmitter is designed for an output of 100 kilowatts, and Berlin would, in the ordinary course of events, soon be one of the most strongly received of Continental transmissions. Unfortunately the new station, shortly after it comes into operation, will probably take over Stuttgart's wavelength, which means that sideband splash is bound to occur between it and London.

Other wavelength changes will take place amongst the German stations in the near future. Munich is to work on Witzleben's wavelength of 419·5 metres, and Stuttgart will go up to 533 metres, which is Munich's present wavelength.

Near their Lucerne Waves.

The idea underlying this is to bring these two stations and Berlin as nearly as possible on to their Lucerne wavelengths during the autumn. Those who possess sets with station-name tuning dials will have to remember that Stuttgart is Berlin, and so on. It is not worth changing the actual dials, since a further change will be required should the Lucerne Plan come into operation, as it is due to do on January 15th.

Of the long-wave stations Huizen is usually good, though apt at times to suffer from a heterodyne of Russian origin. Radio-Paris is always well received, and Zeesen is in excellent form. The Eiffel Tower is not infrequently interfered with, but when clear the quality and volume are good.

Warsaw is tremendously powerful, though at odd times a heterodyne is noticeable. Motala comes through well at times; Luxembourg can be received at full loudspeaker strength on the simplest of sets; Kalundborg is very strong, and at the moment clear of interference; Oslo is also free of interference.

The medium waveband is crowded with first-rate stations. Those at the very top, Budapest, Munich and Vienna, are still variable, but they will soon settle down again. The two Brussels stations are very reliable, but Florence varies somewhat in volume and in quality. Prague and Langenberg come in at enormous strength at any time when they are working. Lyons Doua, though good, is not quite up to its form of last month.

How They are Coming In.

Beromunster can be received strongly in daylight. Rome is quite reliable, but Stockholm fades occasionally. Belgrade is to be heard, though not as a rule very strongly; the same remarks apply to Berlin Witzleben. Katowice is there on most evenings at good strength. Toulouse requires the volume control rather than the reaction knob.

Leipzig is good, but Hamburg is on the weak side. Strasbourg is an excellent transmission. Brno is occasionally to be heard. Milan, the Poste Parisien and Breslau are always to be found at good strength. Göteborg is almost as well received as these three stations.

Bordeaux is returning to form. Hilversum and Heilsberg are always well received. Turin, though providing excellent volume as a rule, is occasionally jammed, and Bari suffers in the same way. Frankfurt and Fécamp are not too consistent, Trieste and Nürnberg are well received evening after evening. Other stations worth attention are Gleiwitz, Hörby, Moravska-Ostrava, Lille PTT and Rennes.

The "P.W." TABLEGRAM

ONCE AGAIN WE ARE FIRST

The constructor who takes his designs from "Popular Wireless" can always be sure of the very latest in circuit arrangements. In the outfit described below, typically advanced "P.W." efficiency is embodied in an assembly of really handsome appearance.

Designed and described by K. D. ROGERS.

UNTIL the advent of "Class B" amplification the battery-set owner was at a decided disadvantage when it came to the reproduction of gramophone records on his set. The battery radiogram must of necessity be capable of providing a fairly powerful output if it is to give anything like satisfactory results, especially from dance and orchestral records, and the production of this power was an expensive matter.

This was, of course, because of the high H.T. current consumed by the output stage of the receiver, which required something like 15 to 25 milliamps *flowing the whole of the time the set was switched on.*

H. T. Consumption Cut Down.

With "Class B" the average consumption of the output stage, which takes the major part of the power from the H.T. battery, is cut down by a very large amount, and the drain from the battery is that the battery user is now enabled to have results from his radio-gramophone that are just as powerful as those obtained by his mains-using friends.

Many are apt to regard the radio-gramophone as being of necessity a large piece of furniture, standing by itself on the floor and covering no small area of the floor space of the room. This is by no means a *sine qua non*, for it is possible, as we shall show, to build a completely self-contained radio-gramophone that will give up to 1,400 milliwatts with an H.T. supply of only 120 volts. Moreover, the set is of such dimensions that it will easily stand on a small occasional table.

It has the gramophone motor, loudspeaker, and the batteries all on board, and whether on radio or gramophone will deliver more than sufficient power output for any ordinary living-room.

Four valves are employed, comprising a screened-grid, detector, driver (L.F.) and "Class B" output stages. The net result is a high degree of sensitivity and selectivity, with a power output that is sufficient to satisfy the most exacting requirements.

The aerial is fed to the moving member of a potentiometer which is connected across the aerial coil of the set. By this means a simple and effective pre-detector volume control is achieved without the need for a multi-mu valve with its necessarily increased H.T. consumption over the ordinary S.G. type.

The secondary of the first coil unit is connected across grid and filament of the S.G. valve, whose anode is fed into the primary winding of the second coil. This provides H.F. transformer coupling with its high selectivity and its economy where construction is concerned. The H.F. transformer used as we use it in the Tablegram does away with

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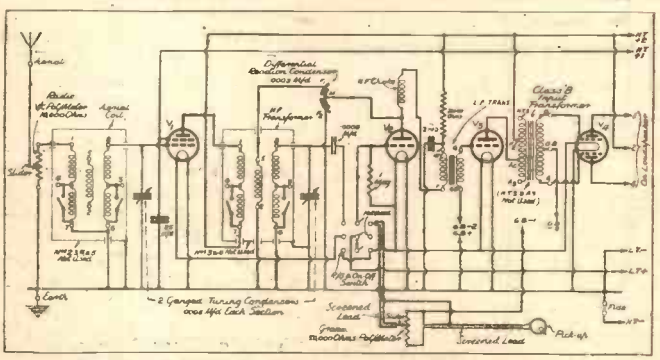
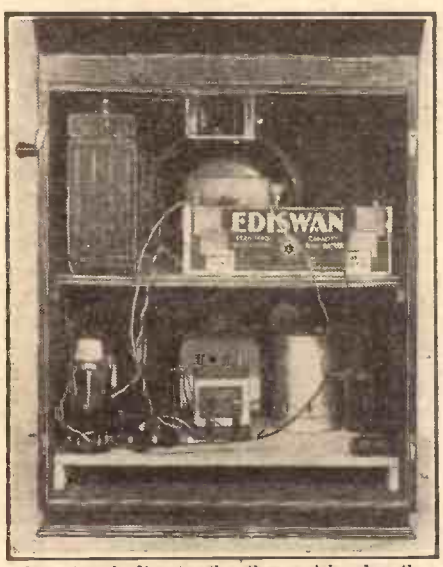
A COMPREHENSIVE SWITCHING SCHEME



Prevention of radio "break-through" when reproducing records is provided for by arranging for the change-over switch to interrupt the L.T. supply to the S.G. valve.

ENTIRELY SELF-CONTAINED



No external adjuncts other than aerial and earth are required, set, batteries and gramophone equipment all being contained in a consolette-type cabinet.

while such things as record changing and needle adjustments are carried out is negligible, being a mere 2 to 3 milliamps as far as the output stage is concerned.

Together with this saving of H.T. we are enabled to obtain a peak output of up to some 2,500 milliwatts, which is as much as the majority of all-mains-driven receivers provide. The net result, therefore, and its economy where construction is concerned. The H.F. transformer used as we use it in the Tablegram does away with

THE LAYOUT IS SIMPLE AND EFFICIENT

That the construction will present no difficulties to even an inexperienced builder will be immediately apparent from this rear view of the completely wired panel and baseboard assembly.

THE "P.W." TABLEGRAM

(Continued from previous page.)

the need of an H.F. choke and coupling condenser, and there is also no need to decouple the S.G. anode in this set—a further saving of components.

The secondary of the second coil unit is used as the tuned-grid circuit of the detector valve, which operates on the leaky-grid principle. Differential reaction is applied through the reaction winding of the second coil, while a radiogram switch controls the operation of the set, changing over from radio to record and controlling the L.T. circuit at the same time.

The output from the detector is fed into an ordinary ratio L.F. transformer, the circuit being decoupled in the usual way by means of a condenser and resistance in the H.T. feed. Then we come to the first L.F. valve, which is the driver for the "Class B" valve, and is of the small-power type, capable of providing some 40 milliwatts at 120 volts H.T. for the input of the "Class B" amplifier.

As the "Class B" valve has to be fed with power, and not merely voltage from the secondary of the transformer, a special transformer is used to couple the driver valve to the "B" valve. The characteristics of this transformer are of the utmost importance, for it has to be suitably designed not only for the type of driver valve but also for the type of "Class B" valve that is to be employed.

The Driver Transformer.

As we have chosen the Marconi or Osram B.21 "Class B" valve, with the L.P.2 as driver, we have picked out a transformer that will suit this combination, and this should be rigidly adhered to when these valves are used. Also it should be noted that the valve requires negative grid bias, unlike "ordinary" "Class B" valves.

The foregoing does not mean that other makes and types of "Class B" and driver valves cannot be used in the set, but if any alteration is made in the valves a suitable driver transformer must be chosen for them. If this is not done the constructor runs the risk of getting distorted results, as well as not the full amount of power he should obtain.

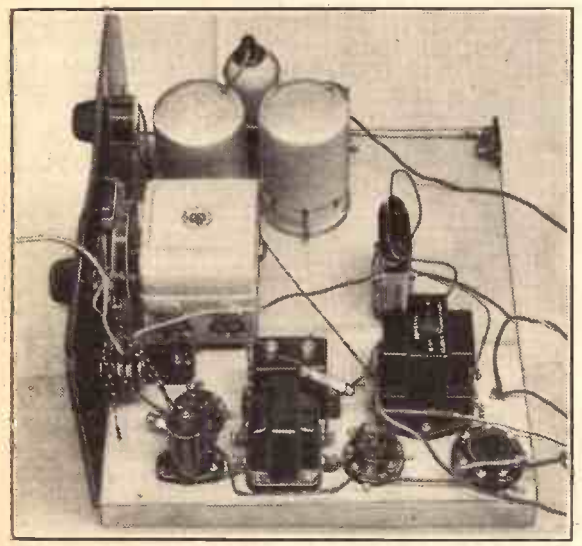
Considerations of Output.

The "Class B" valve feeds into the special transformer incorporated in the loudspeaker. Speakers with ordinary transformers could be used if an intermediate matching transformer were used between the valve and the speaker.

CHOOSE YOUR VALVES FROM THIS LIST

Make.	S.G.	Detector.	Driver.	"Class B"
Mullard ..	P.M.12A.	P.M.1H.L.	P.M.2A.	—
Cossor	220 S.G.	210H.F.	220P.A.	—
Mazda	S.G.215	H.L.2	P.220	—
Osram	S.22	H.L.2	L.P.2	B.21
Marconi ..	S.22	H.L.2	L.P.2	B.21
Hivac	S.G.210	H.210	P.220	—
Eta	B.Y.6	B.Y.1814	B.X.604	—

ARRANGED FOR SHORT WIRING



The detector (nearest panel), driver and "Class B" valves are arranged in logical sequence, with their coupling and decoupling components adjacent to them.

POWER AND CONVENIENCE

With its automatic turntable stop, "Class B" output and handsome appearance, the "P.W." Tablegram gives mains advantages and convenience to the battery user.

The set portion of the radio-gramophone is housed on the "ground floor" of the cabinet, with an attractive front cut to take the panel.

Between the set and the motor board is a baseboard carrying the batteries, and the

(Continued on page 20.)

ENSURE SUCCESS BY EMPLOYING THESE APPROVED COMPONENTS

Component.	Make used by Designer.	Alternative makes of suitable specification recommended by Designer.
1 Twin-gang tuning condenser	J.B. Nugang, type A	—
1 Pair matched dual range coils	Telsen W287	—
1 "Class B" input transformer	R.I., type D.Y.37	Ferranti, Benjamin, Varley, Lissen, Wearite
1 L.F. transformer	Lissen Hypernik	Telsen, Varley, Bulgin, R.I.
1 H.F. choke	British Radiogram No. 49	R.I., Telsen, Graham Farish, Lissen, Goltone
1 50,000-ohm wire-wound potentiometer	Lewcos	Igranic, Bulgin, Telsen, Wearite
1 10,000-ohm wire-wound potentiometer	Bulgin	Wearite, Telsen, Igranic, Lewcos
1 30,000-ohm resistance with terminals or wire ends	Dubilier 1 watt	Graham Farish
1 1-megohm grid leak with wire ends	Dubilier 1 watt	Igranic, Telsen, Goltone, Lissen
1 2-mfd. fixed condenser	T.C.C., type 50	Telsen, Ferranti, Lissen, Dubilier
1 ·25-mfd. fixed condenser	Dubilier, 9200	Ferranti, Lissen, Telsen, T.C.C.
1 ·0003-mfd. fixed condenser	Dubilier, type 610	T.C.C., Telsen, Lissen, Ferranti
1 ·0003-mfd. differential reaction condenser	Graham Farish	Telsen, J.B., Polar

Component.	Make used by Designer.	Alternative makes of suitable specification recommended by Designer.
1 Seven-pin valve holder	Benjamin	Ferranti, Wearite
3 Four-pin valve holders	Lissen, L.N.593	W.B., Telsen, Benjamin
1 Three-pole change-over switch	Wearite, type I.33	—
6 Wander plugs	Belling-Lee	Clix, Bulgin, Eelex
2 Accumulator spades	Clix	Bulgin, Eelex, Belling-Lee
1 Wander fuse	Belling-Lee	—
1 Anode connector	Bulgin	Clix, Belling-Lee
1 Aerial and earth twin plug strip	Bulgin, type P.30	—
2 Grid-bias battery clips	Bulgin, No. 1	—
1 Length screened sleeving	Goltone	—
1 Length connecting wire	Radiophone "Pull-back"	—
Flex, screws, etc.	Peto-Scott	—
1 Single spring gramophone motor with automatic stop and 7-in. handle	Collaro	—
1 Pick-up	Columbia, No. 22	—
1 Loudspeaker for "Class B" output	Blue Spot, 29P.M.	—
1 Cabinet complete with Metaplex baseboard panel & speaker chassis	Peto-Scott	—

PETO-SCOTT

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FIRST WITH EVERYTHING RADIO ON EASY TERMS. We carry huge stocks of all the leading Manufacturers' Products advertised in this Journal. If not advertised on this page, send us a list of your requirements for quotation by return without obligation. Any parcel of parts or accessories over £2 supplied on EASY TERMS. Strict Privacy Guaranteed.

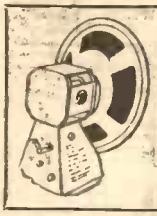
SPEAKERS

NEW BLUE SPOT PERMANENT MAGNET MOVING-COIL SPEAKER 29 P.M. With input transformer. Cash or C.O.D. Carriage Paid, £1/12/6. Balance in 6 monthly payments of 5/-. — Send 5/- only

NEW BLUE SPOT 99P.M. PERMANENT MAGNET MOVING-COIL SPEAKER. Complete with tapped input transformer. Cash or C.O.D. Carriage Paid, £2/19/6. Balance in 10 monthly payments of 6/-. — Send 6/- only

AMPLION AUDIOLA PERMANENT MAGNET MOVING-COIL SPEAKER, with input transformer. Cash or C.O.D. Carriage Paid, £2/9/6. Balance in 8 monthly payments of 6/-. — Send 6/- only

IGRANIC D.9 PERMANENT-MAGNET MOVING-COIL SPEAKER. Complete with dual transformer. Cash or C.O.D. Carriage Paid, £1/9/6. Balance in 5 monthly payments of 5/3. — Send 5/3 only



NEW W.B. P.M.4.A. MICRODE PERMANENT MAGNET SPEAKER complete with switch controlled multi-ratio input transformer. Cash or C.O.D. Carriage Paid, £2/2/0. Balance in 7 monthly payments of 5/9. — Send 5/9 only

EPOCH MODEL 20C, 20CB and 20CQ PERMANENT MAGNET MOVING-COIL SPEAKER for ordinary power. "Class B" and Q.P.P. respectively, complete with input transformers. Cash or C.O.D. Carriage Paid, £1/15/0. Balance in 6 monthly payments of 5/6. — With 5/6 order

NEW LISSEN P.M. MOVING-COIL SPEAKER with input transformer. Cash or C.O.D. Carriage Paid. £1/5/0. Balance in 4 monthly payments of 5/6. — Send 5/6 only

NEW ROLA SPEAKERS

F6P.M. PERMANENT MAGNET MOVING-COIL SPEAKER, with input transformer. Cash or C.O.D. Carriage Paid, £2/9/6. Balance in 8 monthly payments of 6/- — Send 6/- only

NEW F.5 (P.M.32) "CLASS B" MOVING-COIL SPEAKER. "Class B." With "Class B" input transformer. Cash or C.O.D. £1/12/6. Carriage Paid. Balance in 6 monthly payments of 5/-. — Send 5/- only

BAKER PERMAG MINOR MOVING-COIL SPEAKER with transformer for "Class B" or ordinary inputs. Cash or C.O.D. Carriage Paid, £1/15/0. Balance in 6 monthly payments of 5/6. — Send 5/6 only

GRAMO MOTORS AND PICK-UPS

NEW GARRARD MODEL 202A. 12-in. Turntable. Electric Motor for A.C. mains. Cash or C.O.D. Carriage Paid, £2/10/0. Balance in 8 monthly payments of 6/-. — Send 6/- only

B.T.-H. SENIOR PICK-UP AND TONE-ARM. Cash or C.O.D. Carriage Paid, £1/17/6. Balance in 7 monthly payments of 5/-. — Send 5/- only

NEW MARCONIPHONE MODEL 19 PICK-UP. Cash or C.O.D. Carriage Paid, £1/12/6. Balance in 6 monthly payments of 5/-. — Send 5/- only

NEW OLDHAM H.T. ACCUMULATOR (Block type), 120-v., 2,750 m/A., complete with crates only. Cash or C.O.D. Carriage Paid, £3/15/0. Balance in 11 monthly payments of 7/-. — Send 7/- only

PILOT AUTHOR KITS

P.W. TABLEGRAM

KIT "A." Author's Kit of FIRST SPECIFIED Parts, including Peto-Scott Ready-drilled Panel and METAPLEX Baseboard, 14 in. by 10 in., but less Valves, Cabinet, Speaker and Gramo equipment. Cash or C.O.D. Carriage Paid, £5/2/6. — YOURS FOR **9/6** *Balance in 11 monthly payments of 9/6.*

KIT "B." As Kit "A" but with Valves only. Cash or C.O.D. Carriage Paid, £7/7/9. SEND ONLY 13/6. Balance in 11 monthly payments of 13/6.

KIT "C." As Kit "A," but including Valves and PETO-SCOTT TABLEGRAM Cabinet with Baffle Assembly, less Speaker and Gramo. equipment. Cash or C.O.D. Carriage Paid, £9/16/3. SEND ONLY 18/-. Balance in 11 monthly payments of 18/-.

KIT-BITS

Selected C.O.D. Items. You pay the postman. We pay post charges on orders over 10/-.

PETO-SCOTT METAPLEX Baseboard with runners		3	0
1 set of Specified Valves	£2	5	3
1 BLUE SPOT 29 P.M. Speaker	1	12	6
1 COLLARO No. 30 Single-Spring Motor with Automatic Stop and 7-in. Handle	1	3	0
1 COLUMBIA Model 22 Pick-up	1	12	6

EXCLUSIVELY SPECIFIED

PETO-SCOTT OAK TABLEGRAM CABINET Complete with Motor-Board — *Cash or C.O.D. Carriage Paid* **45/-**

Baffle and Baseboard Assembly 3/6 extra.

SEND FOR 1934 CABINET CATALOGUE

"CALEDONIAN" THREE

KIT "A" Author's Kit of First Specified Components, including Peto-Scott ready-drilled panel and METAPLEX baseboard, less Valves and Cabinet. Cash or C.O.D. Carriage Paid, £4/8/6. — Yours for **8/3** Balance in 11 monthly payments of 8/3.

KIT "B." As Kit "A," but with Valves only. Cash or C.O.D. Carriage Paid, £5/19/9, or 12 monthly payments of 11/-.

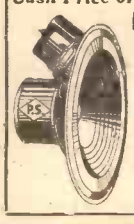
KIT "C." As Kit "A," but with Valves and Cabinet. Cash or C.O.D. Carriage Paid, £6/16/3, or 12 monthly payments of 12/6.

Exact to Specification

"CLASS B" LOUD-SPEAKER UNIT

"KIT A" Author's Kit of First Specified Parts, less Valve. Cash or C.O.D. Carriage Paid £2/7/6. — YOURS FOR **4/6** *and 11 monthly payments of 4/6*

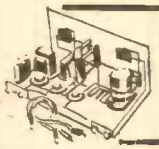
"CLASS B" Valve if required add 14/- to Cash Price or 1/4 to each monthly payment.



EXCLUSIVELY SPECIFIED

PETO-SCOTT Permanent Magnet MOVING-COIL SPEAKER

Cash or C.O.D. Carriage Paid, 15/- Send 5/6 only — *Balance in 2 monthly payments of 5/6.* — "CLASS B" Type. Cash or C.O.D. Carriage Paid, 22/6, or 4 monthly payments of 6/3.



MANUFACTURERS' KITS IN SEALED CARTONS

LISSEN SKYSCRAPER FOUR ALL-WAVE CHASSIS MODEL, in Sealed Carton. Cash or C.O.D. Carriage Paid, £5/12/6. Balance in 11 monthly payments of 10/3. — YOURS FOR **10/3**

NEW LISSEN SKYSCRAPER FOUR ALL-WAVE CONSOLETTE CABINET MODEL in Sealed Carton. Cash or C.O.D. Carriage Paid, £8/2/6. Balance in 11 monthly payments of 15/-. — Send 15/- only

7-VALVE SUPER-HET. in Sealed Carton. Cash or C.O.D. Carriage Paid, £8/17/6. Balance in 11 monthly payments of 16/6. — Send 15/- only

LISSEN 7-VALVE SUPER-HET CONSOLETTE MODEL, in Sealed Carton. Cash or C.O.D. Carriage Paid, £11/10/0. Balance in 11 monthly payments of 21/-. — Send 21/- only

NEW STATION MASTER MODEL 34 M.C. Complete Kit, with Valves, Cabinet and Permanent Magnet Moving-Coil Speaker. Cash or C.O.D. Carriage Paid, £7/2/6. Balance in 11 monthly payments of 13/-. — Send 13/- only

NEW STATION MASTER 34. S.G., Detector and Pentode, complete Kit with Valves, but less Speaker and Cabinet. Cash or C.O.D. Carriage Paid, £4/6/6. Balance in 11 monthly payments of 8/-. — Send 8/- only

TELSEN CLASS B 4 CHASSIS KIT in Sealed Carton, less Valves, Cabinet and Speaker. Cash or C.O.D. Carriage Paid, £3/17/6. Balance in 11 monthly payments of 7/-. — Send 7/- only

TELSEN CLASS B 4 CONSOLETTE KIT including Telsen "Class B" Moving-coil Speaker and Consolette Cabinet, less Valves. Cash or C.O.D. Carriage Paid, £5/17/6. Balance in 11 monthly payments of 10/9. — Send 10/9 only

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TELSEN H.T. AND L.T. A.C. MAINS UNIT W.346. H.T. Portion: Max. Det. and S.G. tappings each adjustable for High, Med. or Low voltages. Maximum 28 m/A. at 150-v. L.T. trickle charges, 2, 4, or 6 volts at ½ amp. Cash or C.O.D. Carriage Paid, £4/17/6. Balance in 11 monthly payments of 9/-. — Send 9/- only

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ATLAS C.A.25, for Mains, "Class B" and Q.P.P., four tappings: 60/80, 50/90, 120, 150, 25 m/A. Cash or C.O.D. Carriage Paid, £2/19/6. Balance in 10 monthly payments of 6/-. — Send 6/- only

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ANY ITEM SUPPLIED SEPARATELY—ORDERS OVER 10/- SENT C.O.D. CARRIAGE AND POST CHARGES PAID

THE "P.W." TABLEGRAM

(Continued from page 18.)

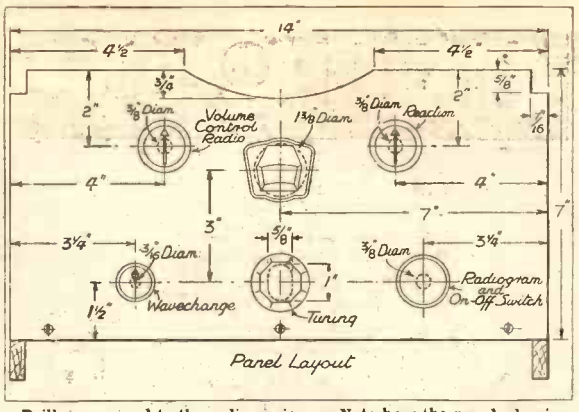
baffle for the loudspeaker. This baseboard is cut away at the front to take the circumference of the speaker, but this is done by the cabinet makers and does not mean work for the constructor.

Above the speaker and batteries is the clockwork motor for the gramophone side of the receiver, with a high-class pick-up mounted on the motor-board. This board is supplied with the cabinet, and it can be supplied cut for the motor, if desired. The volume control for the gramophone reproduction is mounted on the motor-board, and is quite separate from the radio section of the set.

Fixing the Motor-Board.

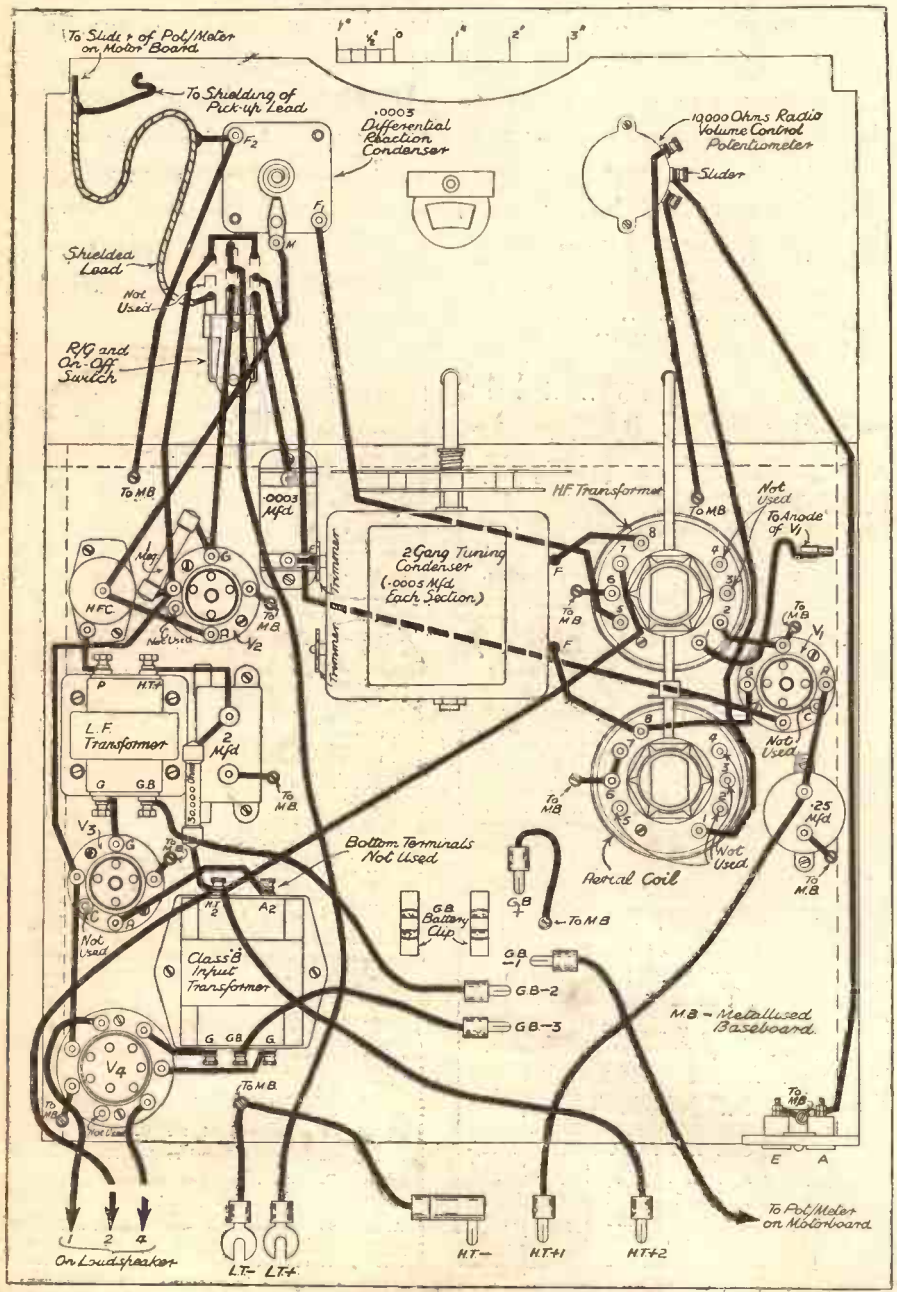
It should be remarked here that the motor-board should be fixed in position last when the assembly of the set is carried out, otherwise the loudspeaker baffle will foul the volume control on the motor-board.

The photographs and drawings show the panel of the set cut to a peculiar shape. This is so that it shall fit the front of the cabinet and clear the speaker frame, and it can be obtained from the cabinet makers ready cut to that shape.



Drill your panel to these dimensions. Note how the panel edge is cut away at the top to clear the loudspeaker.

EXPERTLY DESIGNED FOR MAXIMUM PERFORMANCE



A layout which obeys all the laws of first-class design. The H.F. components are carefully disposed on one side of the baseboard and are well separated from the L.F. end by the twin-gang condenser. The letters M.B. stand for "metallised baseboard," to which many "earthy" connections are made by means of screws and washers.

The Baseboard is Raised.

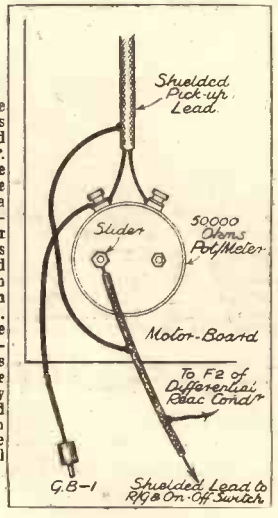
The Metaplex baseboard which is used for the set is mounted on fillets to raise it slightly so that the knobs on the panel shall come in the right positions at the front of the set. If this raising, which is a mere 1 in., is not carried out the knobs will come too low in the cut-away portion of the cabinet.

There is nothing difficult in the construction of the set, there is plenty of room for the assembly of the components, and no soldering is required. Care should be taken over the making of the connections to the Metaplex baseboard. These must be done by means of screws and washers, the

(Continued on page 29.)

PICK-UP WIRING

The gramophone motor-board carries the pick-up and its volume control. The leads from the pick-up go to the potentiometer via a screened covering, while another screened lead drops down to the set and makes connection at the radiogram and on-off switch, as shown on the main wiring diagram. Bias is picked up from the set's grid battery by a single unscreened lead, here shown connected to the volume control potentiometer.



ACCESSORIES TO CHOOSE

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

MAINS UNIT.—Special "Popular Wireless" "Class B" mains unit to be described next week.

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

YOU BE THE JUDGE

"I present to you INCONTESTABLE EVIDENCE

. . . I place before you the actual EVIDENCE of where your set is right or wrong. I am giving you conclusive and all-inclusive evidence of radio faults and efficiency. I give you—not just the circumstantial evidence of amperes, volts and ohms, no mere hypothesis, but proved and tested ACCURACY. I present the precision of the AvoMinor, a younger brother of the famous Avometer, the instrument that is so accurate and efficient that it is preferred and insisted upon by the world's foremost technical experts and service engineers. This in itself is evidence enough that nothing less than the AvoMinor is dependable enough for you.

The AVOMINOR TRADE MARK

TELLS THE WHOLE TRUTH

Now YOU can test YOUR set—examine it, locate the faults, get first-class results from it—with the ease and precision of the technical expert. You can test ACCURATELY with the AvoMinor—test circuits, valves, components, batteries and power units. There is no test you need that you cannot make with the AvoMinor. *It gives TEN different ranges of readings in milliamps, volts and ohms. It is a moving-coil combination testing instrument with a total resistance of 100,000 ohms. Full-scale deflection is obtained with only three milliamps.* No other instrument in the world gives you, at such a convenient price, so many tests with such dependable accuracy.

Ask your radio dealer to show you the AvoMinor. Be satisfied with nothing less. Remember, it's accuracy that is all-important. In case of difficulty, write for fully descriptive folder.

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THE PETO-SCOTT SPEAKERS

The enterprise and resources of Peto-Scott seem to have no limits. They have firmly established themselves as the supreme suppliers of kit sets, and surely no other concern possesses such a wide-flung system of C.O.D. and hire-purchase sales.

It would certainly be interesting to know how many hundreds of thousands of radio enthusiasts have been helped on the road to better radio by the famous Peto-Scott "Easiway" method.

And now Peto-Scott have entered the loudspeaker market with a moving-coil instrument that sets an entirely new price quality standard.

It retails at the astonishingly low price of 15s. as a complete chassis model with a tapped input transformer. Even with a polished walnut cabinet it costs a mere 25s.

The particular one I have on my desk as I write is a mains-energised model for D.C. mains. (There is also a similar one listed at the same price for A.C. mains.)

It is a very well-designed and well-built loudspeaker. Its sensitivity is good, and in respect to quality, too, it reflects great credit on the manufacturers.

How they can manage to produce it at such a price is beyond my comprehension.

One could be forgiven for expecting it to give a somewhat thin and reedy response and require considerable power to drive.

But this is not the case, and it is very evident that there have been ample research and experiment behind its development.

I am pretty certain Peto-Scott will not soon be issuing revised models, as so often happens when a firm first adventures with a new line. In this case there is patently no need, and I also doubt the possibility of improving on this speaker at this incredibly low price.

I advise all readers who happen to pass the Peto-Scott Holborn showrooms to call in and hear one working.

A mere fifteen shillings is all Messrs. Peto-Scott ask for this desirable moving-coil loudspeaker. Permanent-magnet, A.C. and D.C. models are all available.

TELSEN H.F. CHOKES

I have still a number of the new Telsen components standing by for review on this page, but their individual interest and importance are such that I am bound to give them separate treatment.

It would not be fair either to Telsen or the reader to do otherwise. However, it can be said here and now that I have not encountered any single item that does not reach the high standard we now look for as a matter of course in Telsen products.

And I think I have tested practically the whole range. I anticipate future Telsen reviews in this way so that constructors need not necessarily wait upon my reports before going ahead with their shopping.

This week I am going to describe the Telsen Screened H.F. Chokes. There are three types, and they are as follows: The "All-Wave," which is a binocular covering the wide band of from 10 to 2,000 metres. An extremely useful component this for all sets, and especially those which take in short waves as well as the broadcasting spectrum. It retails at 4s. 6d.

And then there is the "Short Wave" for all short-wavers dealing with wavelengths from 10 to 100 metres. This lists at 3s.

Finally, we have the "Standard" (100 to 2,000 metres), which retails at the attractive price of 2s. 6d.

All these Telsen H.F. chokes are fully screened, and, moreover, they are provided each with an earthing terminal.

They are exceptionally compact in construction and, needless to say, their finish is impeccable. When one thinks what one used to get in the way of an H.F. choke for seven or eight shillings or more, one realises keenly the debt we owe to Telsen.

Three different Telsen screened chokes are available, one for all waves, another for the broadcast bands and a special short-wave choke. Binocular and single types are illustrated here.

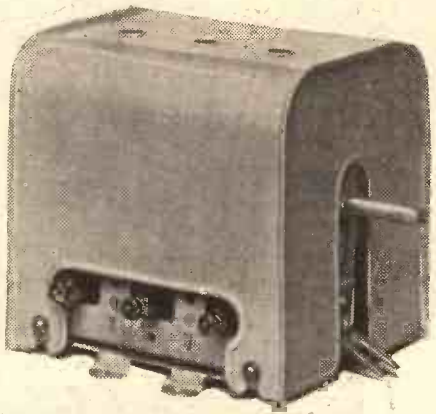
We have thoroughly tested each one of the new screened types and find them to be both efficient and dependable.

They can be strongly recommended to all constructors.

NEW POLAR CONDENSER

Trimming can be very easy and it can also be a nasty, tricky, inconclusive kind of operation. For the first and happy condition to be realised you must know what you are doing and why you are doing it.

But even given this knowledge, the adjustments may still be irritatingly tricky, especially if the trimmers are inconveniently placed.



Trimming is a simple job on the new Polar gang condensers, the trimmers being at the top of the component, and therefore very accessible.

I have often wondered why they are not at the top of condensers instead of at the side and right towards the base in just about the most inaccessible place possible.

However, on the Polar Star Minor three-gang the trimmers *are* at the top, and one can ply a sharpened skewer or other such adjusting device with complete freedom from upsetting hand-capacity effects.

This newest Polar product is in other respects, too, an attractively practical proposition, with its stout cadmium-plated steel frame and accurate and robust construction.

Its sections are accurately matched and its movement is smooth. In short, it is just what a ganged condenser should be to satisfy the most critical constructor.

And the price is 18s. 9d., or, complete with the new Polar "Arcuate" full-vision drive, 24s. 6d., and that, it must be admitted, is reasonable enough.

Weekly jottings of interest to buyers

APPEARANCE *does* count! That much may be deduced from the fact that, due to the tremendous improvements which have been made all round in the cabinet work and general design of commercial receivers this year, the manufacturing resources of several of the leading firms are taxed to capacity.

Kolster-Brandes, for instance, have received so many orders for their new-style receivers that their Sidcup works will be fully employed until Christmas on Exhibition business alone. Good work, K.-B.!

As a matter of fact, to let you into a little secret, an official of K.-B. told me that one of the things which impressed him most at the recent Exhibition was the keen observation of women buyers. Apparently this year, more than ever before, they have been demanding radio sets that will tone with the average house interior.

That K.-B.'s are doing so well is no doubt due to the careful attention that they have given to this important question of appearance. Their chromium-plating edged set, the cabinet for which was designed by Betty Joel, is only one of many examples.

Mr. S. Wilding Cole, the enterprising managing director of K.-B. (and vice-chairman of the R.M.A.), stated on the closing day of the Exhibition that their general business had been as three to one over any previous year's show. That's the stuff to give 'em!

"A City of Sound."

It seems to me that I shall shortly have to forsake the old love and take up the occupation of book critic! At least, that's what will happen if these go-ahead manufacturers of ours continue to produce such wonderful literature.

The latest one to come to hand is from Marconiphone. It has the fascinating

(Continued on page 30.)

ON FIVE METRES

By W. L. S.

IN an earlier article I dealt with the general arrangement of the transmitter and receiver, together with some of the preliminary tests. Here are the full details of the tests carried out later.

It took practically no time to establish the fact that signals from the home station, however low the power input might be, would effectively cover the whole of the town. Even with the ridiculously inefficient aerial in the car, telephony from the fixed station could be perfectly well followed, even while driving through thick traffic.

To my mind this exposes one of the chief freaks of this five-metre work. Why should it be possible to hear clear telephony in all sorts of places in the town which are most definitely not "optical" with respect to the transmitter, while in the open country, not more than three miles away, there is no trace whatever of signals?

Peculiar Absorption Effects.

To continue the story: the next tests we carried out were with "duplex" telephony from the car to the fixed station. There was no trouble about this, as each operator could hear the other transmission, even when his own transmitter was running, so that was no need for "over to you, old man!" and the consequent waste of time.

These tests confirmed the fact that two-way work was reliable anywhere in the town, whether "optical" or not; an extension of them likewise proved that anything outside the optical range, once we were clear of the town, was practically impossible.

OUTSIDE HIS STATION

Mr. T. Woodcock, G 6 O.O, at the window of his "shack," which was the "base" station during the tests described by W. L. S.

I want to consult a geological expert and see whether there is anything about the land in this part of Yorkshire that might account for what appeared to be very severe absorption.

Schedules that we had arranged with Bradford and London (heights of optimism!) led us further afield. On our journey to Scarborough, with a view to listening on Oliver's Mount, we called several halts to listen to the home station, which we had left running in Bridlington, but, as before, as soon as we had passed the crest of the first long hill out of the town we could find nothing whatever.

Oliver's Mount appears to be a marvellous location for a five-metre transmitter, but Bridlington is outside optical range, and—as we more or less expected by now—we heard nothing of the 1,000-cycle note that would have given us quite a thrill.

Neither did we hear our friends in London or Bradford, although we found afterwards that they had kept to their schedules. But in those two cases we hardly expected to meet with success, although we *did* so want to hear our own transmission from a mere sixteen miles or so!

Continuing his account of experiences with a portable outfit on five metres in Yorkshire, our popular contributor tells of the peculiar reception encountered and how contact was maintained while travelling in a car at 50 miles an hour. The previous article appeared in "Popular Wireless" for September 2nd.

We decided after this that we wanted a higher and clearer location for the transmitter. This has proved to be true of five-metre work—that a high and clear location for the transmitter is vastly more important than is the location of the receiver.

Accordingly, as I have already mentioned in Short-Wave Notes, we took the gear up to Sledmere, a spot that, while not being really high, covers a very wide range. The ground does not slope steeply away from the top of the hill, but there is a generally falling-away in every direction and an "optical" range of 30 or 40 miles is obtained. From the top of the famous monument (used as an "aerial mast" by East Yorkshire transmitters on field-days!) this distance would be substantially increased.

Disappointing Results.

Our first test from this spot was just about as unsuccessful as any test could possibly be. We left my transmitter running in the car, with a small "fishing-rod" aerial, while two of the party toured round in another car with a receiver. Those of us who were left behind manfully keyed the transmitter for well over an hour and a half, supremely optimistic at the failure of the mobile party to return.

We imagined that they were sixty miles away and still receiving us well, when they suddenly arrived with the cheering news that our signals had disappeared before they were a quarter of a mile away, and had only just been picked up again—some hundred yards away!

It was too late by then to make any alterations to the transmitter, aerial or general arrangement. We therefore had to be content with packing up and muttering to ourselves that "something's wrong somewhere."

A week later we repeated the experiment from a spot about two hundred feet to the west of the previous locality, and results were *completely* different. We toured round a circular course in the car, and only lost the signals once in the first twelve miles or so—at the bottom of a deep and thickly wooded valley.

High-speed Morse!

Signals were held at R 9 while we were travelling at well over 50 m.p.h along a broad, straight road. As a matter of fact, the "op." left in charge began to send some Morse at this juncture, and neither of the occupants of the car had the slightest difficulty in copying every letter. And this in spite of the audible engine noise, added to the electrical Q R M set up by the ignition system.

Several spots were tried, and always the signals seemed to be R 9. In one place they could not be found on the rather poor aerial fixed to the car; but ten or fifteen feet held straight out from the window of the car, not more than six feet from the ground, brought them back to R 9 again.

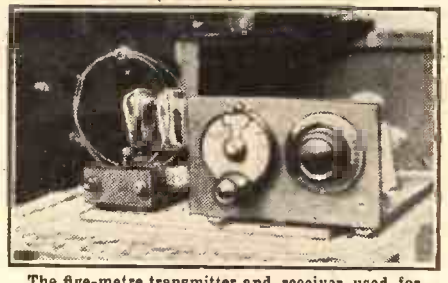
A marked directional effect was noted at this spot. Signals were tremendous when this short aerial was pointing towards the transmitter, and completely unreadable—if not absent—when it was at right angles.

Doubtless some of the five-metre freaks that one hears of may be partly accounted for by directional effects similar to this.

Incidentally, the aerial used for transmission was a vertical wire 16 feet long, fed at the bottom end with quarter-wave feeders (roughly 4 feet in length).

Further tests are now being carried out in London with the identical gear that was used in Yorkshire, and comparative results will be rather instructive.

THE APPARATUS USED



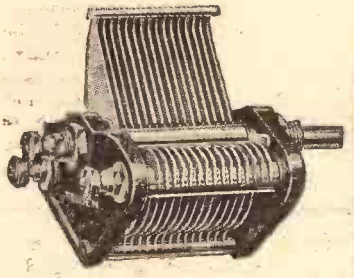
The five-metre transmitter and receiver used for "mobile" work. The gear was worked largely in a motor-car, a number of different aerials being experimented with.

TELSEN

TUNING

CONDENSERS

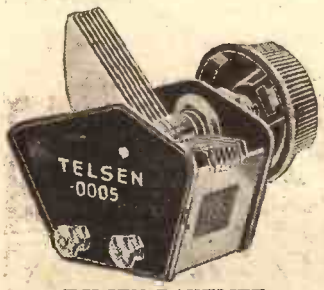
cover every requirement



TELSEN AIR-DIELECTRIC TUNING CONDENSERS

The precision and sturdy construction of this component ensure years of faithful service. Its frame is braced by three solid pillars, and the vanes clamped at three points, making distortion impossible. The rotor is also built into a rigid unit, generous bearings preventing backlash or end-play.

Capacity	*Price*
·00025 mfd. ..	2/6
·00035 „ ..	3/6
·0005 „ ..	3/6



TELSEN BAKELITE DIELECTRIC TUNING CONDENSERS

Represent really remarkable value at the new reduced prices.

Very rigid construction, with high grade dielectric, ensuring permanently accurate spacing with minimum losses. Exceptionally compact. Complete with knob.

Capacity	*Price*
·0003 mfd.	2/-
·0005 „	2/-

TELSEN DIFFERENTIAL CONDENSERS

Similar in design and construction to the reaction condensers. Supplied complete with knob.

Capacity	*Price*
·0003 mfd. W.351 ..	2/-
·00015 „ W.352 ..	2/-
·0001 „ W.353 ..	2/-

TELSEN GANGED CONDENSERS

The finest ganged condensers ever produced, and, at their new reduced prices, the finest value ever offered in their class.

For use where accurate and simultaneous tuning of two or three circuits is obtained by the rotation of one dial. A pressed steel frame of great rigidity eliminates distortion, the rotor and stator vanes being let into one-piece high pressure die castings to ensure accurate spacing. All sections are very carefully matched by means of split end vanes, and trimmers are provided. Complete with knob, pilot light escutcheon and two alternative tuning scales.

	Price
Single Unit	7/6
Twin Ganged	12/6
With dust cover 2/- extra	
Triple Ganged	17/6
With dust cover 2/6 extra	

TELSEN REACTION CONDENSERS

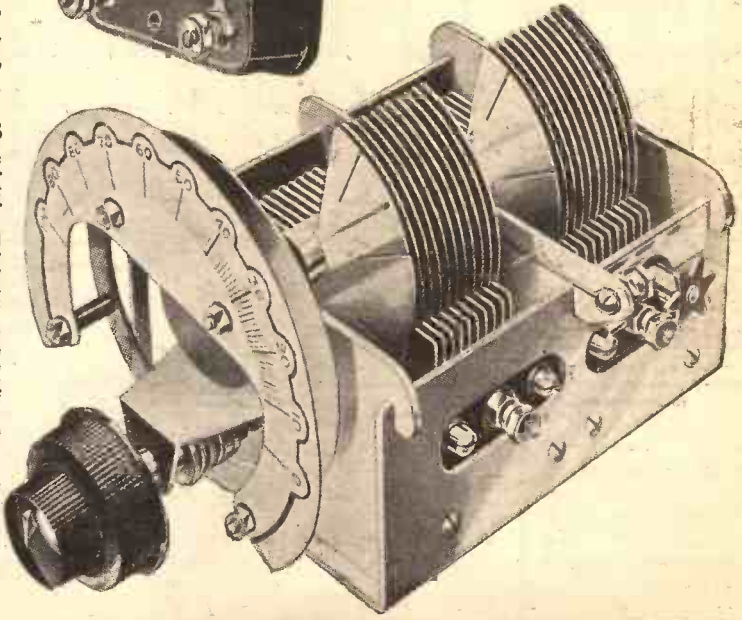
Entirely re-designed. Now incorporate several valuable improvements with no increase in price, the whole unit being also now enclosed in a strong dust-proof bakelite case. Supplied complete with knob.

Capacity	*Price*
·0003 mfd. W.354 ..	1/9
·00015 „ W.355 ..	1/9
·0001 „ W.356 ..	1/9
·00075 „ W.357 ..	2/-
·0005 „ W.358 ..	2/-

TELSEN AERIAL SERIES CONDENSER With Switch

Built on similar lines to the new reaction condensers, providing an ideal selectivity and volume control. Supplied complete with knob.

Max. Cap.	*Price*
·0003 mfd. No. W.350	2/-



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RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos.

Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article.

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

All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

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

QUESTIONS AND ANSWERS

DIRECT RECEPTION OF AMERICAN STATIONS ON MEDIUM WAVELENGTHS.

"SCEPTIC" (Cambridge).—"Is it possible to receive an ordinary (not short-wave) American broadcasting station's programme in this country? A friend of mine is quite positive he has done so on a 3-valve set, very much like my own, which is S.G., detector and pentode.

"I have tried to convince him it was probably a relay from one of the German or other stations on the Continent, which was picking it up by short waves and relaying again on the medium waveband. But he won't have this, because it was at 4.45 a.m. (he is a night-worker, with queer hours), and he says it was far more likely to be a direct pick-up from America at that hour of the night."

We are inclined to agree with him, for even at this season of the year—which is not half so favourable as winter—it is quite possible to receive a programme direct from America, on the ordinary wavelengths, between 200 and 600 metres.

Such freak long-distance reception often takes place upon comparatively simple sets, and during autumn and winter even one-valvers have been proved capable of transatlantic reception. It is always worth trying if you are awake in the small hours.

The only way to be quite sure that a programme thought to be from America is a direct pick-up of an American station is to note carefully the call and programme particulars, and to know from your tuning chart the wavelength corresponding to the dial reading at the time of reception.

Send these particulars to the director of the station concerned, and tell him you think you heard his programme, giving brief particulars of your set, exact time of reception, etc.

American stations are generally glad to hear of their programmes being picked up on this side of the Atlantic, so if there is no doubt that yours was a case in point the director will probably be pleased to confirm the fact in writing.

REMOVING THE HUM IN A MAINS SET.

B. H. R. A. (Earl's Court, S.W.).—"Mine is a two-valve all-mains set, with indoor aerial round the picture-rail. It is just over eight months old, and all the time it has been in use till now there has been a slight but quite noticeable hum in the loudspeaker when there was no music or talking going on.

"This hum, however, has now vanished, and all I can put it down to is the new method of earth wiring which is now in use.

"What happened was that the landlord of the flat had some new pipes laid for a boiler, and when the alterations were going on I asked the plumber to solder me an earth lead to the water pipe, bringing it up through a

(*Continued on page* 28.)

"P.W." PANELS, No. 136. MOSCOW.

There are seven broadcasting stations in Moscow, including a low-powered relay on 378 metres, Moscow Experimental that works on 720 metres, and Moscow-Stalin on 424·3 metres.

* * *

Of the four long-wave stations two are well known in this country, viz. "Moscow, Trades Union" and "Moscow Popoff," on 1,304 and 1,101 metres respectively.

* * *

The other Moscow wavelengths are 1,481 and 1,000 metres, now being used experimentally. In January one of the Moscow stations is to increase power to 500 kw.

Bakelite Condensers

Last season Utility bakelite condensers were the best available, this year the new models are better still. They are sturdier, they are more accurate and we have improved on the previous low H.F. losses figure.

So whenever you require a bakelite condenser insist on a Utility model, the range includes all values from ·00075 to ·0001 and differentials from ·0003 to ·0001, a model for every purpose. The ordinary type can be supplied fitted with a standard Utility dial complete with baseboard mounting panel and escutcheon, as illustrated, for 4/6 complete. This combination gives you a complete tuning unit at an exceedingly low price.

Prices, including knobs:

W307	·00075	**2/6** each
W297/8/9	·0005/3/2	**2/-** each
W300	·001	**1/6** each

Write for a copy of our new catalogue, it contains full details of our complete range of condensers, dials, and switches.

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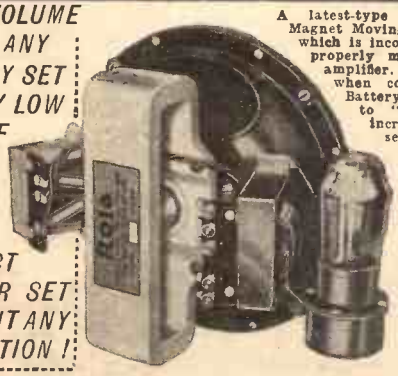
"CLASS B" SIMPLIFIED!

THE NEW ROLA P.M. M.C. SPEAKER & UNIT IN ONE

MAINS VOLUME FROM ANY BATTERY SET AT VERY LOW USE OF H.T.

JUST CONNECT TO YOUR SET WITHOUT ANY ALTERATION!



A latest-type ROLA Permanen Magnet Moving-Coil Speaker, with which is incorporated a complete, properly matched "CLASS B" amplifier. This assembly, when connected with any Battery Set, converts it to "Class B" output, increasing the overall sensitivity of the set several times, and INCREASING THE POWER OUTPUT OR VOLUME UP TO FIVE TIMES!

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Send only 5s. 0d. for 7 days' trial; if satisfied, pay balance in 10 monthly payments of 7s. 6d. (Cash, in 7 days, £3 11s.)

The British Made **WATES UNIVERSAL METER** is the *only* popular priced instrument testing **resistances** as well as batteries, valves, circuit, and all components; 4 readings on one dial.

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This Rola "CLASS B" SPEAKER AMPLIFIER UNIT can quickly and simply be connected to any battery set, and is complete with Cossor, Mullard or B.T.H. "Class B" valve, with full instructions.

The result of adding this unit to your battery set will be equivalence in performance, as regards richness of tone and volume, to a high-grade all-mains set, whilst at the same time retaining economy in battery consumption. Send deposit to-day!

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82, YORK ROAD, LONDON, N.1

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page 26.*)

hole near where the set stands. (It was shorter than the other earth wire, which had to go out of a window to an outside earth.)

"To my surprise, this is not only more convenient, but it appears to have taken the hum away, and the set seems better than it ever was before. Is that because my other earth was not so good as this?"

Yes, we should unhesitatingly put the improved results down to the use of a better earth connection.

It often happens that a rather poor earth-lead arrangement gives rise to hum on mains receivers. In fact, with this class of set it is always worth going to some little trouble to make sure of a good earth.

In your case the old earth lead may have been running too close to some of the set's other wires—aerial, for example—or it may have been that there was a rather high resistance in that part of the earth circuit, either of which conditions might lead to a continuous hum when the set was switched on.

The new arrangement is either better spaced, so that feed-back does not occur, or is of lower resistance, or possibly it combines these two effects, and so removes the cause of the hum.

SIXPENNY BLUEPRINTS OF THREE-VALVE SETS.

R. N. (Winchmore Hill).—"Have you any 6d. blueprints of 3-valve sets? I don't want a set with Q.P.P. or 'Class B' or any of these very latest developments, because I have plenty of good quality ordinary parts on hand left over from last winter which I want to use up.

"Also the set will be used in Berkshire, where a simple kind of set is best, and a plain three-valver will be quite powerful enough without being too hard on the H.T.

"I rather favour the detector and two low-frequency type, but would like details of any three-valvers in blueprint form which you can supply."

The following blue-prints can be obtained from The Technical Queries Department, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4. The price is 6d. per blueprint, and a self-addressed, stamped envelope must be enclosed.

No. 42. The "Q and A" Three. A simple plug-in coil set (det. and two L.F.) to give full volume on the local station, with a possibility of long-distance work when a little skill in handling has been acquired.

No. 59. The "Three Coil" Three. A high-efficiency selective receiver, with an S.G. H.F. stage, which requires only three ordinary plug-in coils.

IS YOUR SET BEHAVING ITSELF?

Perhaps your switching doesn't work properly? Or some mysterious noise has appeared and is spoiling your radio reception? Or one of the batteries seems to run down much faster than formerly?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers its unrivalled service.

Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do. On receipt of this an Application Form will be sent to you post free immediately. This application will place you under no obligation whatever, but, having the form, you will know exactly what information we require to have before us in order to solve your problems.

LONDON READERS. PLEASE NOTE: Inquiries should **NOT** be made by 'phone or in person at Fleetway House or Tallis House.

There is also the "M.W." Blueprint No. 14. The "Multi-Wave" Three. This is an all-wave det. and 2 L.F. receiver, giving excellent results on short, medium and long waves.

And the "M.W." Blueprint No. 7. An "Every-Purpose" three which is a very powerful detector and L.F. three-valver, with plug-in coils and wave-change switching for medium or long waves.

In addition to the above, you can obtain back numbers of "P.W.," Nos. 539 and 557 respectively, dated October 1st, 1932, and February 4th, 1933.

The former contains a blueprint of the "P.W." "Apex," which is an S.G., det. and L.F., with coil unit and simple wavechange switching.

The latter has a blueprint of the "P.W." "Airsprite"—also an S.G., det. and L.F. circuit, with a great reputation for distance and quality.

NOTE.—Any back number of "P.W." which is still in print can be obtained from The Amalgamated Press, Ltd., Back Number Dept., Bear Alley, Farringdon Street, London, E.C.4, price 4d. per copy, post free.

HOW LOCALITY EFFECTS QUALITY OF RECEPTION.

S. E. (Surbiton, Surrey).—"I correspond regularly with a friend who lives near Salisbury, and as we are both keen listeners we often agree to listen to the same series of talks, each enjoying it more because the other is listening, too.

"Here, in Surbiton, I can listen to the London National exactly as before. But in my friend's, case if he tries that wavelength, there is distortion.

"Is it usual for the quality of a programme, apart from its strength, to vary in different localities?"

Both the quality and strength of any station's programme depend to some extent upon the locality of reception.

In the true-service area of a B.B.C. station quality can be considered as first-class, because reception is by "direct waves," i.e. by waves coming direct from the transmitting aerial to the receiving aerial.

At long distances from the transmitting aerial reception is partly by direct waves and partly by "sky" waves. These latter have not travelled along the ground, but have been radiated skywards, and then been reflected back to earth from a point in the upper atmosphere.

Owing to the different route they have travelled they do not arrive at a distant receiving aerial at exactly the same time as the ground waves. They are, in fact, out of step, or "out of phase," and this gives rise to fading and to a certain amount of distortion.

This effect happens with all stations outside their own service areas.

THE AMPLION "AUDIOLA" SPEAKER.

This permanent magnet moving-coil loudspeaker is fitted with a 9 inch diameter cone. Owing to a typographical slip the size was given as 7 inches in the Amplion advertisement in our September 9th issue.

THE "P.W." TABLEGRAM

(*Continued from page 20.*)

wires being placed under the washers. If this is not done there is danger of the metal surface of the baseboard being forced away by the screw, and the wire may make poor or uncertain contact with the coating.

A screened wire is used for the connection between the radiogram switch and the volume control on the motor-board so that no induction between the pick-up feed to the set and the wiring of the set shall take place. Care should be taken that the screening of the lead is earthed to the reaction earth terminal, as shown in the wiring diagram and photographs.

The mounting of the variable condenser is not difficult if a template of the positions of the three pillar supports is made with paper first, or alternatively the pillars could be marked with ink and the feet placed on the Metaplex, and then holes drilled through for the screws. These must be countersunk fairly deeply.

Use a Good G.B. Battery.

In assembling the set there are two or three things that should be remembered. Both the "Class B" and the driver valves take 4-5-volts negative grid bias, and this battery *must* be in good condition. An old run-down battery will spell failure in bad distortion.

The two H.T. positive leads go into 80 volts for H.T.1 and 120 volts for H.T.2. The other flex lead coming off H.T.2 on the driver transformer goes to 2 on the loudspeaker transformer. The two anode connections from the "Class B" valve holder go to terminals 1 and 4 respectively on the speaker transformer. It does not matter which goes to which terminal.

The trimming of the condenser is carried out in the usual way, and is a very simple matter. The radiogram switch operates in this way. In the centre position the set is turned off; in the right-hand position the set is ready for radio reception, and when the knob is turned to the left gramophone records can be played and the S.G. valve filament is automatically switched off. In this position of the switch none of the controls on the set makes any difference to the operation; everything is controlled by the pick-up and the volume control on the motor-board.

ECKERSLEY EXPLAINS

(*Continued from page 7.*)

coil. It may introduce hideous losses. There is no reason to be proud of the fact that, in a given case, the inductance looks constantish with permeability tuning. What you must do is to vary the inductance 9 to 1 for a 3 to 1 change in frequency.

There has been a lot of patient work involved in getting proper permeability tuning, and "any old thing" will not give its true advantages.

In Mr. Polydoroff's system not only has he achieved ganging and a constant $\frac{L}{R}$, but also a very high value of $\frac{L}{R}$, meaning a high gain per stage of high-frequency magnification.

There is no doubt that permeability tuning is a real challenge to the super-heterodyne. We shall hear more about it.

Aren't things moving?

THE LISTENER'S NOTEBOOK

(*Continued from page 8.*)

brought laughter. Julian Palliser was a stalwart in this respect, while Lady Lorrimer had her points, too.

* * *

"The Mulberry Bush" was admirably cast. The B.B.C. has, admittedly, a wonderful army of actors and actresses on whom to draw for its plays, for we seldom find occasion to criticise the players adversely. The fault is either with the play or the production. I wonder how many studios were used for "The Mulberry Bush"!

* * *

Lawrence Baskcomb and his pirate crew seemed to get an amazing kick out of their cocoa and lemonade ration, judging from the quantity and quality of the bawling that went on. A nautical play or burlesque over the air is invariably an occasion for noise, I find. I would much prefer a play from the no less realistic angle of the silent navy. It *is* a fact that an hour of non-stop noise is a tax on one's nerves.

* * *

All the same, I rather like the idea behind these concert-party personalities. It makes the compère a real part of the show, for one thing. Lawrence Baskcomb, as the Pirate King, had some amusing lines to put over, but he has an unfortunate habit of dropping his voice at the end of every phrase. He was quite inaudible at times, even in those rare moments of silence when his over-zealous crew had been prevailed on to "pipe down." I liked much of John Holliday's music. Shall we ever hear it again? We seldom do hear such numbers a second time.

* * *

Now that talks are filling their places again in the programmes, some of the summer items have got to go. Outdoor broadcasts will be among the first. Well, they have been fairly varied this summer, though I still think the B.B.C. might increase their number. They are such excellent fare, and exemplify as much as anything I know the attractiveness of broadcasting.

* * *

Again, in this form of entertainment the B.B.C. has no rival. To the B.B.C. alone we look for all further developments, for if not to the B.B.C., to whom else? Much that the B.B.C attempts is already done, and in some cases done better, by other bodies. But here the B.B.C. has wonderful opportunities of developing something for which broadcasting is uniquely suited. I would like to see the Corporation go all out next year, for I can see unlimited possibilities in this direction.

* * *

The several Guards' bands, too, will also retire to their winter quarters. Many listeners will recall with pleasure the pleasant musical hours these bands have given. One noticed no revolutionary changes in repertoire this summer, for time after time we were regaled with airs we have for long associated with the bands of H.M. Guards. This is all to the good, especially as British music has to face terrific opposition from abroad these days.

AN H.T. ECONOMISER

(*Continued from page 6.*)

positively cannot work if you don't do that. The positive end is plainly coloured red.

A separate grid-bias battery is needed for the power valve; that also is quite essential. And it should be a battery capable of giving you about double the voltage you normally employ for the output valve.

Its positive goes direct to the unit, as marked in the diagram, and its negative to the same grid-bias negative plug you formerly employed for the power valve.

Increase the power valve's grid bias until only about one-tenth of the normal H.T. current is taken by that valve.

Finding the Exact Bias.

You can find the exact grid bias needed for that by consulting the maker's curves of the valve. If you have mislaid these, increase the grid bias as much as you can, without distortion on very quiet signals.

The H.T. voltage remains the same.

The Economiser will now do its work, and very successfully, too, as you will discover, especially if you can watch it with the aid of a milliammeter. To do that, by the way, is extremely interesting, and gives you positive proof of the value of this ingenious money-saver.

THE IMPORTANCE OF THE ANNOUNCER

(Continued from page 3.)

cheerful and at the same time keep in good humour and quieten the "nerves" of other departments and bodies of workers.

The model announcer must, of course, have a beautiful voice, a cultured style, good diction and pure English. He must know enough French and German not to stumble, and enough Italian not to go wrong with musical terms.

Apropos his English: I am not one of those who worship at the shrine of a pedantic pronunciation, and I have long thought that the B.B.C. overdoes its instructions in this respect. The lot of the announcer must be embittered unnecessarily by having to remember the official pronunciation of a word.

If, as is demanded, the announcer be an educated man he is unlikely to pronounce words so oddly that an accepted authority cannot be found to support him. An occasional slip is not wholly to be deprecated, as it reveals the human side of this hidden perfection which links him with his kind.

And if I had my way I would not exclude from the ranks of regular speakers men and women with good provincial accents. I remember once suggesting for a permanent appointment in the music department a man of great musical scholarship, with a unique gift for imparting information and a splendid broadcasting voice; but a fellow-governor was averse to his Yorkshire accent and broad vowels, and so the matter went no further, to the very great loss of listeners.

Supposed to be Anonymous.

The announcers are supposed to be anonymous to the public and, although the name of Mr. Hibberd, the chief announcer, is now as universally known as his very beautiful voice is admired, most of them are not known by name to listeners.

There may be a good and sufficient reason for this not unassociated with a desire to protect them from too-emotional devotees amongst listeners; but this deprivation, from which no other class of performer suffers, could be more than compensated for if the announcers could be taken into the confidence of their chiefs and informed of the Board's policy as it was developed. At present it is not considered necessary to tell the announcers what changes are made in policy; theirs but to obey when orders are given.

But I imagine that it would make all the difference to their self-respect and happiness, as with all intelligent workers, if they were made to feel the integral and considerable part of the Corporation which they are, instead of the nameless talented robots they are supposed to be.

THE MIRROR OF THE B.B.C.

(Continued from page 8.)

some inter-ship telephonic tests during the war that Mr. Taylor realised he was the possessor of a fine voice, which he afterwards had trained in London.

Great Welsh Violinist.

With two hundred microphone appearances to his credit, Morgan Lloyd (violin) should be in fine form for his broadcast to West Regional listeners on Friday, September 22nd, when he takes part in a concert with the choir of the Swansea Orpheus Choral and Orchestral Society.

Mr. Lloyd has had the honour of playing before the King and Queen on board the royal yacht, and he also deputised at the Piccadilly Hotel for the late De Groot when that famous violinist made his last tour of America.

The choir of the Swansea Orpheus Choral and Orchestral Society will also be heard by West Regional listeners on Sunday, September 17th, leading the singing of the hymns in a carolare on the Christian year.

From the Scottish Regional.

This is to announce a broadcast of interest—one might almost say importance—to anglers all over Scotland. On Friday, September 22nd, a number of the fraternity are to hold their annual Fishers' Howff at the Peacock Inn at Newhaven, there to tell in a homely atmosphere stories of their catches and to sing and behave as is their wont on such auspicious occasions.

THE LINK BETWEEN

(Continued from page 22.)

title of "A City of Sound," and without any exaggeration I think it is one of the best efforts I have ever seen, bearing in mind that it is free for the asking.

This excellent Marconiphone book (booklet is hardly appropriate in this case) has an appendix consisting of a 12-page description of all the new Marconiphone models for 1934. It is from the description of the vast factory in which all these fine models are made that the Marconiphone book takes its name.

It is such an excellent production that I propose forthwith to make it a subject for our postcard literature service. Just send up the usual postcard, and leave the rest to us. **(No. 50)**

* * *

A Little "Trade" Secret.

The B.B.C. recently transmitted a complete opera from gramophone records, and many listeners (including myself!) were apparently puzzled by hearing the usual noises of an opera house; including the sounds of an orchestra tuning up, applause, coughing of the audience, etc. Of course, like most other people, no doubt, I had my suspicions.

However, it is now revealed that the "sounds" in this case were reproduced from special "His Master's Voice" records which are stored in the great record library at Broadcasting House.

Of course, strictly speaking, this is hardly "Link Between," but it prompts a thought. Would it be *very* rude to suggest a record with nothing but blank grooves to be put on as applause for certain of those chamber music items?

But back to business!

* * *

Ekco Activity.

My "back-to-business" conclusion to the last paragraph was written with particular significance. Exactly as I imagined when I first saw it, the new Ekco model "74" receiver has scored an instant success, and in order to cope with the phenomenal demand a section of the factory is at present having to work twenty-four hours a day.

In the bakelite shops, for instance, where 1,500-ton presses stamp out the cabinets for the new model "74" receivers, the machinery is never idle. Tons and tons of bakelite powder are daily moulded into cabinets by the skilled operators who work these gigantic presses—the largest of their kind in the country.

Thanks to the courtesy of Messrs. Ekco, I was recently privileged to go over the vast bakelite section of their Southend factory, and I must confess that my visit was fraught with interest. One thing that tickled my fancy particularly was the use of common or garden egg-boilers for the purpose of timing the presses. It seemed such a tremendous contrast from these modern miracles of engineering skill—the 1,500-ton presses—to the grains of sand in the glass container.

OUR POSTCARD SERVICE

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

TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio.

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

Leakage and Breakdown.

LEAKAGE taking place between the windings of a component such as a loudspeaker, transformer or choke, will always result in a decrease in the efficiency, the extent to which the efficiency is impaired depending upon the extent of the leak. You may think at first that it is rather out of the question to talk about leakage, but you would be surprised in what a large number of cases leakage to some extent actually takes place.

There is also the question of an actual breakdown of the insulation, but that is another matter and it generally makes itself quite evident. A leakage, on the other hand, may go unsuspected, and yet may be doing a great deal of harm to the efficiency of the component and of the set. This leakage is sometimes due to bad insulation or to damp.

A Capacity Effect.

In a loudspeaker you may be troubled with leakage or with partial short-circuit or, of course, with a complete breakdown. If there is an actual break in the windings, or if there is, for some accidental reason, a complete short-circuit of the terminals the signals will disappear.

By the way, I should say that in the case of a break in the windings, sometimes the signals will not entirely disappear but will be extremely faint. This is rather a curious effect, and is probably due partly to some capacity effect and partly to a very minute current still managing to get through.

"Scratchy" Noises.

If there is only a partial breakdown in the insulation you will generally get "scratchy" noises, so if you have this particular trouble this is one of the first things to look for—assuming that you have definitely ascertained that the trouble is in the loudspeaker and not in the valves, condensers or other parts of the circuit.

Incidentally, I should warn you that the usual type of test for continuity with a pair of 'phones and a dry battery is not always conclusive in faults of an intermittent character.

The two ends of wire where a break exists may make permanent contact until a fluctuating current passes, when the wires may part and cause a crackle.

Lost Diaphragm Motion.

The troubles which you experience with a loudspeaker are not entirely electrical, however. Sometimes you will get a kind of rattle due to the centre nut, which holds the diaphragm to the armature, becoming loose.

This will be especially noticeable on *low* or *loud* notes. You can often tell if this is the trouble, even if the centre nut is not actually jumping about, by touching the diaphragm with your finger whilst the set is working; the little damping which is produced in this way will soon tell you whether there is any looseness.

If everything is nice and tight, putting your finger gently against the centre of the diaphragm will not make any noticeable difference.

Deterioration of Cone Mounting.

Finally, one of the commonest causes of what I may call "mechanical" trouble with loudspeakers—at any rate so far as my experience goes—is the deterioration of the circular leather strip which secures the edge of the cone to the frame. This often becomes hard or cracked and also is apt to swell and become distorted.

It is really quite worth while to inspect this strip every now and again and if you find it is not lying nice and flat, or is not soft and supple, it is better to remove it and fix another one. Some people use a ring of thin rubber sheet for this, but I think leather is preferable.

Muffled Reproduction.

By the way, talking about loudspeakers, I noticed a little thing a day or two ago which may have escaped the observation of some of you, but which is worth noting.

I was using a mains-driven moving-coil speaker mounted on a baffle-board about 2½-ft. square, and this was placed with the back of the loudspeaker against a plaster wall. If the speaker was brought a little forward, about 2 ft. away from the wall, we found that the clearness of the reproduction was much improved, and if the speaker was put back towards the wall again the quality became rather muffled.

I suppose what was happening was that the sound from the back of the diaphragm was being reflected against the wall and interfering with that from the front, so that the effect of the baffle-board was being counteracted. If the back of the loudspeaker was wrapped round with a cloth (over the legs of the spider frame) so as to cut down the sound emitted from the back of the diaphragm, this showed an improvement, but not such an improvement as we got by shifting the loudspeaker away from the wall.

Have You Noticed This?

I do not know whether there are any special peculiarities in this case, as I have not had time to investigate properly, but I should be glad to hear from any of you who have noticed the same sort of thing.

In some cases, as I mentioned in these Notes quite recently, it is possible to get an *improved* effect by reflecting the sound from the walls of a room. It looks as though this reflection is in some conditions a good thing, and in some conditions a bad one, and it all turns on the conditions applying in your particular case.

(*Continued on next page.*)

TECHNICAL NOTES

(Continued from previous page.)

"Class B" Amplification.

When you are using "Class B" amplification you will generally find it best to use for the driver valve one which has a low impedance but not really a power valve. This valve, as a rule, should be able to handle about 3 volts input.

The two anodes of the "Class B" valve which are connected to the ends of the centre-tapped primary of the output transformer are sometimes bridged across by a resistance-condenser filter; this has the effect of preventing the liability to oscillation. Instead of using a single condenser two condensers may be used, one at each end of the resistance, and the centre of the resistance may then be connected to the centre-tap of the transformer primary. These condensers should be of fairly small capacity, say ·01 mfd. or even ·005 mfd. each with, say, 50,000 ohms for the centre-tapped resistance, that is, 25,000 ohms on each side of the centre-tap.

Minimising Losses.

By the way, I should mention that the transformer which couples the driver valve to the "Class B" valve has a specially low resistance, so as to minimise losses when carrying the relatively heavy current which passes in the grid circuits of the "Class B" valve. For this reason it is undesirable to introduce resistances into the grid circuits of this valve, as is sometimes done with other types of valve.

If resistances are introduced at this point they will only lower the efficiency and counteract the good effect of the low-resistance secondary of the coupling transformer.

Transformer Ratio.

The old argument about the relative merits of transformer and resistance-capacity coupling are not so much heard nowadays as they used to be, owing to the great increase in the efficiency of inter-valve transformers.

It was not that resistance-capacity coupling was necessarily superior to what transformer coupling *could* be, but rather that it enabled us to get on at a time when transformer coupling had not really shown its capabilities to the full. There is no doubt that for robustness and efficiency transformer coupling has a great deal to be said in its favour.

In these days the detector valve is usually followed by only one stage of low-frequency amplification, with transformer coupling between the two.

Valve Loading.

When using the usual arrangement of screened-grid H.F., detector and pentode or power-valve output, some people think that the output valve is not sufficiently loaded by the single stage of transformer amplification following the detector. Stations may be easily tuned in, high-frequency-amplified and effectively detected, but then fail to give good loudspeaker volume, owing to lack of build-up in the single L.F. stage.

How Many L.F. Stages?

Along with the improvements in transformers we have, of course, had enormous improvements in valves and to-day we have valve amplification which enables us to get a great deal more out of a single transformer stage than formerly. When 1 to 3½ transformer ratios were used by everybody it was a common practice to employ two low-frequency stages with two of these low-frequency transformers, having, as it were, two bites at the cherry.

Now we have valves with very high amplification factors, but even then some people think that the amplification is not sufficient to make up for the loss in transformer step-up when only one stage of L.F. is used. The question, in fact, resolves itself into this: whether with the modern valve it is better to increase the transformer ratio, using a single stage, or to use a lower ratio and two stages.

Frequency Response.

Most people, I think, will prefer to use a fairly high ratio and a single stage. Transformers have greatly improved in their frequency response, owing to minimising of the self-capacity of the secondary winding and to increased primary inductance.

In addition to all this, the parallel-feed arrangement has got us out of a good many difficulties.

Modern Selectivity.

In the old days, when we used to talk about selectivity it almost invariably meant, when we came down to brass tacks, the cutting out of the local station in order to pick up a weak distant station or foreigner. It is rather curious that more recently this question of selectivity has taken on a two-fold aspect, for we now have to be sure not only that we can cut out the local and receive the foreigner, but *vice versa* that we can cut out the foreigner and receive the local.

NEXT WEEK

How to Make

THE A.T.B. ALL-WAVE THREE

and

A "CLASS B" MAINS UNIT

in

POPULAR WIRELESS

Powerful Foreigners.

This is due to the fact that a number of very powerful foreign stations are now "on the air," and the field-strength produced by some of them in this country, particularly late on in the evening, is actually comparable with—if not indeed greater than—the strength produced by B.B.C. stations. So in a sense it is as though we had a much larger number of locals to deal with, except for the question of wavelength.

POPULAR WIRELESS, September 23rd, 1933. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

THE FIRST TONE-BALANCED ALL-WAVE SET

Questions Raised by Readers

Popular Wireless

No. 590. Vol. XXIV. September 23rd, 1933.

HIGH-CLASS FINISHES FOR CHEAP CABINETS

EVERY WEDNESDAY PRICE 3D

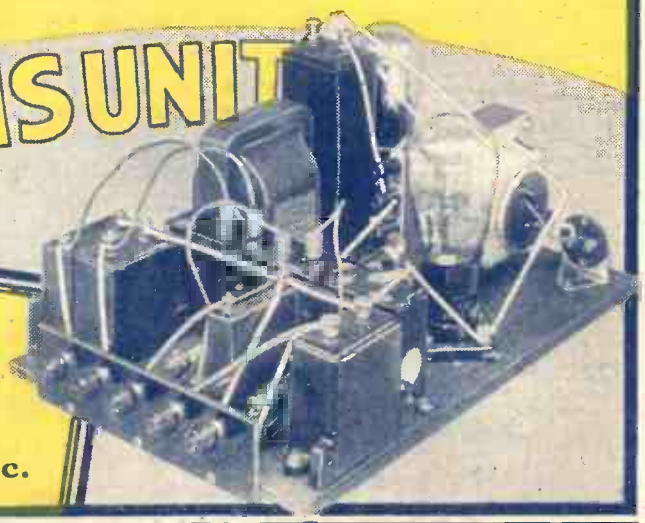
THE A.T.B ALL-WAVE THREE

A FOUR-BAND SET WITH AUTOMATIC TONE COMPENSATION

Anyone can build it

ALSO

A CLASS B MAINS UNIT



RADIO UP TO DATE

★ ★ ★

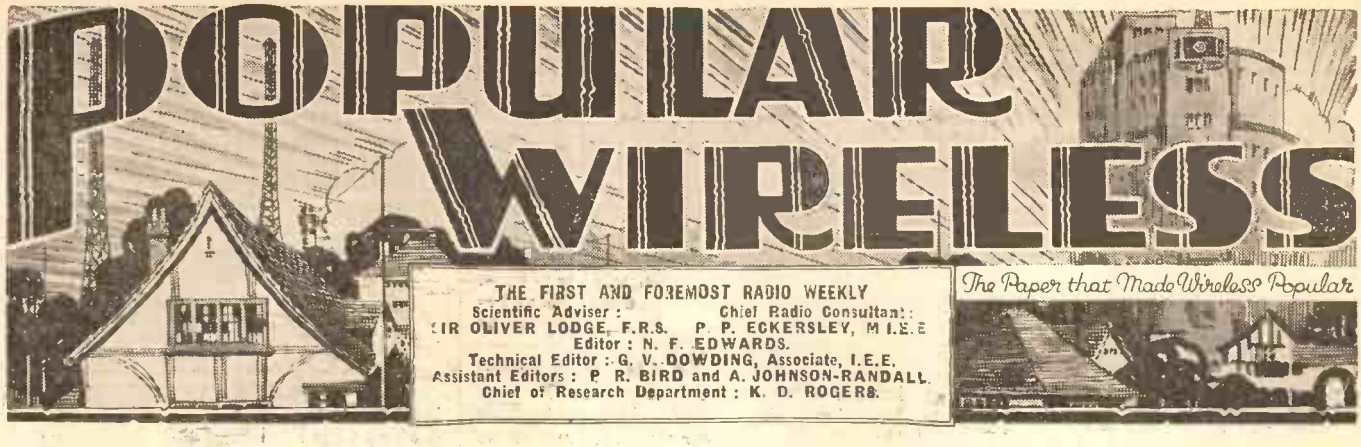
LOUDSPEAKER SOUND-PATTERNS

★ ★ ★

THE MYSTERIES OF SPACE

★ ★ ★

MAKING RADIO MOULDINGS, etc., etc.



TWO OF THE BEST RATING BY UNITS LETTERS OF COMPLAINT "HAPPY HARRY"

RADIO NOTES & NEWS

WHO SHALL PAY? A SECRET REVEALED TELEVISION PROGRESS "OPTICAL" WAVES

Here's How, Henry!

IT was warming to the heart, that triumph of Henry Hall and his band at Radiolympia. No light task to follow the reign of the deservedly popular Jack Payne outfit and "make good"!

Henry preserved his temper, his modesty and his determination, using and not abusing adverse critics, with the result that the public, always ready to give a man a chance, has given him time to prove his worth, which they have now acknowledged in no uncertain manner. If it is true that Jack Payne is to return to the B.B.C. we are fortunate, for we shall have two of the best dance bands ever heard.

Echo of Radiolympia.

OF the organisation of the Radio Show I have only two criticisms, one being that the atmosphere was too "close"; it gave me a headache. The other is that there did not appear to me to be enough seats. But I have heard from a number of sources a more serious criticism directed against some of the exhibitors, namely, that their stand attendants were, technically—shall I say *hazy*?

They would deal in vague generalities, as though selling coals, but when pressed for figures or for technical facts they seemed to be scuppered. Now, the day has passed when the public will buy on the strength of a name; people buy on design and performance, as they buy motor-cars. All radio salesmen should be trained wireless men.

No More Three-Valvers!

HOW'S that for a scare line? But it may be true. That is, if the latest idea, one initiated by Ekco, catches on. You probably have heard about it already. The scheme is that, instead of designating a set by the number of valves in it, the number of "stages" should be given.

In my opinion, a very sensible plan. And it may constitute a good stepping-stone to what will, I think, be the ultimate method, and that is some easy-to-remember description of the overall power and selectivity of the set.

After all, it is not so much the circuit of the set as what it will do that really matters.

A Scientific Rating.

MY suggestion is that the overall power of a set should be rated in amplification units. We could start at 1 for a crystal set!

The selectivity could quite as easily be rated in a similar manner. I claim no credit for this suggestion because it is based on a plan our Technical Editor has been working on for some time. I'd better change the subject quickly lest he accuses me of stealing his themes!

The B.B.C. Stumbles.

THE B.B.C. dropped a terrible brick a little while ago. Let me quote "Musical Opinion." "It was a pity the B.B.C. chose a Friday evening for the opening of the new organ, for this is for most organists the unalterable choir-practice night."

Strange! I always thought Friday evening was reserved for hairdressing. [This is a frightfully subtle wisecrack.—Editor.]

Motor Coach Enterprise.

INCREASING numbers of motor-coaches are being equipped with radio for the entertainment of passengers. A reader writes to me from Southport saying that he recently enjoyed a journey on one so fitted.

He says that both himself and all who were travelling with him thoroughly enjoyed the programmes provided, and adds that he looks forward to the day when all vehicles are fitted with wireless.

Says the B.B.C.

LT.-COL. J. M. MITCHELL, chairman of the Scottish Area Council of the B.B.C., is reported to have said that "people who merely send letters of complaint (to the B.B.C.) are a great nuisance."

Let me ask the gallant lieutenant-colonel a question. Supposing his electric-light supply suddenly developed the staggers, the water company fed him with ink instead of water, and his gas company started to puff hot air through his pipes instead of coal gas. Would he communicate complaints to the offenders and thus become a self-styled "great nuisance," or would he suffer in silence?

Rather Drastic.

A CORRESPONDENT suggests that "broadcasting should cease at 10 p.m. There should be no Sunday programmes. There should be a law to enforce that wireless sets should be so tuned that they could not be heard outside the rooms in which they are operated."

What about a law prohibiting loud-speakers and making earphones compulsory?

The Gramophone Maestro.

I SEE that Christopher Stone has made his début on the music-halls. Extraordinary the power broadcasting has of popularising personalities! Ten years ago the idea of a gramophone record critic appearing "on the halls" would have appeared quite absurd, but now it seems a quite logical development. Good luck, Chris! May your records never be broken!

Better Late Than Never.

I READ in the Press that one of Eric Maschwitz's brain-waves is that C. B. Cochran, that King of Showmen—begging G. B. Shaw's pardon!—shall stage some shows for the B.B.C. My aunt! I

(Continued on next page.)

ARIEL CONTINUES HIS RUNNING COMMENTARY ON RADIO

suggested this in these Notes years ago, and took no credit for doing so because it was so easy to think of. The idea "stood out a mile."

Nay, I went farther and proposed that C. B. C. should be appointed—if he would agree!—to some such position as Mr. Maschwitz now holds. Mr. Maschwitz evidently feels that, as he has got the job, C. B. C. ought at least to understudy him.

Concerning "Happy Harry."

"HAPPY HARRY," according to a Sunday newspaper, was a really bad man. He used to sneak into people's houses at night and steal their chattels. Then came the day, or rather night, when he even sank to such depths that he stole a wireless set.

He dragged it back to his dive and connected it up. A police S O S came through describing no less a villain than "Happy Harry" himself. "Strike me pink! Can you imagine my feelings?" Harry is reported to have said.

In desperation he tore the set to pieces, determined to sell the parts "for a few pence," only to discover that fifty pound notes were stuffed inside it. Whereat he decided to have done with burglarious enterprises and purchased with his loot a peddling business.

Trouble is, this yarn seems to have a most unsatisfactory moral!

Electrical Interference.

THERE have been stormy meetings of the Nottingham City Council on the subject of interference caused to listeners by the electrical trolley-buses run in the city. Apparently the arguments mostly concerned the question as to who should foot the bill for the apparatus needed to deal with the interference at its source.

One of the councillors wanted to know if the Ministry of Health would pay for the cost of stopping the fumes emanating from a fish-frying establishment.

If not, did the Council have to pay for interference elimination?

Eventually it was decided to do nothing until a report could be submitted to the I.E.E. Interference Committee in October. Meanwhile, crackles still blot the programmes of Nottingham listeners!

Secret of Success.

MR. A. MOODY, the brain behind the Radio Show at Olympia, has proved his ability as a great organiser. That's that. Now, it was observed of Mr. Moody that while he evolved something unusually zippy he placed his left hand behind his back, *underneath* his coat, thereby demonstrating the cut of his waistcoat, and with his right-hand fingers he pinched his nose.

One man who tried this recipe for success immediately remembered where he had left his wife's pair of scissors. Another thought of a new name for an old resistance coil. Try it yourselves and become as super-men, knowing good from evil—circuits.

New Television Development.

AT the meeting of the British Association on September 6th there was for the first time an exhibition of television by means of a directed light beam. The beam was used as the link between the television transmitter and receiver.

The Marconi light-beam link, which has already been demonstrated as a medium for telephony, consists of a transmitter in which the electrical impulses corresponding to the television picture signals are converted into light impulses through the operation of a sodium tube mounted in a search-light fitting and a new type of photo-cell receiver.

Marconi and Ultra Shorts.

WHEN scientists began to experiment with communication by means of ultra-short waves they thought that the process was more or less optical and that transmitter and receiver must be in sight of each other. Marconi was not long in dispelling that illusion by effecting communication between points so distant from each other that the curve of the earth was between them.

He has now succeeded in communicating by wireless, using ultra-short waves, over a distance of 258 kilometres, nearly nine times the "optical" distance between transmitter and receiver. The man who bends waves to his will!

The Dungeon Gate Yawns.

"WILL all radio fans in the vicinity of Grangetown Post Office please refrain from oscillating when there is no need for it?" writes a Middlesbrough reader to his local newspaper. He concludes by saying that "if this interference does not cease I shall ask the Post Office to find the culprits and deal with them accordingly."

I don't like the sound of that "accordingly." If I were one of these miserable culprits I'd switch off my set and sneak away into another county.

SHORT WAVES

"I see that they have got a woman announcer at the B.B.C."
"I thought it wouldn't be long before some woman would want the last word."—"Pictorial Weekly."

* * *

THE NEXT STREET, PLEASE!

An old lady, to whom the wireless is a development which she cannot realise, heard music by Henry Hall's dance band sounding in the drawing-room.
"My dear," she said, "shall I give them something to go away?"
"You can't do that," explained her hostess, "as they are in London."
"Well, they must make a lot of money going about like that," said the old lady.—"Daily Mirror."

* * *

"You can buy wireless sets with safety," runs a headline in the "Daily Sketch."
But our wireless dealer seems to think hard cash is necessary, too.

* * *

"It is interesting to note that this broadcasting station is to be re-equipped with a new *rave*-length," we read.
More talks.

* * *

"Is there anything good?" said the Listener,
Turning on the Regional wave;
And his friend in the silence waited, waited
For the noise that the sound box gave.

And the strangest medley of musicians
Came into the old house then
From all over the continent of Europe,
From all over the world of men—

Till a friend rose suddenly from an armchair
And smote him on the side of the head.
"*Do* stop mucking about with stations
And let's have London," he said.

—"Punch."

A New Suggestion.

A RATHER optimistic person has suggested that it would be better for the trade to stabilise radio sets and "sell entertainment" rather than to continue to produce novelties in design and carry on a war between manufacturers.

It might be better, but so also might it be better to abolish all war, between nations, between animals, birds, plants and fish. But again, who could bring all this to pass unless all are agreed? One dissentient and the plan is spoiled. No, I believe that competition means evolution, which is a basic natural law of this world.

B.B.C. Personalities.

I CULL these interesting facts from a contemporary. The heaviest man at Broadcasting House is probably Mr. Gerald Paul Askew, of the Balance and Control Dept. (very appropriate), and the "noisiest" is Mr. Regan, the "house keeper," so far as vocal strength is concerned. He used to be a boxing referee.

The youngest of those known to listeners is probably Martyn Webster, the producer, who is 23, and the oldest is no doubt Mr. Whitley, the chairman, who is 67.

ARIEL.

A CLASS B MAINS UNIT

Although primarily intended to place the battery-set owner on an equal footing with the "mains man," Class B amplification has also an undoubted appeal for large numbers of mains users. Mains-driven Class B provides super-volume with superb quality without expensive high-voltage apparatus. The special unit for A.C. mains described below provides a particularly efficient and stable H.T. supply for all Class B sets, and is recommended for use with the "P.W." Tablegram which appeared in our last week's issue.

Designed and Described by K. D. ROGERS.

WITH the rapid increase in the use of Class B amplification many set owners are naturally contemplating employing the system with a view to energising the anode circuits from mains units. Unfortunately this is not possible unless the mains units used are specially constructed for the task, with a very good voltage regulation.

The Class B stage takes such a varying anode current that it will upset the voltage regulation of an ordinary mains unit to such an extent as to render the operation of the receiver most unsatisfactory.

The current drawn from the H.T. unit by the Class B valve itself will vary between a couple of milliamps and some 30 or more, dependent on the valve and the strength of reception. To cope with this variation of current and yet to retain the same (or approximately the same) voltage is beyond the powers of most usual types of mains units.

Excellent Regulation Achieved.

But there is a simple way out of the trouble if the design of the mains unit is specially carried out; and in the unit we present for readers' attention this week we have achieved excellent regulation of voltage over all the widely differing requirements of current that are demanded by the Class B valve.

This is achieved by so constructing the unit that it will supply somewhat more than the total current required by the Class B set at the required voltage of, say, 120 volts, and then stabilising the unit with a neon lamp, so that a large drain of current is always taken from it, either by the set or by the set plus the neon lamp.

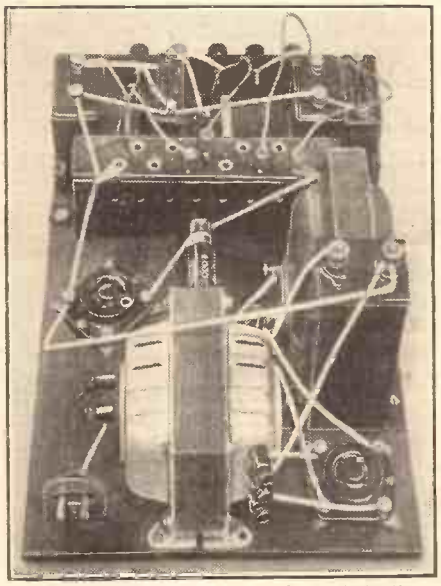
Neon Stabiliser.

The neon stabilising valve made by Cossor is designed for this purpose (the S.130), and its effect is to keep a steady load on the circuit, passing more current as the voltage of the unit tends to rise owing to reduction in current required by the set, and decreasing in its consumption as the set requires more current and the voltage of the unit tends to fall.

The net result is that the unit applies a steady voltage to the set, fluctuations being rendered impossible by the reservoir effect of the neon stabiliser. Thus we can construct very simply a mains unit that will supply ample milliamps of current at 120 volts when demanded, or reduce to a mere 5 or 6 without serious voltage change.

The power unit that we have designed is for use on A.C. mains, and allows any Class B or Q.P.P. receiver to be used directly off the mains as far as H.T. supply is concerned. Naturally it is available for use with ordinary receivers if desired, but in that event there would be a certain waste of components, for the neon stabiliser is not required for straight sets.

The circuit of the unit is quite straightforward, with the exception of the resistance in series with the positive power-supply lead. This resistance is chosen to control the current passed by the Cossor stabiliser. The value of the resistance is chosen advisedly and should be adhered to.



This view of the completed unit demonstrates the simplicity of the layout and the wiring.

Uses Full-Wave Rectification.

The rectifying portion of the unit is normal, being a full-wave valve rectifier operated from a specially designed power transformer which has no L.T. winding, being confined to the windings necessary for the rectifier. This keeps the cost of the component down, for there is obviously no need to have any L.T. A.C. supply from the transformer when dealing with a Class B set.

Across the rectifier is the usual loading condenser of 4 mfd., and the smoothing choke takes its usual place in series with the H.T. positive lead. The neon stabiliser is connected across H.T. positive and negative, across which is also a potential divider which allows various voltage tappings to be taken off for use with screening grid and detector circuits.

Four Positive Taps.

In order to make the unit as universally adaptable as possible we have included two other taps, so that there are four H.T. positive tappings in the pack.

The taps are adequately decoupled where the S.G. and detector feeds are concerned, but H.T. plus 2, which is intended for use where a variable voltage for the driver valve is desired, is not decoupled, a condenser to earth only being provided. H.T. plus 3 is the maximum tap and its plug should be inserted in the No. 10 socket.

(Continued on next page.)

THE PARTS TO USE AND THE MAKES TO CHOOSE

Components	Make used by Designer	Alternative makes of suitable specification recommended by Designer
1 mains transformer	Wearite, type Class B	—
1 smoothing choke	Lissen L.N.5301	Ferranti, R.I., Wearite
1 4-mfd. condenser	Dubilier, type L.S.A.	T.C.C.
2 four-pin valve holders	Benjamin "Vibrolder"	Telsen, W.B., Lissen
1 2,000-ohm wire wound power resistance and holder	Ferranti	—
2 2-mfd. fixed condensers	T.C.C., type 50	Dubilier, Telsen
1 2-mfd. do.	Telsen W.226	Igranic, Dubilier, T.C.C.
1 ·5-mfd. do.	Telsen W.223	T.C.C., Dubilier
1 potential divider, 15,000 ohms	Igranic	—
1 20,000-ohm resistance and holder	Graham Farish "Ohmite"	Dubilier, Ferranti
1 1,000-ohm resistance and holder	Dubilier 1 watt and "Dumetohm" holder	Graham Farish
1 mains plug	Belling-Lee No. 1042	Goltone, Bulgin
5 terminals	Bulgin	Igranic, Belling-Lee
4 wander plugs	Clix	Belling-Lee, Igranic
1 terminal strip, 5½ x 1½ in.	Peto-Scott	—
1 wood baseboard	Peto-Scott	—
3 yards 18-gauge tinned copper wire	Goltone	—
2 yards insulated sleeving	Goltone	Wearite
Flex, screws, etc.	Peto-Scott	—

A CLASS B MAINS UNIT

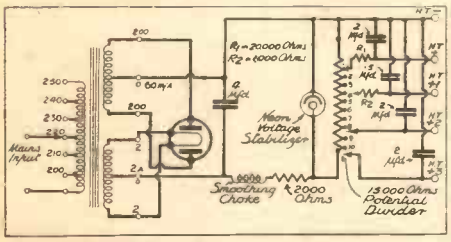
(Continued from previous page.)

In the construction of the unit it is important that the neon valve stabiliser be connected the right way round, for the anode pin must be connected to the positive side of the power supply. This will inevitably occur if the wiring diagram is carefully followed, the anode socket of the neon valve holder being joined to the 2,000-ohms series resistance.

A Perfectly Safe Unit.

In the unit we illustrate we have shown no cover, but it is a good plan, if the unit is not to be included in a set such as the "Tablegram" described last week, to make a metal box to contain it. This will keep it clean, and at the same time perfectly safe from the point of view of unauthorised persons touching it when it is switched on.

ADEQUATELY DECOUPLED



The various H.T. voltages are picked up from a potential divider connected across the rectified and stabilised output of the mains transformer.

In the wiring it will be found useful to make the terminal strip and attach the wires to the terminals before the strip is attached to the baseboard. The wires should be about 5 inches long, being cut to the right length when connected to the components to which they are to be attached.

The adjustment of the input mains voltage on the transformer is carried out by means of the special disc incorporated in the transformer. The pillar which is nearer the edge of the disc is unscrewed and removed, when the disc is rotatable. This is turned until the correct voltage appears, when the pillar is replaced and the dial is locked in position. The mains input is obtained by means of an ordinary adaptor plug in a lighting socket or a plug in a power socket of the house system, this plug being connected to a flex ending in a plug fitting the two pins on the input side of the power pack.

For Any Set.

The Class B mains unit can be used with any Class B set, and will not be addicted to peaking if it is on when the set is off, there being no need for a thermal-delay switch of any kind. The power pack must, however, be switched off when the set is not in use, otherwise it will continue to take current from the mains.

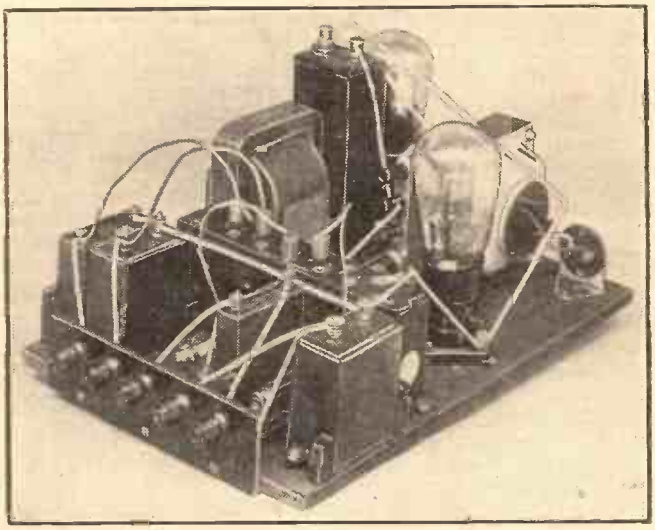
From the point of view of operation the Class B mains unit can be looked upon as an H.T. battery, except for the fact that it has to be switched on and off at the beginning and end of a programme. The voltages can be varied within wide limits, though the adjustments should be carried out with the unit "off," so that no chance of a shock can occur.

The movement of the tapping plugs down the resistance from the end marked ten will decrease the voltage of the taps in convenient steps.

As regards the construction of a cover for the mains unit, it is suggested that a metal box with four sides and a top be arranged to fit snugly over the baseboard, being screwed in place to the edges of the plywood.

A section of one end can be cut away round the terminal strip, but at the other end of the case a slot should be cut so that the mains input plug can be inserted through it. This then acts as a safety device preventing the removal of the lid while the mains are connected to the unit.

ENSURES CONSTANT VOLTAGE



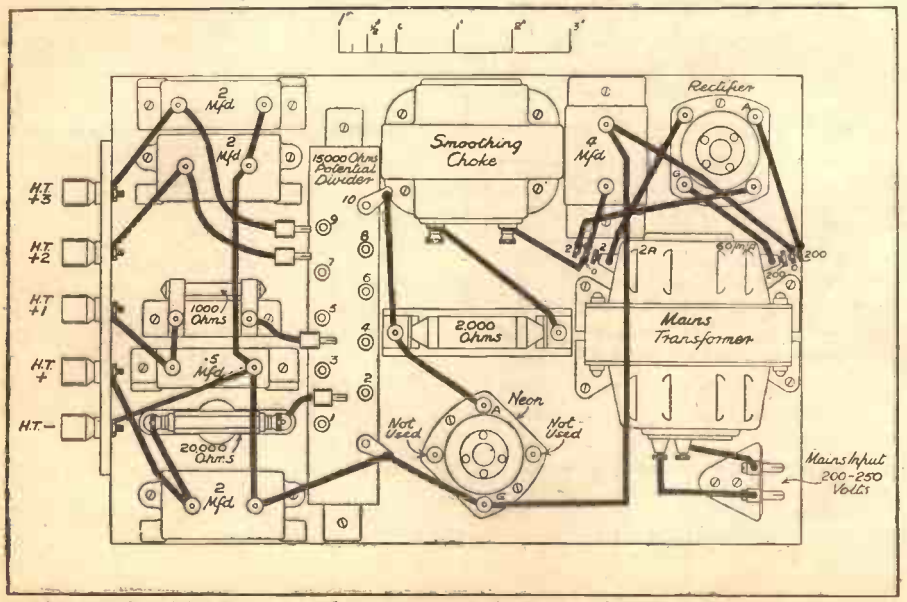
Taken from the output end, this photograph shows the finished unit with the "valves" in position. The neon stabiliser is the nearer "valve," and is an important component. In spite of the large variations in the current drawn from the unit by the Class B stage, the output voltages are kept constant by the stabiliser.

Earthing the Case.

It should not be necessary to vary the H.T. voltages of the taps while the receiver is working after they have been set originally, so there is no need for any provision to get at the potentiometer, while a simple connection from H.T. — to a terminal on the metal case can be made to secure earthing of the case.

A series of holes should be drilled along the bottom of the sides of the case, with a couple of large holes at the top above the valves for air circulation to prevent overheating.

SUPPLIES RECTIFIED AND STABILISED POWER



A layout such as this requires no skill to duplicate, and the wiring would only occupy one hour of even a novice's time. Note how short the wires are and how logically they connect up the links in the chain of components from input to output end.

THE VALVES TO USE

	Make used by Designer.	Suitable alternative makes.
RECTIFIER	Mullard D.W.2	Marconi U.10 Mazda U.U.60/250, Cossor 506 B.U., Osram U.10, Eta D.3-50 B., Tungsram P.V.495
STABILISER	Cossor S.130	

QUESTIONS RAISED BY READERS

The variety of the questions asked by readers at the Radio Exhibition was little short of amazing, and ranged from "What is a crystal made of ?" to "I can get only six stations, what is wrong ?" Frequently-raised queries are dealt with on this page, and tests which may go a long way towards solving them are suggested.

WITHOUT doubt readers took full advantage of our offer to deal with their wireless worries at our stand at the Radio Exhibition; so much so, in fact, that during the busy hours we were completely hemmed in by eager amateurs for hours on end.

The questions themselves ranged from queries on highly technical theory to the simplest form of "what set do you advise me to make," and it is safe to say that almost every possible symptom of trouble was put before us and every known cure suggested during the nine days of the Show.

We were indebted to a lady reader for the most unusual query.

Her question was, "What is a crystal made of ?"

Such a question, by itself, is perfectly straightforward, admirably brief and to the point.

But in this case it was put immediately following a long series of "fault-finding" questions and an equally long, unbroken series of males.

The combined effect of change in sex and subject must have been responsible for the momentary delusions of our technical expert, for he says that his immediate reaction was that he had suddenly been plunged into "Alice in Wonderland," and that the Queen of Hearts was asking him in sepulchral tones, "What are little boys made of ?"

Grave and Gay.

Whilst still under this impression he is alleged to have made the reply, "Cat's-whiskers and puppy-dog tails!", which is probably the most perfect mixture of nursery and laboratory as yet attained.

However, he rapidly recovered and was able to give the required information coherently and correctly.

Turning back to the more serious side, we find that the home constructor has at last realised that it is impossible for us to diagnose the trouble with his receiver unless he gives us all the symptoms that accompany the fault. It is, for instance, of little use to say, "I can get only six stations on my set; what is wrong with it ?" unless much more detailed information is forthcoming.

To illustrate the point more clearly, here are some of the questions which we should put to a reader who made the above query:

"Have you tested the set on another aerial of known efficiency ?"

"Has the set always given such poor results, or has the trouble recently developed ?"

"Does another receiver give satisfactory results when coupled to your aerial and earth and batteries or eliminator ?"

"Have you had your valves tested on broadcast in another receiver ?"

"What stations do you receive well and what stations are difficult to tune in ?"

The answers to these questions are the results of simple tests which any amateur is able to carry out—with the assistance of a friend or local wireless dealer—and do not require any special knowledge or instruments.

A "Jumping-off Place."

But in spite of their obvious simplicity, they do give us a "jumping-off place" from which we may make useful deductions and thereby locate the position of the fault within fairly narrow limits.

And now a few words about the faults and troubles that have come to our knowledge during the Exhibition.

We have had a number of queries concerning unsatisfactory results from good receivers coupled to H.T. eliminators.

In most of these cases the receivers have been proved to be in proper working order, since they operate perfectly off dry batteries

WHERE DO I CONNECT IT?

A photograph of one of our technical experts at work at Olympia. During the Radio Show we had a continual stream of visitors waiting their turn to ask questions.

and, very often too, the eliminator has been shown to work another set perfectly.

In almost every case of this nature it will be found that the anode voltages vary considerably from those which are recommended for the correct operation of the receiver.

On most good eliminators the various H.T. tappings are marked with the approximate voltage obtainable from each; but it must be remembered that these markings can only be approximate, since the voltage depends to a very large extent upon the current that is being taken from the eliminator, and that a rise of less than 1 milliampere on a low-voltage tapping may cause a drop in voltage at that tapping of over 10 volts.

Obviously, where these circumstances arise it is necessary to make quite sure that the mains unit in question really is suitable for the set and that its output is adequate.

Another interesting and fairly frequent complaint made to us came from owners of three- and four-valve sets which were being operated at a fairly long distance from the nearest Regional transmitter.

As a matter of fact, the majority of these queries came from the South Coast, where many of the Continentals are more strongly received than the London stations.

The complaint is simply that the nearest British stations fade badly after dark, the fade-out being accompanied by a rise in the strength of the foreigner on the neighbouring wavelength and, between times, a hopeless mixture of the two is heard.

Will A.V.C. Help ?

Most readers who were suffering from this type of trouble were anxious to know if automatic volume control would help them out of the difficulty. There are two distinct reasons why it will not.

The first is that, so far as present-day A.V.C. circuits are concerned, they are not sufficiently sensitive for use on sets which employ only one normal stage of multi-mu H.F.

The second reason lies in the very nature of the fading. This type of fading is not the normal kind with which we are all so familiar, but is produced by interference of the reflected rays from two stations on close wavelengths which alternately come in and out of phase with one another, and so either boost each other up or flatten each other out, as the case may be. The phenomenon is usually accompanied by the most marked distortion.

Other queries and groups of queries there were in hundreds, but it is not possible to deal with even a small part of them here.

One thing is certain, however, and that is that if readers who visited our stand obtained as much help in receiving answers to their queries as we obtained pleasure in giving them, then our tonsils have not been torn or our brow furrowed in vain. B.B.

THE MIRROR OF THE B.B.C. By O. H. M.

GOVERNORS AND THE REGIONS

Antagonising Mr. Churchill—Emulating the Nazis?—The Return of Uncle Arthur?—Exploiting Provincial Talent.

I AM told on unusually unimpeccable authority that the move to strengthen the Regions at the expense of the London headquarters of the B.B.C. had its origin in the Board of Governors. The consequent migration of some of the best London programme talent promises to have far-reaching effect on the work of the B.B.C.

This can be regarded as a kind of test case of the use of Governors as trustees in the public interest. Without their intervention it is unlikely that the rule of the remorseless centralisers among the permanent staff would have come unstuck. With their intervention there is now a chance for some real programme competition between the Regions and London.

It is not so much that the staff at Regions has been inferior in ability or enterprise, but rather that they have been cramped and starved. Now all this is likely to change, to the great advantage of listeners everywhere.

Lilian Harrison.

Broadcasting House is planning a novelty of unusual interest in the performance of Walton's "Façade," as originally composed, with Edward Clark as conductor and Miss Lilian Harrison as speaker.

Mr. Churchill and the B.B.C.

Although some time ago the B.B.C. hinted vaguely that in a future general series on India they might invite Mr. Churchill to the microphone on his favourite subject, there is no prospect of an early development. Meanwhile the feeling grows, both inside and outside the B.B.C., that it is a mistake to banish Mr. Churchill, whose personality has a much wider appeal than his opinions. If the B.B.C. persists in this "ban" it will make a singularly awkward enemy, and will find few supporters in any political or Press camp.

Pressure Against Sponsored Programmes.

The respite which has been granted the interests engaged in broadcasting English sponsored programmes from the Continent may not be long. The B.B.C., although not directly intervening, keeps on driving the Post Office, the Foreign Office, and the International Broadcasting Union to increase pressure on the French Government.

HITLER AND HIS SET

The German Chancellor who attaches much importance to radio in the home, being shown a production model of the "People's Receiver" at the Berlin Radio Exhibition

The latest intimation is that Paris may ban all English sponsored programmes from the end of 1933; alternatively on the conclusion of all contracts that are then running. Even if the French Government acts thus, there will remain Luxembourg and Athlone, neither of which has the slightest intention to bow to the B.B.C. So France may well reflect before making its attitude more conciliatory than that of her rivals.

B.B.C. and Jews.

A Jewish friend of mine on the staff of the B.B.C. has been put through a severe catechism about his forebears, his foreign contacts and his views, political and otherwise. I wonder if this means another purge. The pronouncedly pro-Nazi flavour of fashionable opinion at Broadcasting House lends colour to the suggestion; but a move of this kind could hardly survive the publicity that would be provoked if it became general.

Fate of the Geneva Union.

The fate of the International Union of Broadcasters (U.I.R.) at Geneva is again in the balance. Once the new wavelength agreement is put into force, which will be in January or February next, there will be very little for the Union to do.

In the past it has owed its existence mainly to British and German support; the latter is almost certain to be withdrawn at the earliest opportunity, and the B.B.C. cannot be expected "to carry the baby." A pretty sure sign of the trend of events is the search that is being made at Broadcasting House for a job for Arthur Burrows, the general secretary of the Union, who was loaned by the B.B.C. eight years ago.

Fostering Midland Talent.

Very commendable is the way in which the Midland Region is always striving to foster the talent within its midst. Norris Stanley, well known for a long time to listeners, is the solo violinist in a military band concert on Wednesday, September 27th, and what could be nicer than his choice of three compositions by Dorothy Howell, including one not yet published.

Miss Howell was born in Birmingham, and is probably best known for her symphonic poem, "Lamia," and her orchestral ballet, "Koong Shee." Songs will also be sung by Astley Fulford (baritone) and a cornet duet played by Messrs. Baker and Stevens.

A Piano Recital.

On Monday, September 25th, a two-piano recital will be given by Edna de Lacy Ross and Rosalie Westrope Street,

(*Continued on page* 71.)

The LINK BETWEEN

BY G. T. KELSEY

Weekly jottings of interest to buyers.

BUSY factories are the usual aftermath of the Radio Show at Olympia, but this year seems to be breaking all records.

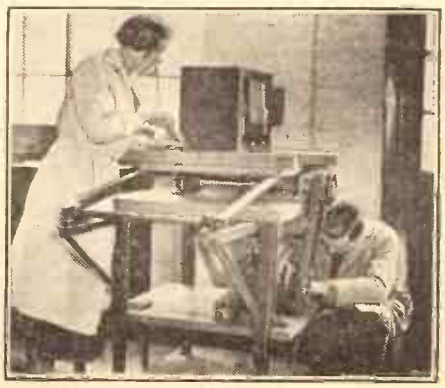
The latest encouraging news comes from that enterprising Bromley concern—Graham Farish, Limited—who, despite a recent 50-per-cent increase in factory accommodation, are taxed absolutely to capacity on the manufacturing side to meet the rush of orders occasioned by the recent Radio Exhibition.

Graham Farish are certainly forging ahead, and with all their new and attractive lines it will surprise me very much if they do not have a record year. At least they have provided me with a very sound reason for commencing my notes in an optimistic vein, and I wish them every success.

Incidentally, I hear that they are publishing a new catalogue this month, and in view of the interest that it is likely to arouse in the home constructor world, I propose forthwith to include it in our postcard literature service. Readers making application for this particular number will receive in addition a copy of the famous Graham Farish Station Tuning Chart, which, is well worth having. **(No. 50)**

(*Continued on page* 73.)

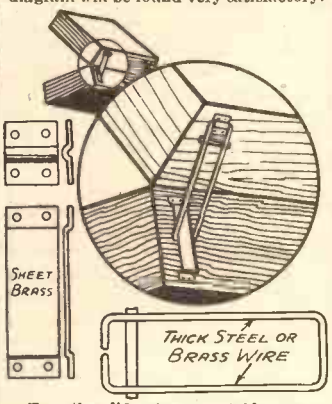
A ROUGH RIDE



This mechanism for testing sets by vibration has been set up in the "His Master's Voice" laboratories at Hayes, Middlesex. In 26 minutes, it can subject a set to vibration equivalent to a train journey from London to Glasgow.

STRONG LID SUPPORT.

PORTABLE sets often suffer from the fact that there is insufficient support for the lid when this is open, and in order to prevent the hinges being strained or broken, the link hinge shown in the accompanying diagram will be found very satisfactory.



For the lid of a portable set.

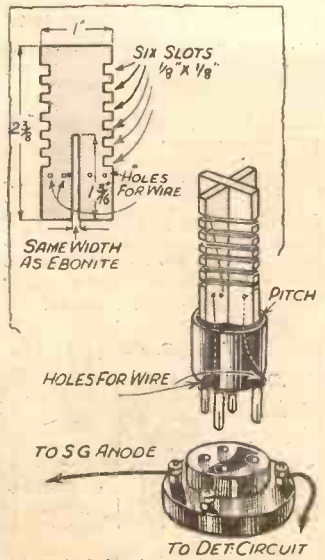
The parts are made from ordinary sheet brass and some thick steel or brass wire, and the only point to watch is to make a good job of the joint in the wire link, which may be done by soldering a brass strip across as shown, or by such other means as, for instance, joining the ends by means of a piece of metal tubing.

The great advantage of this design is that the hinge folds up flat or out of the way when the case is closed, but offers sound support when the set is in operation.

A coat of dull black paint gives a suitable finish, or the parts may be left bright and polished.

CONSTRUCTING AN S.G. CHOKE.

THE following items are required: Two small pieces of ebonite, 1 in. wide, 2⅜ in. long; 1 old valve base, any type; 1 valveholder; dessertspoonful of pitch from an old battery; sufficient No. 36 gauge enamelled wire for 960 turns.



A valveholder is used for mounting.

Shape ebonite as per sketch, and drill the two small holes for each end of the wire.

Now wind 160 turns of wire in *top* slot. The wire must be anchored in one pair of holes, and about 3 in. left hanging. Now wind another 160 turns in second slot from top, but this time in *opposite* direction. The subsequent windings in the other 4 slots are also 160 each, wound in opposite directions. This completes 960 turns, and the wire must be anchored in the remaining pair of holes, with another 3 in. left over.

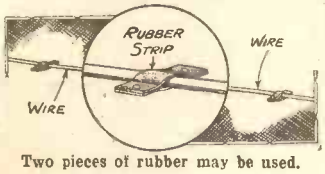
Now take the valve base and clean it out, drilling two holes, as shown. Place choke in base, passing the two leads through the holes. Now melt the pitch over the gas or fire and, holding the choke central in the base, pour in the pitch.

This will cool very rapidly, and when set will hold the choke firmly in position. Now solder the two leads to the "grid" and "anode" terminals of the valve base, and clean the pins. Your choke is now complete.

It will be found to be very efficient, and I have used it with success on a short-wave set and in a broadcast receiver. However, do not place it too close to screws or other components.

INSULATED AERIAL CLIPS.

WHEN an aerial or earth wire inside a room has to be fixed down along a picture rail, etc., the following insulated clip can be used:



Two pieces of rubber may be used.

Take some rubber from a motor-car inner tube and cut it into strips ¾ in. by ¼ in. Lay the strip across the wire and tack down on either side. This can be improved by putting one strip underneath and another on top, and then tacking it down.

A 'PHONE FILTER.

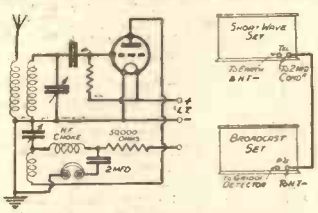
I WISHED to use a very good pair of 8,000-ohm 'phones on a single-valve short-wave set, but I was determined not to have any H.T. current flowing through the windings, in case they should be burnt out. I therefore fixed up a resistance filter, which also acts as a decoupling device, and this has proved very satisfactory.

It consists of a resistance placed in the anode lead, with one side of a 2-mfd. condenser connected to the plate end of the resistance. The other side of the condenser goes to one 'phone terminal, and the other 'phone terminal goes to earth.

With this filter it is possible to connect the 'phone terminals of the short-wave receiver to the gramophone pick-up terminals of the ordinary broadcast set, and put anything received on the short waves over to the loudspeaker.

This scheme would not work if the 'phone terminals of the short-wave set were in the anode lead, as one pick-up wire is connected to H.T.— and earth, and this would short the H.T.

If both sets are worked from the same batteries it is only necessary to take one wire from the short-wave set



The connections are quite simple.

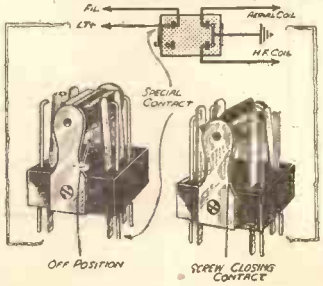
to the grid of the detector valve on the broadcast set. This wire comes from the 'phone terminal which is connected to the 2-mfd. condenser. Another wire is not required, as the other 'phone terminal and H.T.— are already connected.

It is essential to keep a pair of 'phones or a resistance of about 4,000 ohms connected to the short-wave set in order to create continuity across the 'phone terminals.

SAVE A CONTACT.

WHEN a switch of the type illustrated is used as a combined wavechange and on-off switch it is usually necessary to use a contact on each side for the filament switching.

This can be avoided if the switch is altered in the manner shown, and a two-point change-over switch, for example, can be made to short two coils for medium waves as well as control the filament supply.



A screw as an extra contact.

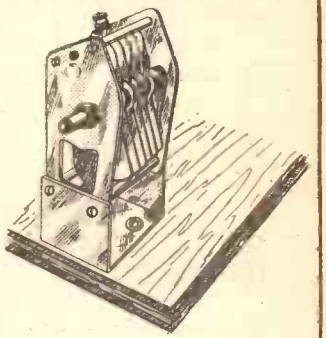
First turn the switch to the position that is required for short waves, then mark the ebonite cam opposite one of the contacts that are not making. Dismantle the switch, drill the cam where marked, and insert a short, round-headed screw. It is advisable to drill the hole slightly smaller than the screw so that the screw cuts its own thread; then, if necessary, it can be adjusted afterwards. The illustration clearly shows the action of the screw.

MOUNTING CONDENSERS.

A chassis-type method of mounting, which can be adopted in the majority of tuning condensers, is outlined below. A piece of aluminium is required, approximately 2 in. x 4 in. x $\frac{1}{32}$ in., although obviously these dimensions will vary with individual requirements.

Examination of the condenser will usually disclose the fact that the two end plates are spaced by threaded rods or spindles, with screws in the end. The aluminium is bent into a "U" shape, as shown in the drawing, the distance between the two parallel sides being equal to the distance from the outside of one end plate to the outside of the other.

The necessary nuts or screws on the condenser are removed, and the bracket is drilled accordingly and fitted to the condenser. Holes for fixing screws should previously have been drilled in the bottom part of the bracket. This assembly will give a unit which may be quickly and easily mounted, and it has the advantage of being quite strong, in spite of the fact that the bracket is sufficiently thin to make it easily bendable.



Panel-mounting is thus abolished.

COIL WINDING.

IT often happens that a constructor wants to wind a coil of some sort, but not having a lathe handy has to do it the best way he can. One method of doing it is with a hand-drill and vice, which most constructors have.

Start by placing the hand-drill in the vice, keeping the main wheel free of the jaws and putting a spindle in the chuck.

Then, placing the article to wind on the spindle, you turn the handle with one hand and guide the wire with the other. Also you can wind the coil tightly, if you desire.

An improvised winder for coils.

ONE GUINEA FOR THE BEST WRINKLE!

Readers are invited to send a short description, with sketch, of any original and practical radio idea. Each week £1 1s. will be paid for the best Wrinkle from a reader, and others will be paid for at our usual rates.

Each hint must be on a separate sheet of paper, written on one side of the page only. Address your hints to the Technical Editor, "Popular Wireless," Tallis House, Tallis Street, E.C.4, marking the envelope "Recommended Wrinkles."

Will readers please note that the Editor cannot, in any circumstances, guarantee to return rejected Wrinkles, and that payment for published hints is not made until ten days after they appear.

The best Wrinkle last week was sent by Mr. F. Miller, Ponnsyloanice Cottage, Church Square, Portland, Dorset, to whom a guinea is being awarded.

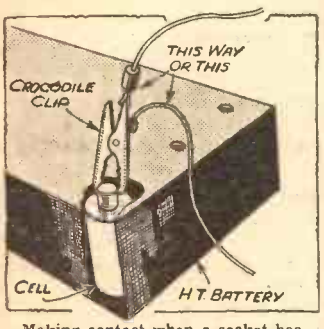
(Continued on next page.)

RECOMMENDED WRINKLES

(Continued from previous page.)

WHEN SOCKETS BREAK.

SOME high-tension batteries have a very small socket for fixing wander-plugs, and if you force the plug or turn it the socket very often comes off. Now, instead of going to the next tapping and perhaps losing about 10



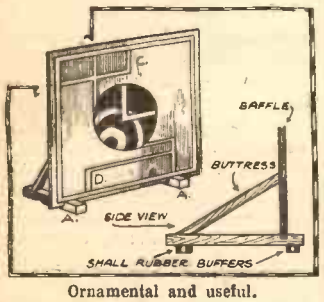
Making contact when a socket has broken off.

volts, if you scrape away the composition around the cells you will find a little ferrule on the top of the cell. Get a crocodile clip and fix on to the cell and take your wire from the clip, and your battery acts as well as ever.

A FIRESCREEN LOUD-SPEAKER.

READERS seeking the best method of mounting a permanent-magnet moving-coil speaker will find an ideal solution in the construction of the fire-screen baffle described below.

Obtain a baffleboard of ¾ in. to 1 in. in thickness, and at least 2 ft. square, with a cut-out fretting of a diameter suitable to the speaker in question. Cut 2 ft. or runners (A) with cross slots in which the baffle may stand vertically, and mount these at extreme ends of the board (see sketch). Supporting buttresses are screwed on the back of baffle to carry weight of speaker with ease. Small rubber buffers are then screwed on the "feet" to obviate scratching of polished surfaces and eliminate vibration. A beading of simple character may conveniently be nailed round the edges with an additional ornamental effect of the two beadings (C) and (D).



Ornamental and useful.

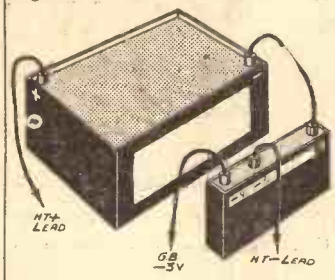
Stain Jacobean oak and varnish. The result is an article of professional appearance and of use as an article of furniture, at a total cost of 7s. 6d. or so.

UNUSED HIGH TENSION.

A CHANGE to one of the popular pentode valves (battery type) may introduce a certain amount of loss in connection with the G.B. battery, as the majority of such pentodes require a bias of only 3 volts. Of the normal 9-volt grid-bias battery, therefore, only 3 volts are required, the remainder being wasted, or at least unused.

By a little rewiring, these spare 6 volts can be utilised in the H.T. circuit, thus increasing the total high tension available. The drawing shows how this should be carried out. The negative socket of the high-tension battery, which in standard practice goes to earth, is taken instead to the positive socket of the grid-bias battery.

The grid-bias negative lead for the transformer, which is usually taken to negative 3 volts on the G.B. battery,



Boosting the H.T. supply from the grid battery.

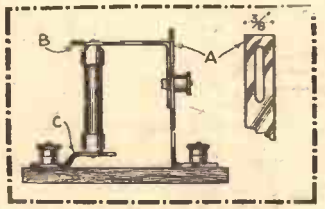
is taken to negative 9 volts instead, and the earth (or negative lead from the set) is plugged in negative 6 volts. The grid-bias lead will still be 3 volts negative in relation to earth, and the remaining 6 volts will be added to the high tension.

To alter the value of the grid bias it will, of course, be necessary to move the centre (or earth) plug towards the negative end to decrease the bias, and towards the positive end to increase it.

It should be remembered that the cells in a grid-bias battery are only normal capacity; consequently, if they are used in conjunction with a super-capacity battery, they will naturally become exhausted some time before the H.T. battery, but there is no reason why they should not give good service in a set taking only 7 or 8 milliamps.

AN ADJUSTABLE HOLDER.

THREE strips of sheet brass, three terminals, and an odd piece of ebonite are the only parts required to make a very useful holder for grid



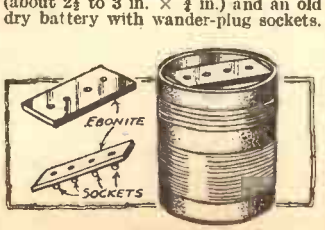
Holds components of any length.

leaks, anode resistances, or fixed resistors of various lengths. The three strips, A, B and C, are each about ¾ in. wide, A being cut from fairly stout material and slotted, as shown, to clear the screw shank of a small terminal, the head of which is soldered to the springy strip B. In place of the lower spring strip, C, an ordinary flush-type valve socket may be used, this being joined to the terminal via a copper foil link.

It will be seen that by slackening the milled nut on A, the strip B may be easily adjusted, in order to accommodate resistances of various sizes.

TAPPING A COIL.

WHEN winding a coil on which it is desired to make several tappings, it is often found that no sockets for wander-plugs are provided on the former. For the following method of remedying the defect, the only requirements are a small piece of ebonite (about 2½ to 3 in. × ¾ in.) and an old dry battery with wander-plug sockets.



A scheme for using wander plugs for coil taps.

Several of the latter (the number depends on the number of tappings to be made) are removed. Holes the size of the sockets are drilled in the ebonite and the sockets are inserted in the holes; they should fit tightly. They should then be glued in position.

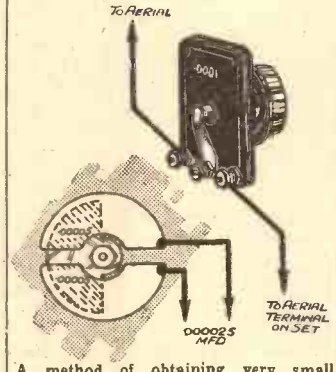
The whole should then be glued on to the top of the coil, the corners of the ebonite being rounded. Leads from the coil can then be soldered to the underside of the sockets and wander-plugs can now be easily inserted in any socket at will.

N.B.—It may be found more convenient to solder the leads to the sockets before gluing the ebonite on to the former.

A CONDENSER DODGE.

BY exercising a little thought and making a few simple calculations, it is quite easy to convert an ordinary differential reaction condenser into a reliable small series-capacity condenser for the aerial lead.

As an example let us take a ·0001-mfd. differential condenser. The normal maximum capacity between one set of fixed plates or vanes and the



A method of obtaining very small capacities.

moving vanes is ·0001 mfd., when the two sets of vanes are in mesh.

Alternatively, when the moving vanes are rotated 180° the maximum capacity between the moving vanes and the other set of fixed vanes is ·0001 mfd. If, therefore, the moving vanes are rotated only 90°, they are in mesh, one half with one set of fixed vanes and the remaining half with the second set.

In this case it is obvious that the capacity between the moving vanes and either set of fixed vanes is ·00005 mfd. (i.e., half the maximum capacity) Therefore, if we use the two terminals to the fixed vanes of the differential and ignore the terminal to the moving vanes, the maximum capacity between them is equivalent to two ·00005-mfd. condensers in series, which will give us a maximum capacity of ·000025 mfd.—a value which should be small enough for all normal requirements.

MAKING A CHEAP CABINET.

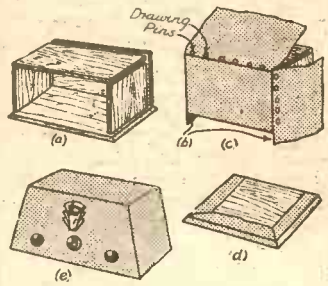
WHEN making a set to a specific design, it is sometimes found that the general shape and knob positions do not permit the set to be fitted into one of the standard cabinets that are on the market, or alternatively that a suitable cabinet is too expensive. In this case a cheap and presentable cabinet can easily be made at home with a few ordinary tools and by using a little ingenuity.

The idea is to have a cabinet of "five-ply" wood, and cover it with Rexine, or some similar cloth, in a workmanlike manner. For the woodwork part of the job, the only tool that is really essential is a wood-saw, as a smooth finish is not absolutely necessary. Of course, with a little more trouble a simple fret could be incorporated so that a speaker could be accommodated, if the cabinet design was suitable.

Having constructed the wooden case to the required dimensions, it is a fairly simple matter to cover it with suitable Rexine. Fix one side of the Rexine to the cabinet with a row of drawing pins, and liberally but evenly spread glue or any other good adhesive over the under side.

Then firmly press down the Rexine along the line of the pins with one hand, pulling it tightly in a direction away from the pins with the other. It is perhaps unnecessary to mention that the first sweep of the Rexine to be attached to the cabinet must be that part which is nearest to the pins, working outward until the whole side is covered.

More drawing pins are used to keep



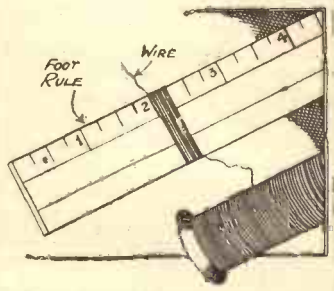
A cabinet "made to measure."

the Rexine in position until the glue has set. An elementary form of cabinet is shown at (*a*). In covering a cabinet of this kind, in which the base has a chamfered edge, it is best to glue or nail the sides, top and back together, and cover these (*c*). The loose ends (*b*) are turned in and glued on the inside of the cabinet.

The base of the cabinet (*d*) is then covered with suitable strips and screwed or nailed to the upper part of the cabinet on completion. A simple but effective cabinet is illustrated at (*e*). In this the sides are made to slope slightly, giving the cabinet a "modern" appearance.

FORMER LENGTHS.

IT is sometimes difficult to find out how long to cut the former when about to wind a coil with a certain number of turns, especially when using very fine wire. A good tip is to wind

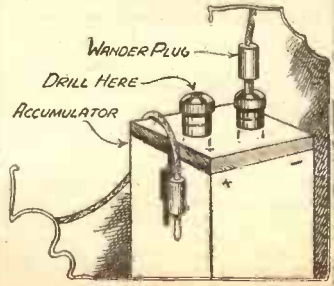


Tells you how many turns to the inch.

¼ in. carefully on a foot rule, counting as one winds. The total length of former required is then quickly worked out.

EXTRA L.T. CONNECTIONS.

IT is sometimes necessary to take an extra tapping from the L.T. accumulator to supply current for an additional H.F. short-wave or L.F. unit. This can be made quickly by drilling a hole in the top of each accumulator terminal large enough to take a wander plug. This will not interfere with the existing wiring.



Allows extra connections to be made to the L.T. accumulator.

The LISSEN ALL-WAVE "SKYSCRAPER" 4

A new home-constructor's kit covering all the important wavebands from 12 to 2,000 metres on battery operation.

THE increasing popularity of short-wave listening—a popularity for which POPULAR WIRELESS was largely responsible—has, strangely enough, failed to bring in its train a corresponding increase in the number of commercial receivers equipped for short waves as well as for the usual broadcast bands.

In fact, so far as we are aware, there was on the market only one constructor's kit with an all-wave range until this year. And this year Lissen, pioneers as always, have startled the home-constructor world with a new "Skyscraper" Kit—the All-Wave "Skyscraper" Four.

Solving a Big Problem.

The reasons for this apparent neglect of an ever-increasing market are not far to seek. Not until Lissen found the way was it possible to apply high-frequency amplification to all wavebands. Not until Lissen had devised and perfected a new universal four wave-range coil was it possible satisfactorily to provide switching over a range of from 12 to 2,000 metres. Not until Lissen realised the value of using a screened-grid valve as detector to reduce damping effects was this form of detector used in an all-wave kit set, or indeed in any kit set.

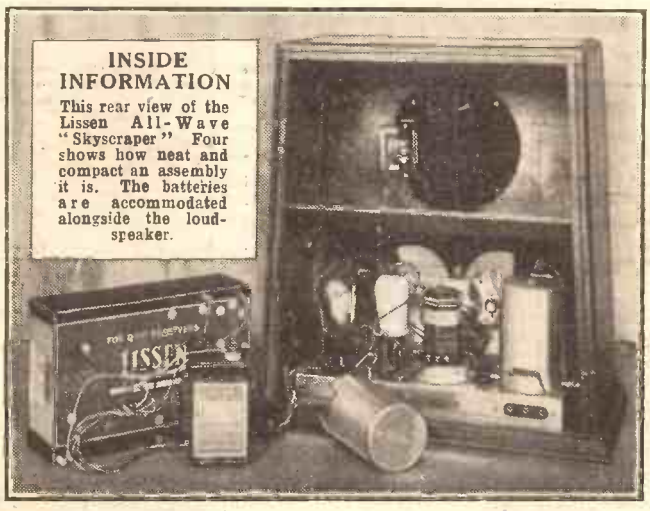
Clearly, then, to Lissen must go the credit—as it has gone so often before—for tackling in a big way an important problem. But it is vastly more important to discover whether the All-Wave "Skyscraper" Four is, in its performance, an adequate solution to that problem.

It has always been Lissen's contention that a kit set bearing the name Lissen should combine extreme ease of construction with results unsurpassed by any with a commercial receiver. The building of a receiver for four wavebands, instead of the usual two, might seem to present immediate difficulties. Actually there has rarely been a set which was easier to construct or simpler to handle. The thousands of constructors who built the original "Skyscraper" kit bear witness to the fact that it was mere child's play to make. And yet no more difficulty attaches to the new All-Wave "Skyscraper" Four. On this score the solution is very much more than adequate.

Volume and Quality.

As for the output of this receiver, Lissen have once again proved their thoroughness. The brilliant tone of a Lissen power pentode has already been demonstrated. Yet they were not satisfied with this output for a set that was to gather in music, song and speech from the corners of the earth. So, when you come to build the set, you will find that in the output stage are two pentodes in quiescent push-pull. Mains volume from batteries! And so that the ship shall not spoil for a ha'porth of tar, a special moving-coil speaker has been designed so that a fine output shall ensure even finer reproduction. Nothing is lacking on the score of quality.

But what of the actual station-getting performance, perhaps the most important consideration for a receiver which has been designed for world-wide reception?



INSIDE INFORMATION

This rear view of the Lissen All-Wave "Skyscraper" Four shows how neat and compact an assembly it is. The batteries are accommodated alongside the loudspeaker.

We tested the Lissen "All-Wave Skyscraper" Four last week. With admirable restraint we left the best to the last and put the set through its paces on the ordinary broadcast bands. Lissen's claim that "not only will you receive your local and other main B.B.C. stations, but you will receive at good volume many of the larger stations on the Continent" is putting it mildly! Disregarding for the moment the fact that there *are* short waves on the receiver, we should recommend it as an extremely good broadcast set, adequately selective for modern exacting needs and sensitive to a degree.

Tuning is as easy as two matched Lissen condensers can make it. The combined variable-mu potentiometer volume control and reaction condenser ensures a proper adjustment of volume from a whisper to full output. And that is all there is to it!

But when you begin to handle the switch at the side of the cabinet, the switch which, with its five positions, offers the choice of short and ultra-short waves in addition to the two broadcasting bands, as well as switching the set off and on—then the fun begins!

Thrill of Short Waves.

Stations between 12 and 80 metres, stations in South Africa, Australia, America, chase each other as you turn the dials. You need no experience of short-wave work, for Lissen have found the secret of making short waves as easily obtainable, as reliable and as full of real entertainment value as the broadcasting bands. It's as simple as falling off a log—but what immense, what exhilarating fun!

The thrill of building one's own receiver and hearing it work is complete only when the construction has been straightforward enough to overcome hours of tiresome "fiddling" and days of "making the thing work." Because Lissen kit sets have always been designed with this in view, because the constructional charts which accompany them are as complete in every detail as human ingenuity can make them, the success of a "Skyscraper" set is assured from the moment the purchase money is paid.

The thrill of short-wave listening is something which, once experienced, will never be forgotten. It is a receiver of proved quality and perfection. "PETER SIMPLE."

TECHNICAL SPECIFICATION. The Lissen All-Wave "Skyscraper" Four is a four-valve receiver consisting of variable-mu S.G. high-frequency stage, S.G. detector, and matched pentodes in quiescent push-pull. There are three controls on the front, two for tuning and one combining the functions of variable-mu potentiometer volume control and reaction condenser. A wavechange switch operates coils covering wavelengths of 12 to 35 metres, 28 to 80 metres, 195 to 520 metres, and 800 to 1,970 metres, and switches the set on and off. The price of the kit, with valves and cabinet, is £6 8s.

MEET on this page the progenitors of all radiograms and, more especially, the earliest commercially-made model now seemingly perpetuated by the well-known "His Master's Voice" trade mark.

The gramophone had its rise in 1894, when Professor Emil Berliner, of Washington, coated a flat zinc disc with a film of varnish and engraved thereon, by means of a stylus, the tiny vibrations of a diaphragm.

Some interesting details about the earliest gramophones—gramophones which were to show the way for the development of our modern masterpieces of radiogram design.

By F. JACQUET.

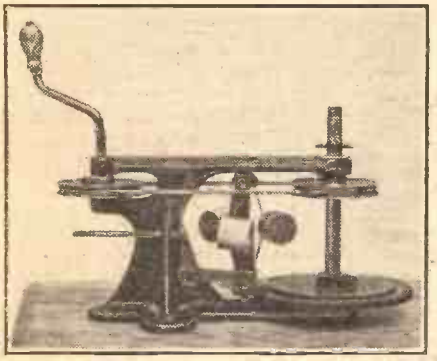
Experimental Models

Berliner applied the name "gramophon" to his disc machine, and he made a few experimental models, all of which were hand driven. Two of these 1894 models are extant in this country—one in the Science Museum at South Kensington, the other in the Gramophone Company's museum at Hayes, Middlesex.

It was not, however, until 1897 that the first practical and commercial gramophone was made. In that year the original Gramophone Company commenced to turn out a few of these novel instruments.

Curious contraptions they were, not a bit like the Edison and other makes of cylindrical record phonographs which were much in vogue at that period. However, the new disc instrument, although laughed

TURNED BY HAND



This instrument never proved very popular, and no wonder, for it had to be turned the whole time by hand.

at by many of the experts of the period, held its own, and, more than that, it progressed.

It is interesting to reflect upon the fact that wireless was just coming into being about the time the disc gramophone was born. Marconi was experimenting actively, and Sir Oliver Lodge, that G.O.M. of wireless science, was investigating the principles of tuning at that period.

Fourteen-inch Brass Horn

The very first gramophone model to be manufactured in England was put on the market in 1897 at the price of £5 10s. It had a 14-in. brass horn, a 7-in. green baize-covered turntable, and the machine was built up upon an oak base measuring approximately 10 in. × 8 in.

A single spring motor was incorporated, and this was wound up by means of a vertical winding key situated behind the turntable.

Power to the turntable spindle was transmitted from the spring through three pinions, the final pinion comprising a fibre wheel sandwiched between two brass plates and meshing with a vertically-held governor.

Perfect Tracking

The soundbox of the instrument was 1¾ in. in diameter, and it was secured to the horn of the machine by means of a leather elbow. Incidentally, this method of supporting the soundbox had the advantage of allowing perfect tracking of the needle over the record, a feature which was sadly departed from in the later gramophone models.

Another curious progenitor of the modern radiogram is the little hand-wound gramophone which was put on the market just after the introduction of the original spring-driven machine.

This machine also played the 7-in. single-sided records of the period—records, one may add, which had about one inch or so of recorded matter on them, and which played for about seventy seconds and no more; and although it retailed at the lower price of three guineas, it did not meet with much success. Consequently, few of these models were made, with the result that this original hand-wound gramophone is an exceedingly scarce instrument to-day.

Terrible Results, But—

Terrible, indeed, are the results obtained by using a pick-up in conjunction with an early record on the hand-driven machine—and perhaps more terrible still is the effect obtained when you turn the handle of the hand-driven instrument the wrong way.

Nevertheless, to possess an early gramophone of the above types is to develop an affection for it. You feel that you would think twice about accepting the very latest thing in radiograms or wireless receivers in exchange for it.

MADE IN 1897

This early gramophone is similar to the one depicted on the "His Master's Voice" trade mark.

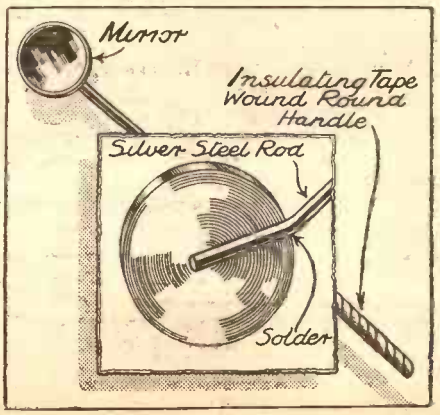
A HANDY INSPECTION MIRROR

By GEORGE L. WAKEFIELD

THERE is a place for this little gadget in every radio fan's tool kit. It consists of a small circular mirror mounted on the end of a long handle. It will be found an invaluable aid to fault tracing, as it quickly reveals every hidden joint, plug and terminal, enabling them to be scrutinised for any unsound contacts.

Procure a small mirror about 1 in. in diameter. This can be obtained from any toy shop, or perhaps you can persuade a feminine member of the family to oblige with one of the small mirrors to be found on the bottom of jars of face cream. Cut a circle from 22-gauge sheet brass or copper, making it ⅛ in. larger in diameter than the mirror. Raise a 1/16-in. lip all round the disc by gently hammering the edge over the end of a piece of iron rod. The mirror should now fit nicely in the shallow cup so formed.

The handle can be made from a 7-in. length of 3/32-in. silver steel rod. Bend it slightly ½ in. from one end so as to facilitate looking into awkward corners. Solder the handle on to the back of the mirror mounting, and when it is cool stick the mirror in place with a touch of liquid glue. To finish off, it is as well to insulate the handle by binding it with thick thread or tape.



The handle is fixed on by soldering.

Wherever wireless terms are understood "Ohmite" means "The Best Resistance"

"Better than wire wound."

OHMITE RESISTANCES

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

HEAVY DUTY TYPE 2/3

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GRAHAM FARISH PRODUCTS

Safe maximum current carrying capacity of "Ohmites."

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
4,000	24	50,000	5·5
5,000	20·25	60,000	5
10,000	12	80,000	4·24
Other values pro rata		100,000	3·5

Safe maximum current carrying capacity of "Ohmites" Heavy Duty Type.

100° F Temperature Rise

Ohms.	Milliamps.	Ohms.	Milliamps
1,000	80	20,000	16
2,000	70	30,000	13·5
3,000	58	40,000	12
4,000	48	50,000	11
5,000	40·5	60,000	10
10,000	24	80,000	8·48
Other values pro rata.		100,000	7

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

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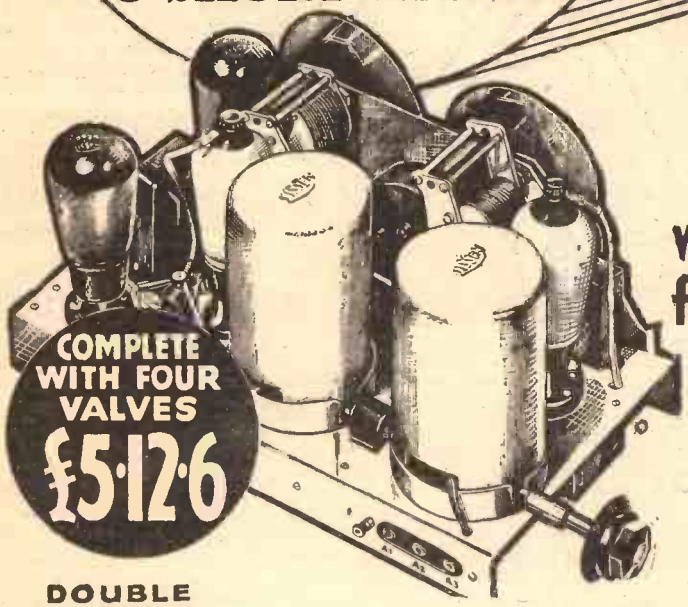


WORLD WIDE NEWS & ENTERTAINMENT for Home Constructors ONLY!

DOUBLE BALANCED PENTODE OUTPUT & MOVING COIL SPEAKER

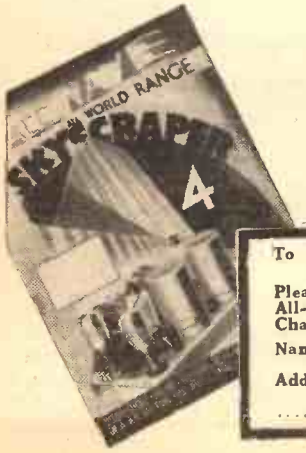
BUILD WITH YOUR OWN HANDS
SAVE POUNDS — SUCCESS CERTAIN

4 WAVELENGTH RANGES INSTEAD OF 2 IN NEW LISSEN ALL-WAVE ALL-WORLD SKYSCRAPER KIT SET!

At last the day of All-World Radio has arrived, and you can build with your own hands the first receiver to give you not only England and Europe, but America and Australia direct. The Lissen All-Wave All-World "Skyscraper" 4 tunes from 12 to 2,100 metres. It brings two complete new wavelength ranges within reach of the ordinary listener—stations and programmes which before he was never able to receive—Ultra Short and Short-Wave transmissions from the ends of the earth. And remember you get these stations through Double-Balanced Pentode Output giving brilliant reproduction on a Moving-Coil Speaker—as much power as a Mains Set from ordinary high-tension batteries.

Lissen have made this All-Wave All-World Radio available to Home Constructors first, because it brings back the thrill of conquest to hear America and Australia *direct* on a set you have built yourself, it makes you an enthusiast to realise what a wonderful thing you have created!

When you see the Great Free Chart of the All-Wave All-World "Skyscraper" 4, which tells you how to build it and how to work it and why it gives such marvellous results, you will agree at once that it will be wise of you to build for yourself rather than buy a factory assembled receiver which cannot give you these new and intriguing short-wave stations. The FREE CHART simplifies everything; there are pictures of every part, with every wire numbered, every hole lettered, every terminal identified. YOU CAN'T GO WRONG! But get the Chart and see for yourself—then build the Lissen All-Wave All-World "Skyscraper" 4, the SET THAT SPANS THE WORLD!



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LISSEN
ALL-WAVE ALL-WORLD
"SKYSCRAPER" 4

ECKERSLEY EXPLAINS-

This week our Radio Consultant-in-Chief deals in his usual entertaining style with some queries raised by readers. He tells one how to overcome mechanical hum in mains apparatus, another the way to arrange very long pick-up leads, and a third why fixed condensers need shorting twice to be fully discharged. Some interesting reminiscences are also included by this vivid writer.

R. D. B. (Kilmarnock) writes that he has an A.C. mains unit, and although reception is free from hum the eliminator isn't, and only a pile of books on top of the eliminator eliminates the hum! Is there any other way to eliminate the eliminator (mechanical) hum?

Well, there's always a pile of magazines, and if they're back numbers of "P.W." you've a ready reference and no hum!

But perhaps that's rather frivolous!

I know very well what a nuisance mechanical hum can be. I once worked for six months "at irregular intervals" in a station where a 500-K.V.A. transformer just hummed and hummed and hummed. But a turbo alternator is worse; that made me deaf for a week!

A.C. hum from transformers is due to the changing and alternating electro-magnetic forces from the A.C. currents in the windings creating changing and alternating mechanical forces in the iron which, therefore, moves, slightly, under those forces, and so, like the moving diaphragm of a loudspeaker, gives out a note corresponding to the periodicity of the mains.

Magnifying the Trouble.

Small and carefully made transformers do not give out much hum, but cheaper types are liable to be noisy. But if the transformer, liable to be noisy in the first place, is mounted in a resonating tin box, then of course you have, so to speak, put a trumpet on the moving iron speaker and vastly magnified the sound.

It is impossible to give a cut-and-dried solution to this trouble, but I should say common sense and felt and rubber would help. Do not, however, R. D. B., wrap up the transformer in any heat-resisting material, or it will get so hot as to melt—that will, of course, stop the hum!

Sometimes the tin lid of an eliminator zizzes, and here an irritable half an hour with bits of rubber and glue may help.

Candidly, though, if the pile of books works, it may be the best solution! I hope, though, it doesn't prevent ventilation.

Taking Things Easy.

C. B. A., of Chatham, wants to arrange his gramophone pick-up some 30 feet from his set. Are there any precautions?

I've been wanting to do this for five years! I know how to do it, but I've been—well, a little lazy, shall we say? I want to have a little low table with the motor and the turntable and the record library (I don't own a single record, incidentally) all complete. Then I shall sit down beside my little table and I shall not have to get up.

Prelude to a Prayer.

I shall have my fibre needles (in their drying jar), my little brush for dusting the record, my needle clippers, and I shall imagine myself quite, quite comfortable because I shall never have to stand up.

Electrically, there need be no precautions other than those shown in the diagram below.

My pick-up will be of low impedance and requiring a transformer. But I shall be sure to have my transformer in the set and the long lead on the "low-tension" or "low-impedance" side of the transformer, so that there shall be no capacity effects due to the cable. I shall certainly have a screened cable.

If I am making a permanent job this could well be twin-lead covered, run round the skirting board, with plugs so that I can detach either the amplifier at one end or the gramophone table at the other (for tidying, dusting, spring cleaning and other necessary purposes). But, if a flexible lead is all that is necessary, I shall buy metal-screened flexible cable (twin), and shall drape it across the floor and have to roll it up every time I have finished and unroll it every time I want some stormy weather.

After I have done all this I shall pray more fervently than ever for a gramophone record which plays for twenty minutes!

A Shocking Surprise.

B. S. K., of Barton, reminds me of an old and silly trick we used to play in the labs. of yesteryear. But I must answer his question first. He asks:

"I recently tested some 8-mfd. condensers at 500 volts. I shorted them somehow later, and there was, of course, a spark. Judge my surprise a week later when, on picking up one of the condensers, I received a shock. I am sure that I shorted this one momentarily with a screwdriver. I can't imagine what happened. Surely condensers do not accumulate a charge if left for some time?"

But condensers do, apparently, accumulate a charge. You charge them. Very well. You discharge them—apparently—once.

But you haven't completely discharged them, because, in picturesque language, they "soak up a charge" and it takes more than one discharge to rid them of all electricity, just as one squeeze at a sponge doesn't dry it completely.

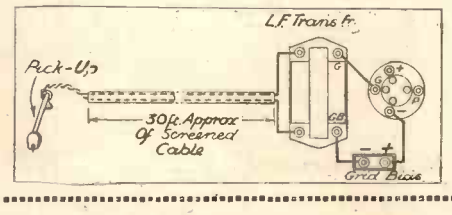
Two Reminders.

There are two things to remember in this connection: (1) Never do what B. S. K. did and short condensers by screwdrivers or very low conductors; it spoils the condensers. To discharge a condenser connect a few hundreds of ohms between their terminals and leave the connection on for about 15 seconds. (2) A valve with permanent negative on the grid does *not* completely discharge a high-tension condenser: it may give one a kick, unless precautions are taken, when experimenting, to discharge it—*through a resistance—after* the H.T. is switched off.

But my joke! We used to get very good high-voltage microfarads, charge them up and leave them on the shelves for the unsuspecting experimenter to pick up—and drop!

Weren't we funny? Such a sense of humour! It quite reminds one of the dear old school, doesn't it?

HOW LONG PICK-UP LEADS SHOULD BE ARRANGED



By having long pick-up leads arranged as in this diagram, it is possible to have the turntable and pick-up alongside one's easy chair and to change needles and records without getting up. The screened cable can be run round the skirting board.

BERLIN'S Big Receiving STATION

BY OUR SPECIAL CORRESPONDENT.

A glimpse of an out-of-the-way station which corresponds to the reception side of our famous Post Office station at Rugby. Berlin is used mostly for commercial messages, but a good deal of wavelength and interference checking is carried out there.

BEELITZ is the exact equivalent of the reception side of our Rugby station. It is used chiefly for commercial messages, but a great deal of wavelength and interference checking is done there to prevent jamming between broadcasting stations and commercial transmitters. When I visited "Konigs" I was advised to see how things are done at Beelitz, and I paid a visit recently after a little trouble in getting official permission.

Beelitz strikes a very official note. The station building, of rather forbidding aspect, looks very *Reichs!* The station grounds are most precisely laid out. There are little gardens and neat paths where the ground has not already been taken up by earth plates and lead-in tubes.

It is an ideal spot for reception. From the little balcony on the top of the station one can see for two or three miles in every direction. Several lattice masts have been put up, and the beam type aerials are strung between these in a suitable direction for transatlantic reception.

The Aerial System.

One of the engineers at the station has spent over a year in designing the aerial system. It appears to be simply a network of wires, forming rectangles with sides of about 20 feet.

The transmitter hall and the main reception room are placed at about the centre of the circle formed by the masts, and a lead to each aerial junction point runs out radially through a copper tube.

This is a novel idea. The tube is not actually joined to the H.F. circuit, but is insulated about every couple of yards by small porcelain blocks. Both at the receiving end and at the base of each mast there is a tuned coupler which balances out the capacity effect of the lead-in tube. If the wire to each mast were run out "naked," there would be all kinds of varying stray capacities set up by wind and rain, I was told.

Power Supply.

On the ground floor and in part of the basement of the station (the building is actually much larger than it appears to be at first sight) there is a generator room. There are six small rotary converters changing the local power supply into D.C. for the various H.T. and L.T. and G.B. circuits of the receiver racks. A semi-Diesel engine is kept in reserve, so that if the power lines from the town break down the whole station, including the lighting, can be kept going.

The generators are controlled from a large panel at one end of the room, to which the wires from each machine run underground in metal conduits. This panel is only a distribution point, though.

Selective L.F. Amplifiers.

The whole of the Beelitz building is wired with cables at various voltages for high tension, and leads are run through in separate piping for low tension. A receiver rack can thus be put up almost anywhere and immediately tapped on to a source of steady D.C.

Superhets. are used for long-wave reception, but straight circuits are used for short-wave semi-beam work. There is not a great deal that a broadcast listener can learn from a look round Beelitz, for, as the receivers are generally used for high-speed commercial Morse, the technique is quite different from that of, say, the short-wave side of Konigs Wusterhausen, where speech has to be handled.

In some of the Beelitz receivers they don't have to worry about quality on all frequencies. In fact, in four of the sets the *L.F. amplifiers are deliberately tuned to one frequency*, so that automatic Morse of that particular frequency can be selected. This cuts down heterodyne troubles.

In the main receiver hall there are nine racks. Seven of these carry receivers and amplifiers, while two are extremely ingenious decoding panels which are coupled up to the outputs of the receivers and pass the automatic Morse messages on to specially balanced telegraph lines.

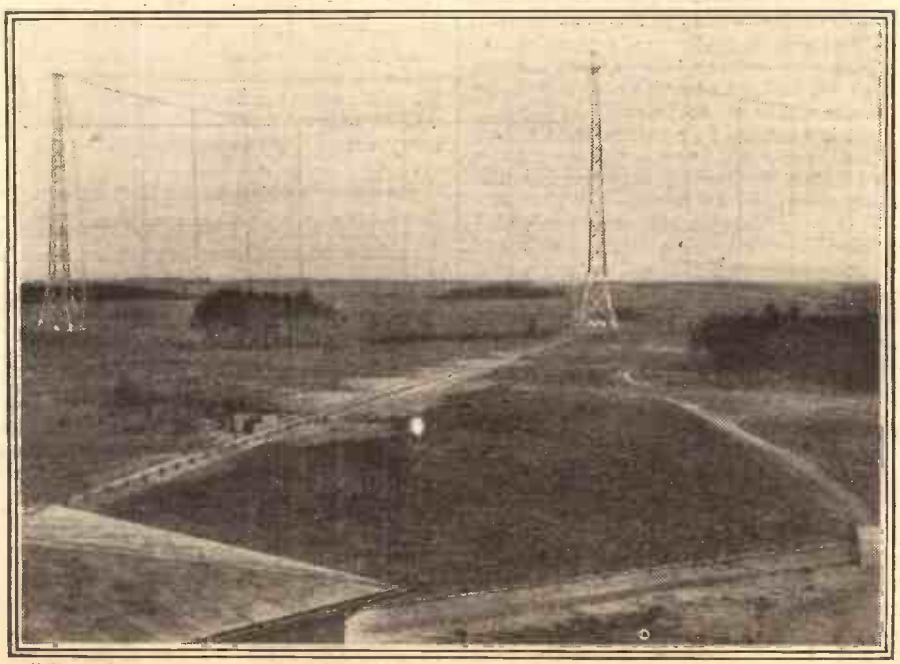
Wavelength Checking.

These carry the messages back to various postal centres where they are automatically printed. Beelitz, you see, is not used for the actual business of reception. The engineers adjust the receivers for the five or six wavelength channels used, and, at the 'phone request of the office headquarters, they bring in any special broadcast news or commercial telegraph transmissions.

The amplifiers can also be used for receiving broadcast pictures on the new international cable system—the method which our Post Office uses for sending maps and pictures by cable under the Channel to Berlin.

The Beelitz engineers have a research laboratory at the station where every German station is officially checked up and given an O.K. if there has been no mutual jamming with the commercial transmitters. This is regular official checking, and other Continental stations are also unofficially checked and reported to the R.R.G. authorities if there is any interference.

THE BEAM AERIAL FOR TRANSATLANTIC RECEPTION



"The station grounds are most precisely laid out. There are little gardens and neat paths where the ground has not already been taken up by earth plates and lead-in tubes." Two of the lattice masts are visible in this general view.

RADIO UP TO DATE

By CARDEN SHEILS.

AS the years go by there is a tendency to imagine that we are nearing the stage where radio must become standardised simply because there can be nothing left to invent. But if ever there was a fallacy this is one; and it is proved by the amazing crop of novelties that have been introduced during the last twelve months.

Take the newcomers to the valve family alone. Multi-mu, screen grids and pentodes, the double-diode, the double-diode triode and pentode, the pentagrid converter, the hexode, the single-bulb push-pull (Class B) are all fresh additions to the multiple-electrode class; whilst the Catkin, or all-metal valve, the Micromesh valve, and the Westector, or cold-cathode valve, indicate other new lines of development.

Valves and Circuits.

And how, it may be asked, do these affect modern circuit design? The answer is that they are exercising a profound influence in almost every direction.

Automatic volume control may be mentioned as one instance. The four- and five-valve "small" superhet represents another; "midget" construction in general a third; and so one might go on. Improved valve design always brings with it better circuit results, whether in the "super" or "straight" types of set.

Automatic volume control depends for its efficiency upon the production of sufficient rectified biasing voltage to control the amplification of the H.F. stages over heavy "fading" in the aerial pick-up.

Controlling Tone and Volume.

The D.D. and D.-D.T. type of valve will do this better—or at least more conveniently—than it has ever been done before. And once the problem of steady speaker volume has been solved it is a short step to the latest system of quiet or delayed A.V.C., which acts like a charm, so that one can tune in from station to station without hearing any noisy background or disagreeable mush.

So much for control on the H.F. side. This leads us in turn to tone compensation on the L.F. side—designed to give better "balance" and freedom from distortion. Here the "P.W." Automatic Tone Balance deserves special mention. It is by no means the least of the year's "crop," and has already proved its value to the set manufacturer as well as the home constructor.

Mains and Batteries.

Then another point. Everyone will agree that the battery-driven set has been given a fresh lease of life, so that for the first time it can look the mains-driven set squarely in the face. Why? We have to thank Q.P.P. and "Class B" amplification—both of this year's vintage.

The new push-pull (or push-push) developments have increased the undistorted output which can be obtained from a battery-driven set up to the full limit of reasonable domestic requirements. Any listener who wants more volume than a "Class B" amplifier will give him is simply qualifying to become a nuisance to his neighbours, and ought to be gently but firmly discouraged.

Not so long ago it was being lamented by many that radio was reaching finality. But after reading our contributor's review of this year's innovations, even the most pessimistic will have to admit that radio is advancing at a pace calculated to sweep any but the most alert of designers right off their feet.

Of course, this means no disparagement to the mains-driven set. The advantage as regards H.T. supply will in all likelihood always remain with the listener who is on the mains. But the battery-set owner can now get ample loudspeaker strength—and in good quality—without eating up money in the form of H.T. juice.

Still another notable feature is the appearance of the modern four- and five-valve superhet, which puts up a better performance than the eight- or nine-valve model of a few years ago—at a fraction of the cost.

Here, again, the credit is due, at least in part, to the new valves—though the circuit designer also deserves good marks for his ingenuity in making the most of them.

Simplifying the Super.

Instead of using separate valves for H.F. amplification, mixing and generating the local oscillation, these various operations are now being merged together in a single valve, either a pentode or the so-called pentagrid converter.

The action of the screening grid prevents any of the local oscillator energy from "getting through" on to the aerial, and so saves interference with other receivers in the neighbourhood.

The same property also prevents the tuned-signal circuits from reacting with the local-oscillator circuits, and so upsetting the tuning. When a pentode is employed for "mixing" this absence of mutual reaction between the circuits enables "ganged" tuning control to be applied to a superhet far more simply than has hitherto been possible.

Death of the Triode?

The pentagrid converter—though not yet in wide use—goes further still by utilising the principle of "electron coupling," which occurs inside the bulb and not in the external circuits. This for the present seems to be the "last word" in superhet design.

In the straight receiver the D.-D.T. is replacing the ordinary triode valve, especially the power-grid detector, whilst S.G.'s and pentodes are coming into general use both on the H.F. and L.F. sides of the set. In fact, they threaten to ring the funeral knell of the old-fashioned triode.

Television Possibilities.

In conclusion, a word must be said concerning television and the distinctly brighter prospects opened up by the new system of cathode-ray reception. Cathode-ray tubes, suitable for amateur use, have only recently been placed on the market—an event promptly signalised by the publication in POPULAR WIRELESS of a series of articles giving full constructional details for building a set of this type.

Taking it all round, then, the home-constructor seems to have before him opportunities of exploiting his skill in the achievement of bigger and better results such have never before been available to him.

TYPICAL OF MODERN DESIGN

The "Double D.T." receiver seen in this reproduction was the first set with multi-mu pentodes and double-diode triode. It was designed and described by "Popular Wireless" early this year, and is typical of the clean lines of modern design.

HIGH-CLASS FINISHES FOR CHEAP CABINETS

Here are some practical hints on staining and polishing which will enable you to achieve "professional" results at a very low cost.

By W. WYMER.

IMAGINE the cabinet of a de-luxe receiver made from deal! Such an idea seems to border on the ridiculous; and yet, apart from appearances, radio cabinets made of dry deal, devoid from cracks, equal in all respects ones made of choicer woods.

With this fact in mind, the trade-"ideas" men have evolved some striking finishes which make it æsthetically possible to employ deal as a cabinet wood; and here it is intended to bring down to a practical "home-working" basis the simplest of these ideas, because deal is infinitely cheaper than most hardwoods.

Colouring Wooden Panels.

In case your interest is merely set building, let us take for a beginning the average panel cut for cheapness from a sheet of alder plywood.

At best its grain is unsightly, and by merely brushing on a stain this quality is invariably emphasised. To overcome this the ultra-modern finish either eliminates the grain in favour of a new and different texture or supplements it with a false grain.

Considering the former first, if a stain is sprayed on via a scent spray so that there results a speckled finish, at a short distance from the work the line of the grain is broken. Each successive coat of stain so put on breaks it up further until there is no sight of it left. Thus we get a new effect without bodying-up on the face of the work.

Points to Bear in Mind.

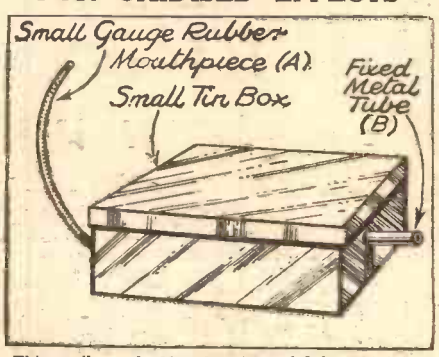
What appearance results if on a surface of yellow speckles there is sprayed similar coats of crimson, vandyke brown and black? The stains being semi-transparent, the result is a series of overtones broken by a myriad of dots of which the black ones predominate. And the shape and density of the "under spots" are not constant, since many of them are clipped or covered. Imagination simply cannot do justice to effects of this kind.

The above process is equally suitable for deal carcass work, but in all cases the following pointers should be kept in mind.

The size and closeness of the speckles depend on the distance between the nozzle of the spray and the work and the absorptive or spreading tendencies of the wood. To prevent excessive spreading the job should be glue-sized and afterwards sand-papered smooth.

Any bad joints or breaks in the wood should be mended with a filler which is agreeable to the class of stain used. For instance: water, whitening and plaster of Paris for water stains; resin (or shellac) and beeswax for spirit stains; putty for the stain advocated later.

FOR OXIDISED EFFECTS



This easily-made blow-box is useful for obtaining oxidised effects on varnished surfaces. By blowing through the tube marked A, powder is forced through the tube B. Separate boxes can be used for different shades of powder.

Oil stains cannot be used as the average scent spray is not sufficiently powerful to atomise oil.

Before polishing the work several brush coats of polish should be applied as a binder filler. These will consequently save both time and polish. At least a day should elapse between coats, because polish on deal continues to sink in after the action appears to have stopped.

Producing an Artificial Grain.

As a variation of the above finish, a brush may be drawn over the speckles as they fall on to the wood. This produces a short artificial grain which looks surprisingly good over or under a flat stain of the same or a different colour.

A real modernist note can be achieved by cross-hatching a short artificial grain, or by blurbing out the surface with a cork dipped in stain, and then overstaining with colour put on with a brush, spray or other improvised patterning tools.

As a stain the writer recommends varnishless paint thinned down with petrol. This unconventional mixture retains its colour density regardless of the quantity of dilutent added. Moreover, any colour is easily procured, and the "hiding" powers of this stain are comparatively great.

Built-up Surface Effects.

The variety of surface effects and colour combinations that are obtainable with a stipple paste are limited only by the versatility of the worker. This deal-altering process consists of applying to the wood a thin coat of paste material on which a texture or grain is worked before the paste becomes set, and subsequently finishing off with colour.

The best-quality paste is made up from 2 lb. each of flatting paint and plaster of Paris and ½ lb. of ground mica.

Thinned down with turpentine to the consistency of glue, this paste is brushed over the work, and a texture is obtained by daubing with a sponge, a crumpled-up cloth, etc.; or a grain is got by pressing on to the paste a piece of open-grained hardwood, previously having had its grain raised by immersing it in water. Unwrought wood or graining rollers made by wrapping a piece of "grain-surfaced" Rexine round a bottle may be used as an alternative.

Filling the Indentations.

The indentations may be filled in with any of the fillers mentioned if a smooth surface is desired. The ultimate colour of the finish may be altered by using stains that are in affinity or otherwise to the body mediums.

For example, water stains would colour plaster-filled indentations, but not the paint-bodied ground. This could be previously coloured. The entire surface could be overstained by any method with a spirit stain.

All that is necessary to achieve an old ivory or "dead" ebony effect on deal is to give the wood two or more coats of semi-matt, light ivory or ebony enamel, and when dry polish with rotten-stone or its equivalent and water. The abrasive used should be worked through a linen pad, and not sprinkled on the work.

Simulating Old Ivory.

For old ivory, the antique effect (a brown tinge) can be got by using a few spots of stain in with the last dose of abrasive used. The high-lights can afterwards be wiped off with solvent similar to that used in the stain.

Oxidised effects.—The work should first be varnished, and when the varnish is "tacky" metal powders or dry pigments should be blown on to it via a blow-box made according to the sketch. By blowing through the tube A the powder in the box is stirred up and forced through tube B. Separate boxes for different shades of powder are generally used. A flat-coloured surface may be shaded with a stain of the kind mentioned.

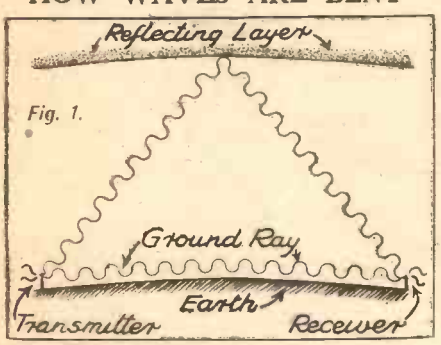
Silvering, gilding, etc., with powders in this way produce a cheaper and far superior job to one painted with metallic paints.

In this interesting article, our contributor, Mr. Leslie Baily, gives a graphic description of the discovery of the Heaviside and Appleton Layers, which are held to account for the successful reception of wireless signals over vast distances.

STREAMS of electrified particles flying out into the depths of space from the blazing sun—do we owe to that remote cause the fact that we can send a wireless message round the curve of the earth, from England to Australia ?

And is that annoying phenomenon known as "fading," which weakens one's reception of Moscow or Madrid just when one is

HOW WAVES ARE BENT



Many miles above the earth's surface there is an ionised layer which reflects the indirect or sky wave from the transmitter, causing it to be bent back at an angle as depicted in the above sketch.

getting a thrill from it, due to this celestial shower-bath of cathode rays, as the sun's escaping particles are called by modern scientists ?

In a new research laboratory at Hampstead scientists, led by Professor E. V. Appleton, are making an onslaught against the secrets of space. Results of great interest have already been secured by the Radio Research Board's probing into the mysteries of how wireless waves travel through space. The Heaviside Layer and the Appleton Layer have been discovered by these etheric explorers, and they have told us how fading and the curvature of wireless signals round the earth may be attributed to these layers. But what causes the layers ? That is a problem still baffling the experts.

Finding the Reason Why.

You may pick up a telephone in England and speak to Cape Town. Your voice is transmitted by beam radio. Similarly, when the B.B.C.'s short-wave station at Daventry sends programmes to the Empire they are transmitted by a beam of wireless waves projected towards the receiving country. The aerial is faced towards the distant country, and the beam gets there. But little is known of how the beam gets there. The more scientists can discover about this the better long-distance transmission will become, because radio engineers will be able to modify their aerials and transmitters in the light of new knowledge.

Picture to yourself the space above the earth as a great ocean ; our world is the bed of the ocean. The lower layers of the ocean are called the troposphere—the "weather layer" where turbulent air is the chief characteristic. This immediately surrounds the earth.

Outside it comes the stratosphere, which Professor Piccard has investigated in his balloon. It is about 12 miles above the earth, and the temperature is extremely cold.

A Life-Giving Layer.

If we were able to take Piccard's balloon a great deal higher still we should pass presently into the next layer of the ocean, the ozonosphere. The amount of ozone up there is very small—but how important to the human race ! This gas catches a large amount of the ultra-violet light sent out from the sun, absorbs it, and so prevents it reaching the earth. This reduces enormously the power of the sun to produce sunburn. Lord Rayleigh has remarked that but for the ozone layer there might be

BEAM TRANSMISSION

The Heaviside and Appleton Layers play a great part in successful long-distance transmission and reception, and beam radio as well as ordinary broadcasting is affected by the vagaries of these mysterious layers which scientists are investigating

nobody on earth to investigate the upper atmosphere !

The ozonosphere absorbs 6 per cent of the incoming solar energy, and consequently the temperature is much higher than in the stratosphere—about 40 degrees centigrade. The height of the ozone layer is still in doubt, but by voyaging further into space we reach the Heaviside Layer, between 60 and 80 miles high.

It is this layer of electrified atmosphere that bends transmissions of medium-wave broadcasting stations back to earth, as in Fig. 1.

When your wireless set is tuned in to a distant station on the medium wave-band the energy that reaches it arrives partly as waves transmitted along the ground and partly as waves reflected back from the upper atmosphere. The Heaviside Layer is not perfectly steady, however. Its position is continually shifting. As a result, the two sets of waves are inclined to upset each other ; at one minute they will be in phase, and all is well with your reception, then the waves from up aloft get out of phase with those along the ground, and your reception fades.

Proved by an Echo.

The Heaviside Layer is also the explanation of the phenomenally good reception of certain distant stations such as Toulouse. In England we happen to be at an ideal distance from Toulouse to obtain the greatest benefit of the reflected ray.

This layer owes its name to an Englishman, Dr. Oliver Heaviside, who suggested its existence. It is not difficult to prove the existence of the layer—there is the famous experiment of Professor Appleton, who transmits wireless waves up into space and listens to the "echo," i.e. the return of the wave from the Heaviside Layer.

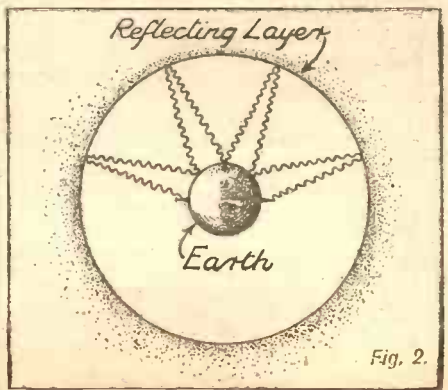
Timing Radio Waves.

Waves were sent out in London and received at another point. The ground wave came in first, then the reflected wave, and by measuring the difference of their arrival times Professor Appleton calculated the height of the Heaviside Layer. The difference is as little as 1-1500th of a second !

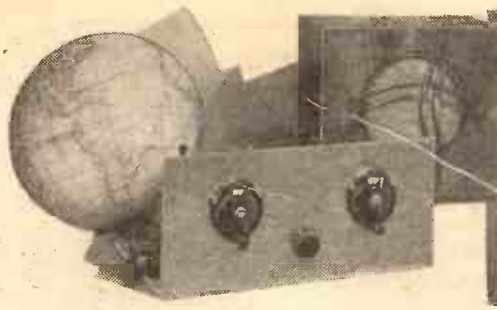
But whilst listening to these echoes

(*Continued on page* 72.)

ENCIRCLING THE EARTH



This diagram illustrates how the waves reach different parts of the world in spite of the earth's curvature. These waves are, of course, the indirect waves and not the direct or ground rays.



The A.T.B. ALL-WAVE THREE

By G. V. Dowding, Associate I.E.E.

THE object of this set is to provide first-class results over the whole gamut of useful wavelengths, from 15 metres to over 2,000 metres.

It is the first set to do that.

The problem of maintaining good quality on the "normal" broadcasting bands was solved some time ago. And automatic tone balance has been universally acclaimed as the most efficient, most inexpensive and simplest solution.

By its means, the distortion occasioned by reaction is eliminated and the distant stations are heard with the clarity of local transmitters.

But reaction distortion is even more serious on the short waves, because it is necessary to apply reaction to its utmost limits practically all the time.

Indeed. it is quite obvious that without some kind of tone compensation the quality can never be anything but poor as compared with, for example, reactionless reception of a medium- or long-wave station.

Convincing Proof.

Unfortunately, this poor quality has been tolerated and accepted as inevitable on short waves by many, and this is no doubt the reason why some listeners do not think short-wave listening is worth while as an entertainment.

But it can be; the A.T.B. "All-Waver" proves it convincingly.

For the very first time automatic tone balance has been applied in full measure to the short waves. So instead of the short-wave powers of the A.T.B. "All-Wave" Three being a kind of apologetic make-weight, they invest the set with a unique versatility. They open up for the listener an entirely new field of programme exploration.

I have long realised the vital work A.T.B. could do on short waves, but there have hitherto been difficulties in its application.

And it was not until recently that these difficulties were completely surmounted.

At No Cost.

In retrospection, I wonder if they really were all *difficulties*.

For one thing, I made up my mind from the very first that the A.T.B. for short waves must add nothing to the cost or construction of the set. It could have been accomplished in several ways if this restriction had not been imposed.

However, it was, and so you have one hundred per cent all-wave A.T.B. in this set for nothing, as it were.

But have I done right? It's a sinister thought, yet I have the feeling that because it is so simple and costs nothing that it won't be appreciated!

Glance at one of the photos. Does it look like a picture of a receiver capable of doing what no other set can do, or does it convey the impression of just another of those built-in-an-hour compacts of simplified inefficiency?

Well, it may be good psychology for a doctor to put colouring into his medicines to make his clients believe they are getting better value for money, but I think it savours of quackery.

Hearing is Believing.

And if there are any constructors who won't credit the original A.T.B. or this new all-wave A.T.B. with the powers attributed to it by the leading engineers of the British radio industry because it wants looking for in a set and isn't a bristling, expensive mass of complications, then I hope they will at least endeavour to hear an A.T.B. set in action. That will at once convince them.

The power and the selectivity of the "A.T.B. All-Wave" Three are that of a good, modern design plus additional percentages due to A.T.B., for it must not be

(*Continued on next page.*)

"P.W." AGAIN AHEAD!

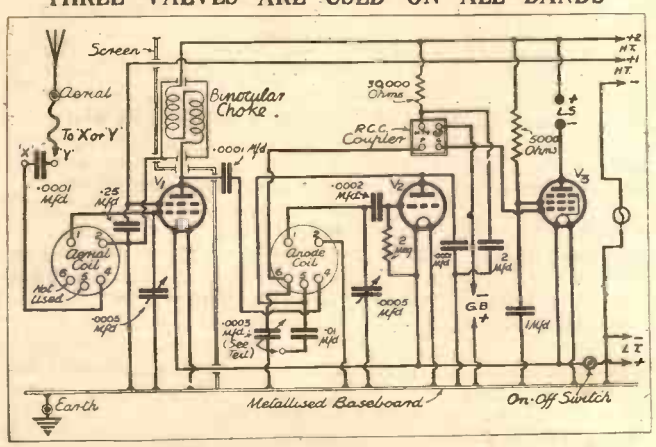
Automatic tone balance was exclusively described in "Popular Wireless" for the benefit of home constructors early this year, and a measure of its importance is afforded by the fact that the A.T.B. patent has since been acquired for use by the British Licensing Pool. (One further and entirely unique tribute to the originality of "P.W." designs.)

And now "Popular Wireless" again leads the way with an entirely new and even wider application of this ingenious and valuable principle.

In the A.T.B. All-Wave Three full automatic tone compensation is given on short as well as the ordinary broadcast waves, and a "four-band" performance of extraordinary efficiency and quality is achieved.

No all-waver entirely comparable with this A.T.B. design has previously been possible.

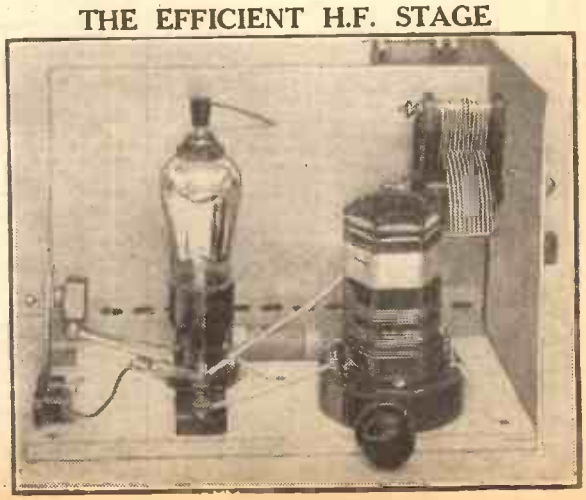
THREE VALVES ARE USED ON ALL BANDS



The circuit of the A.T.B. All-Wave receiver comprises an S.G. stage, followed by detector and low-frequency valves which are connected by a compensating R.C. unit forming part of the automatic tone-balancing scheme.

The screened-grid stage, seen in the photograph on the right, is operative on the short waves as well as the medium and long waves. It greatly aids the bringing in of far-distant stations, and thus gives the A.T.B. ample opportunities of showing how really worth while it can make foreign reception.

THE EFFICIENT H.F. STAGE



THE A.T.B. ALL-WAVE THREE

(*Continued from previous page.*)

forgotten that A.T.B. is not only a quality-preserving system.

Simply because reaction can be extended to its limits without its normal muffling distortion-producing unintelligibility, numerous programmes which would otherwise be dismissed as being beyond reach become available as true alternatives, the effective sensitivity and selectivity of the set both rising considerably.

Modified Condenser.

Advantage has been taken in this present A.T.B. set of one comparatively new and one quite new component.

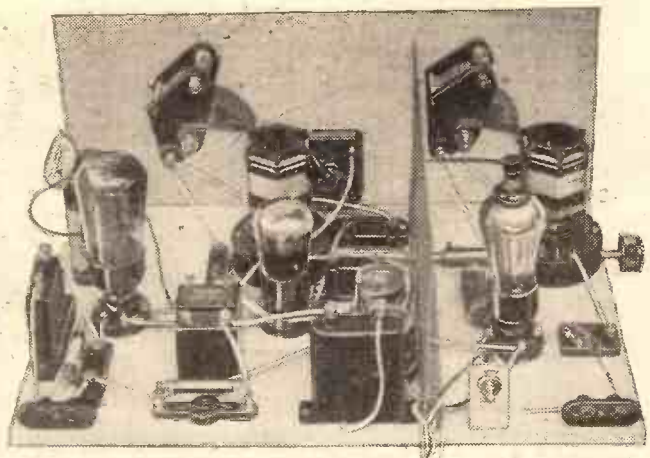
The tuning circuits incorporate Lissen Four-Band tuning coils. Although very compact, these embody all the windings necessary for the exceptionally wide coverage of 15 to 2,000 metres, the wavechanging all being done by means of one small knob.

The programmes made accessible in this way are staggering in number, and are to be heard at all times of the day and night and from practically every country in the world.

Integral with the A.T.B. is a Varley compensating unit, but, it should be noted, this replaces the ordinary L.F. transformer and adds little or nothing to the cost of the receiver.

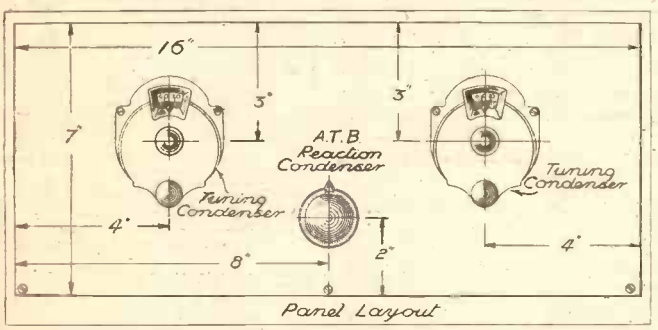
Everything else, too, is easy-to-obtain, standard apparatus, although it is necessary to make a slight adjustment to the reaction condenser. But this is easy enough to do, as I will now proceed to show.

The reaction condenser is actually a Telsen Aerial Series Condenser (the ordinary kinds of reaction condenser are not suitable for this set).



"For the very first time automatic tone balance has been applied in full measure to the short waves. So instead of the short-wave powers of the A.T.B. 'All-Wave' Three being a kind of apologetic make-weight, they invest the set with a unique versatility. They open up for the listener an entirely new field of programme exploration."

A REMARKABLY SIMPLE LAYOUT



There are only three components to be mounted on the panel. These are the two tuning condensers and the reaction control. The wavechange switch is arranged on the left-hand side of the cabinet, looking at the front of the set.

And on inspection it will be seen that it has a shorting bar fixed to its one terminal with which a short arm on the spindle makes contact.

Well, this shorting bar should be removed by unscrewing the terminal head and the nuts which lie under it.

Now get a 1-in. 6.B.A. bolt and nut, and with this fix the shorting bar to the diagonally opposite hollow split rivet that is mounted through the case of the condenser.

This hollow rivet is not in electrical contact with the reaction condenser, and so is a most convenient point of attachment.

This 6B.A. bolt and nut that holds the shorting strip in its new position becomes the extra terminal needed.

The shorting strip now lies along that side of the condenser on which the moving-vane terminal is—an exact opposite to its original place.

Previously the spindle arm made contact with it when the condenser knob was turned to full capacity, but now this happens at minimum capacity and a third terminal point is provided.

The whole thing is much simpler than it may sound, as you will see if you hold the condenser in your hand and visualise the alteration.

The layout of the set has been planned on very straightforward lines, and the component disposition is such that there is no crowding at one spot and an opening out at another. An even distribution is maintained.

Eliminating Wiring.

And the employment of a Metaplex baseboard (an effective and inexpensive alternative to the usual copperfoil covered wood) reduces the wiring considerably.

It is necessary to drill a hole through the vertical screen for the rod that couples the switch action of the coils, and it will be best for the rod to clear the screen and not scrape against it as it is rotated.

(*Continued on page* 58.)

USE THESE PARTS FOR THE A.T.B. ALL-WAVE THREE

Components.	Make used by Designer.	Alternative makes of suitable specification recommended by Designer.
2 All-wave coils	Lissen	—
2 ·0005-mfd. tuning condensers	Telsen W.132	Polar, J.B.
2 Vernier dials	Telsen W.141	Igranic, Utility
1 ·0003-mfd. condenser (for reaction)	Telsen W.350 (see text)	—
1 2-mfd. fixed condenser	Ferranti	T.C.C., Telsen, Dubilier, Lissen
1 1-mfd. fixed condenser	Lissen	Dubilier, Ferranti, Telsen, T.C.C.
1 ·25-mfd. fixed condenser	T.C.C., type 250	—
1 ·01-mfd. fixed condenser	Dubilier, type 610	T.C.C.
1 ·0002-mfd. fixed condenser	Dubilier, type 620	Graham Farish, Telsen, Lissen, T.C.C.
1 ·0001-mfd. fixed condenser	Dubilier, type 620	T.C.C., Telsen, Lissen, Graham Farish
1 ·0001-mfd. fixed condenser	Dubilier, type 670	Lissen, T.C.C., Telsen, Graham Farish
1 ·0001-mfd. fixed condenser	T.C.C., type "S"	Telsen, Dubilier, Graham Farish, Lissen
2 Four-pin valve holders	W.B.	Benjamin, Lissen, Telsen, Ferranti
1 Five-pin valve holder	W.B.	Benjamin, Lissen, Ferranti, Telsen
1 Compensating R.C. coupler	Varley CP 170	—

Components.	Make used by Designer.	Alternative makes of suitable specification recommended by Designer.
1 Screened binocular choke	Graham Farish, L.M.S.	Telsen
1 2-megohm grid-leak with wire ends	Dubilier 1 watt	Lissen, Goltone
1 30,000-ohm resistance with horizontal holder	Graham Farish "Ohmite"	Dubilier
1 5,000-ohm. resistance with horizontal holder	Dubilier	Graham Farish
1 Two-point on-off switch	Bulgin S.80	—
1 Bracket for above	British Radiogram	—
1 Twin plug strip	Bulgin P.30/A.E.	Belling-Lee
1 Twin-plug strip	Bulgin P.30/L.S.	Belling-Lee
1 Metal panel, 16 in. x 7 in.	Peto-Scott	—
1 Metaplex baseboard	Peto-Scott	—
1 Cabinet to suit	Peto-Scott	—
1 Vertical screen, 10 in. x 6 in.	Magnum	Peto-Scott
1 Grid-bias battery clip	Bulgin, type No. 3	—
4 wander plugs	Goltone	Belling-Lee, Clix, Eelex
1 Wander fuse	Belling-Lee	—
1 Anode connector	Belling-Lee	Goltone
2 Accumulator connectors	Belling-Lee	Goltone, Eelex, Clix
1 Crocodile clip	Bulgin C.R.5	—
6 Yards 18-gauge tinned copper wire	Goltone	—
5 Yards insulated sleeving	Goltone	—
Flex, Screws, etc.	Peto-Scott	—

PETO-SCOTT

EVERYTHING RADIO — CASH C.O.D. or EASY TERMS

Peto-Scott are pioneers in Radio and Television. Our Service to the British Public was introduced in 1919 and during 14 years of Solid Service and Satisfaction we have established a reputation for fair dealing that defies competition. Customers in all parts of the globe come to us regularly for all their radio requirements—Sets, Kits of all descriptions, Part Kits, Miscellaneous Components, Speakers, Eliminators and Accessories. Purchases can be made for Cash, C.O.D., or on Easy Payments. WE DEAL WITH YOU DIRECT—Peto-Scott's Easy Way System with its strict privacy and no third party collections—will bring radio to your home by convenient monthly payments. Send list for quotation; no obligation.

SPEAKERS

NEW BLUE SPOT PERMANENT MAGNET MOVING-COIL SPEAKER 29 P.M. With input transformer. Cash or C.O.D. Carriage Paid, £1/12/6. Balance in 6 monthly payments of 5/-. — Send 5/- only

NEW BLUE SPOT 45 P.M. PERMANENT MAGNET MOVING-COIL SPEAKER. Cash or C.O.D. Carriage Paid £2/5/0. Balance in 7 monthly payments of 6/-. — Send 6/- only

NEW LISSEN P.M. MOVING-COIL SPEAKER with input transformer. Cash or C.O.D. Carriage Paid, £1/5/0. Balance in 4 monthly payments of 5/6. — Send 5/6 only

NEW LISSEN WALNUT CABINET P.M. MOVING-COIL SPEAKER. Cash or C.O.D. Carriage Paid £2/10/0. Balance in 8 monthly payments of 6/-. — Send 6/- only

NEW W.B. P.M.4.A. MICROLODE PERMANENT MAGNET SPEAKER

complete with switch controlled multi-ratio input transformer. Cash or C.O.D. Carriage Paid, £2/2/0. Balance in 7 monthly payments of 5/9. — Send 5/9 only

NEW W.B. TYPE P.M.6 PERMANENT MAGNET MOVING-COIL SPEAKER with input transformer for Power or Pentode. Cash or C.O.D. Carriage Paid, £1/12/6. Balance in 6 monthly payments of 5/-. — Send 5/- only

NEW FERRANTI M.5.T. MOVING-COIL SPEAKER with input transformer suitable for Power, Pentode or "Class B." output. Cash or C.O.D. Carriage Paid, £1/17/6. Or 7 monthly payments of 5/-. — Send 5/- only

NEW ROLA "CLASS B" PERMANENT MAGNET MOVING-COIL SPEAKER AND AMPLIFIER

Complete with Valve and Input Transformer. Two models: A for PM2B, PD220 and 220B; B for 240B and HP2 (state which when ordering). Cash or C.O.D. Carriage Paid, £3/11/0. Balance in 11 monthly payments of 6/6. — Send 6/6 only

BAKER PERMAG MINOR MOVING-COIL SPEAKER with transformer for "Class B" or ordinary inputs. Cash or C.O.D. Carriage Paid, £1/15/0. Balance in 6 monthly payments of 5/6. — Send 5/6 only

NEW FERRANTI "CLASS B" SUPER-POWER CONVERTOR. Instantly converts your set to "Class B." Complete with Valve. Ready assembled. Cash or C.O.D. Carriage Paid, £3/3/0. Balance in 11 monthly payments of 5/9. — Send 5/9 only

ELIMINATORS

ATLAS C.A.25, for Mains, "Class B" and Q.P.P., four tappings: 60/80, 50/90, 120, 150, 25 m/A. Cash or C.O.D. Carriage Paid, £2/19/6. Balance in 10 monthly payments of 6/-. — Send 6/- only

REGENTONE W.I.F. H.T. ELIMINATOR for A.C. mains. 100/150 volt 12 m/a. Tapped suitable for all sets. Cash or C.O.D. Carriage Paid, £2/15/0. Balance in 11 monthly payents of 5/-. — Send 5/- only

NEW EXIDE H.T. ACCUMULATOR, 120 VOLTS, W.H., in crates, 5,000 m.a. Cash or C.O.D. Carriage Paid, £4/13/0. Balance in 11 monthly payments of 8/6. — Send 8/6 only

PILOT AUTHOR KITS

ALL-WAVE 3

KIT "A." Author's Kit of FIRST SPECIFIED Parts, including Peto-Scott Ready-drilled Aluminium Panel and METAPLEX Baseboard, but less Valves and Cabinet. Cash or C.O.D., Carriage Paid, £5/0/0. — YOURS FOR **9/3**. *Balance in 11 monthly payments of 9/3.*

KIT "B." As Kit "A," but with Valves only. Cash or C.O.D. Carriage Paid, £8/19/0. SEND ONLY 12/9. Balance in 11 monthly payments of 12/9.

KIT "C." As Kit "A," but including Valves and PETO-SCOTT American type Cabinet. Cash or C.O.D., Carriage Paid, £7/16/6. SEND ONLY 14/3. Balance in 11 monthly payments of 14/3.

Peto-Scott American-type Cabinet with lift-up lid, 17/6

3 Specified Valves, £1/19/0

THESE ARE THE PARTS THE AUTHOR USED

1	PETO-SCOTT metal panel, ready drilled, 16" × 7"	4 9
1	PETO-SCOTT "Metaplex" baseboard, 16" × 10"	2 0
1	PETO-SCOTT vertical screen. 10" × 6"	2 0
2	LISSEN all-wave coils	1 10 0
2	TELSEN W.132 ·0005-mfd. condensers	7 0
2	TELSEN W.141 vernier dials	3 0
1	TELSEN W.350 ·0003-mfd. condenser	2 0
1	FERRANTI 2-mfd. fixed condenser	3 9
1	LISSEN 1-mfd. fixed condenser	2 6
1	T.C.C. type 250 ·25-mfd. fixed condenser	1 9
1	DUBILIER type 610 ·01-mfd. condenser	3 0
2	DUBILIER type 620 (·0002-mfd.; ·0001-mfd.) condensers	2 6
1	DUBILIER type 670 ·0001-mfd. condenser	1 0
1	T.C.C. type "S" ·0001-mfd. condenser	1 3
2	W.B. 4-pin valve holders	1 8
1	W.B. 5-pin valve holder	10
1	VARLEY compensating R.C. coupler	11 6
1	GRAHAM FARISH L.M.S. type screened binocular H.F. choke	4 6
1	DUBILIER 1-watt 2-megohm grid leak	1 0
1	GRAHAM FARISH "Ohmite" 30,000-ohm resistance with horizontal holder	2 0
1	DUBILIER 5,000-ohm resistance, with holder	2 0
1	BULGIN type S.80 2-pt. on-off switch	1 6
1	BRITISH RADIOGRAM bracket	6
2	BULGIN twin plug strips, P.30AE and P.30LS	1 6
1	BULGIN No. 3 grid-bias battery clip	2
4	GOLTONE wander plugs	4
1	BELLING-LEE wander fuse	1 0
1	BELLING-LEE anode connector	4
2	BELLING-LEE accumulator connectors	9
1	BULGIN C.R.5 crocodile clip	2
6	yds. 18-gauge tinned copper wire, 5 yds. insulated sleeving, flex, screws, etc.	3 9
	KIT "A," CASH OR C.O.D.	£5 0 0

Exact to Specification

P.W. TABLEGRAM

KIT "A." Author's Kit of FIRST SPECIFIED Parts, including Peto-Scott Ready-drilled Panel and METAPLEX Baseboard, 14 in. by 10 in., but less Valves, Cabinet, Speaker and Gramo. equipment. Cash or C.O.D. Carriage Paid, £5/2/6. — YOURS FOR **9/6**. *Balance in 11 monthly payments of 9/6.*

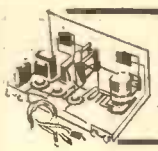
Set of Specified Valves, £2/5/3.

EXCLUSIVELY SPECIFIED

PETO-SCOTT OAK TABLEGRAM CABINET Complete with Motor-Board — *Cash or C.O.D. Carriage Paid* **45/-**

Baffle and Baseboard Assembly 3/6 extra.

SEND FOR 1934 CABINET CATALOGUE



MANUFACTURERS' KITS IN SEALED CARTONS

LISSEN

NEW LISSEN SKYSCRAPER FOUR-ALL-WAVE CHASSIS MODEL, in Sealed Carton. Cash or C.O.D. Carriage Paid, £5/12/6. Balance in 11 monthly payments of 10/3. — YOURS FOR **10/3**

NEW LISSEN SKYSCRAPER FOUR ALL-WAVE CONSOLETTE CABINET MODEL in Sealed Carton. Cash or C.O.D. Carriage Paid, £8/2/6. Balance in 11 monthly payments of 15/-. — Send 15/- only

NEW LISSEN 7-VALVE SUPER-HET. in Sealed Carton. Cash or C.O.D. Carriage Paid, £8/17/6. Balance in 11 monthly payments of 16/6. — Send 15/- only

LISSEN 7-VALVE SUPER-HET CONSOLETTE MODEL, in Sealed Carton. Cash or C.O.D. Carriage Paid, £11/10/0. Balance in 11 monthly payments of 21/-. — Send 21/- only

NEW COSSOR, MODEL 341, S.G., Detector and Pentode, and Balanced Armature Speaker, complete with Cabinet. Cash or C.O.D. Carriage Paid, £6/7/6. Balance in 11 monthly payments of 11/9. — Send 11/9 only

TELSEN CLASS B 4 CHASSIS KIT in Sealed Carton, less Valves, Cabinet and Speaker. Cash or C.O.D. Carriage Paid, £3/17/6. Balance in 11 monthly payments of 7/-. — Send 7/- only

NEW GARRARD MODEL 202A. 12-in. Turntable. Electric Motor for A.C. mains. Cash or C.O.D. Carriage Paid, £2/10/0. Balance in 8 monthly payments of 6/-. — Send 6/- only

NEW GARRARD A.C.4. Electric Gramophone Motor. (For A.C. Mains) Cash or C.O.D. Carriage Paid, £2/2/0. Balance in 7 monthly payments of 5/9. — Send 5/9 only

NEW BLUE SPOT COMBINED PICK-UP AND TONE-ARM. MODEL 33. Cash C.O.D. Carriage Paid, £1/15/0. Balance in 6 monthly payments of 5/6. — Send 5/6 only

PILOT "CLASS B" CONVERSION KIT

Converts your present Battery Set to "Class B" Amplification. Complete with all necessary components, including driver transformer, "Class B" output choke, W.B. 7-pin valve holder B.V.A. 240B 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 and other parts unobtainable from your local dealer SENT C.O.D. We have the largest stocks in the country. Orders over 10/- send Post Paid. (Easy Terms available on Orders over £2.) Quotations by return. No obligation.** — Send 5/- only

AVOMINOR NEW UNIVERSAL MODEL. Measures 0-6, 0-30, 0-120. M.a. 0-6, 0-120, 0-300 volts, 0-10,000, 0-60,000 and 0-1,200,000 ohms, complete with leads. Cash or C.O.D. £2/0/0. Balance in 7 monthly payments of 5/6. — Send 5/6 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.*

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Dear Sirs,—Please send me CASH/C.O.D./H.P. ..... for which I enclose £.....s.....d.

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ANY ITEM SUPPLIED SEPARATELY—ORDERS OVER 10/- SENT C.O.D. CARRIAGE AND POST CHARGES PAID

THE A.T.B. ALL-WAVE THREE

(*Continued from page 56.*)

The wavechange control will protrude through the side of the cabinet in accordance with commercial practice. Bearing this in mind, you should allow just a trifle of slack in the connecting wires of the first coil unit so that it can be moved a trifle.

Or you can join the wires to it after the set has been placed in the cabinet. To get the correct position for the cabinet hole, remove the switch knob and loosen the coupling-bar ganging connection between the two coils.

Push the coil back so that the set will slide into the cabinet, and then, with a pencil, mark the exact position where the spindle will need to pass through the side of the cabinet.

Fixing the Spindle.

You can then, by measurement, transfer the marking to the outside of the cabinet and drill the hole. To "wangle" the spindle through, recoupling the coils and screwing them down is by no means a difficult task. But if your cabinet has no lid to lift up you might find it easier to cut a slot in its side for the coil-switch spindle.

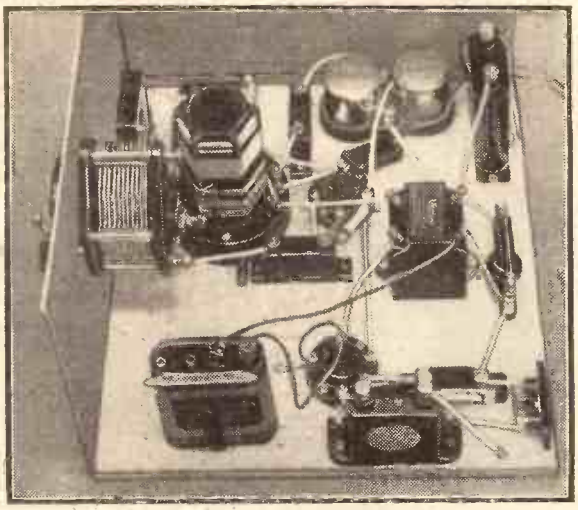
Then the complete, wired set would merely be slid in.

The on-off switch position can be varied without detriment to the set if you so desire. We have it mounted on a simple aluminium bracket (brass would do quite as well).

THE CORRECT VALVES TO USE

Make.	S.G.	Detector.	Output.
Mullard	P.M.12	P.M. 1 H.L.	P.M. 22 A.
Cossor	215 S.G.	210 H.F.	220 H.P.T.
Mazda	S.G. 215	H.L.210	Pen 220
Marconi	S 21	H.L.2	P.T. 2
Osram	S.21	H.L.2	P.T. 2
Hivac	S.G.210	H.210	—
Eta	B.Y.6	B.Y.1814	—

BENEFITS WITHOUT COMPLICATIONS



One of the outstanding features of the receiver is the fact that the advantages of automatic tone compensation and four-band switching have been achieved with unusual simplicity in operation. There are no coils to change and the A.T.B. is entirely self-adjusting.

Earthing the Baseboard.

Connection to the Metaplex baseboard is made simply by forming loops in the ends of the wires and holding them down by means of small screws.

The short flexible lead and the crocodile clip enable the aerial terminal to be joined to either terminal of the ·0001-mfd. fixed condenser at will, so that it can be brought either in or out of circuit.

When it is in circuit a higher degree of selectivity is provided, but many will not often need that. Anyway, it is a more or less initial adjustment to be made to suit individual local conditions.

The battery leads are taken straight out from this set and their lengths can be adjusted in accordance with the placing of the batteries.

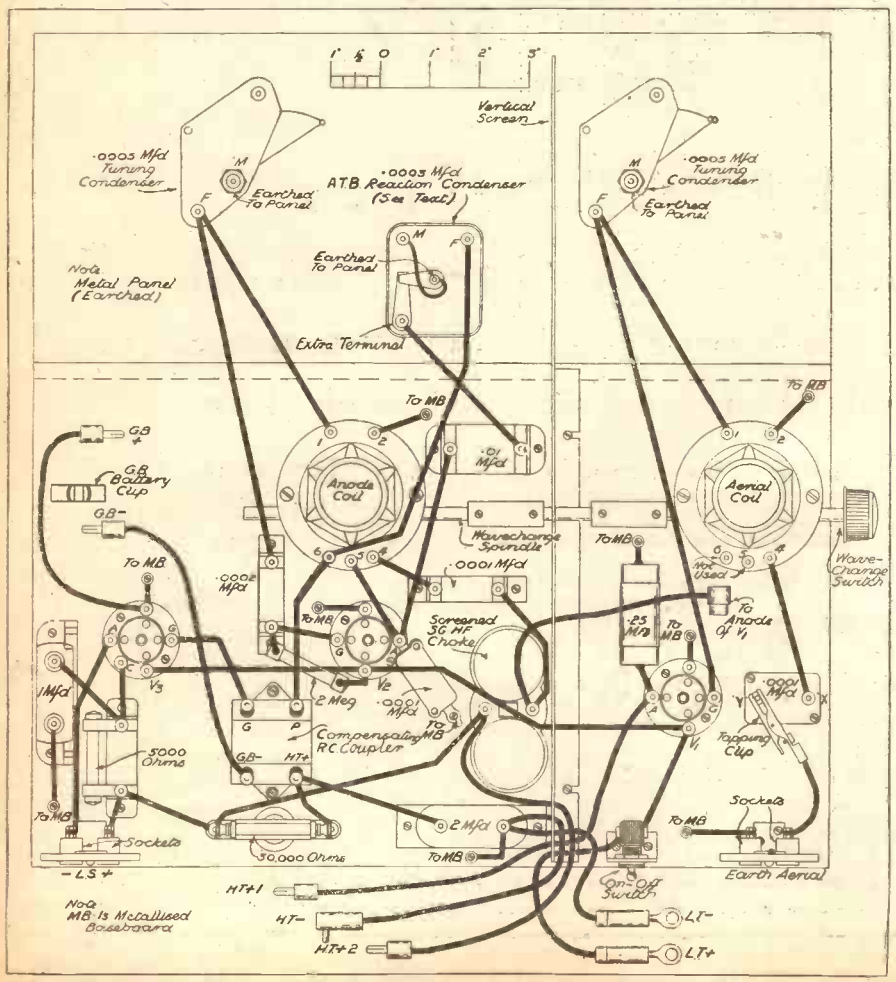
Arranging Battery Leads.

In order to remove the direct strain from their connections to the various components, etc., they can be passed through the slots in the vertical screen and then plaited.

You will see by inspecting the photos how we have done this in the original model.

There is nothing that I need say about the operating of this set, for it is perfectly straightforward in every way. But you will find the results obtainable are very much above standard!

WORLD-WIDE RANGE WITH FIRST-CLASS QUALITY



As can be seen from this diagram, the wiring presents no difficulties. It will be noticed that the coils are ganged so that a single knob controls the switching for all four wavebands.

RECOMMENDED ACCESSORIES

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

LOUDSPEAKER.—Atlas, Blue Spot, W.B., R. and A., H.M.V., Rola, Ferranti, Marconiphone, Celestion, Ormond, G.E.C., Magnavox, Epoch, Amplion, etc.

AERIAL AND EARTH EQUIPMENT.—Coltone "Akrite"; Electron "Superial"; Radiophone "Receptru" downlead; Graham Farish "Filt"; Bulgin lightning switch.

In positions of trust . . .

where reliability may be a matter of life and death, the Exide Battery is chosen. It is in the wireless cabins of 9 out of 10 British ships, ready to radiate or receive the signal of distress.

Exide

BATTERIES

EXIDE "D" TYPE L.T. BATTERIES

TYPE DTG	20 amp. hours . . .	4/6
TYPE DFG	45 amp. hours . . .	8/6
TYPE DMG	70 amp. hours . . .	11/-
TYPE DHG	100 amp. hours . . .	14/6

These prices do not apply in the I.F.S.

For wireless H.T. get Drydex — the dry battery by Exide

Obtainable from Exide Service Stations and all reputable dealers. Exide Batteries, Exide Works, Clifton Junction, near Manchester
Branches: London, Manchester, Birmingham, Bristol, Glasgow, Dublin, Belfast R38

THOSE SPAGHETTIS

A GREAT deal has been said against spaghetti resistances, and not much for them. Yet I am far from being convinced that spaghettis need be as black as they have been painted; in fact, I consider they have uses not so well served by other types of resistances.

The main trouble has been that many constructors have badly mishandled spaghettis, by twisting them, imposing strain on them even tying knots in them.

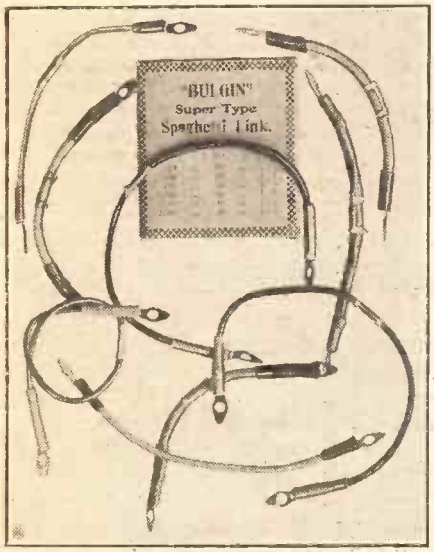
Also it is undeniable that some makes have been less reliable than others, to say the least of it.

Some few weeks ago Messrs. Bulgin sent me a large collection of their spahgettis. There were several samples of each of numerous values.

I have used a considerable number of these Bulgin spaghettis—among other things for "Valvonium" experiments, it is interesting to note.

And quite frankly I have found them invaluable, and not once did any one on either the scores of relinability or rating occasion cause for anxiety or criticism.

I recommend them to the attention of experimenting constructors as being particularly useful items.



Spaghetti resistances are in many cases the most suitable type of resistance to use, and those of Bulgin make will be found both reliable and accurately rated.

TELSEN ELECTROLYTIC CONDENSERS

The resources of the great Telsen organisation have been clearly illustrated by the diversity and number of entirely new components produced by it for this season.

Such things as iron-cored coils, mains units and so on cannot be placed in production as easily as bakers' produce different shapes of cakes. They call for considerable development, ability and extensive factory facilities.

And, I should imagine, one of the most difficult of all propositions to tackle successfully is the electrolytic condenser.

But Telsen have taken it in their stride, as it were, and their new high-voltage type is a very excellent article, too.

It is made in two types, the one for peak voltages up to 275 and the other for 500 volts. And the prices are, as is usual with Telsen gear, exceptionally low.

Only the most modern mass-production methods scientifically applied could make possible such prices as 5s. for the 500-volt, 6 mfd., and 3s. 6d. for the 275-volt, 4 mfd. Similar articles, made by expert craftsmen (that is essential), working without the great moulding, stamping and pressing machines, could not economically be sold under three or four times those figures.

By producing them on an extensive scale, Telsen's are able to supply their dry electrolytic condensers at most attractive prices yet maintain a high-class standard.

This is certainly an age of value for money. But to return to the Telsen electrolytic condenser in particular. This is of the "dry" type, and can be mounted in any position. Its fixing is rendered the more easy owing to the provision of a special bracket enabling it to be secured to any form of panel or baseboard.

It is a first-class component and in all the uses to which we have put it, it has proved entirely reliable.

A NOVEL BATTERY

The necessity of providing an H.T. fuse in all radio sets is one which, I believe, "P.W." was the first to realise. And every "P.W." set specification allows for this.

The principle is carried still further, indeed, to its logical conclusion by the Chorlton Metal Co., Ltd., whose "Millgate" H.T. battery has a fuse permanently incorporated in it.

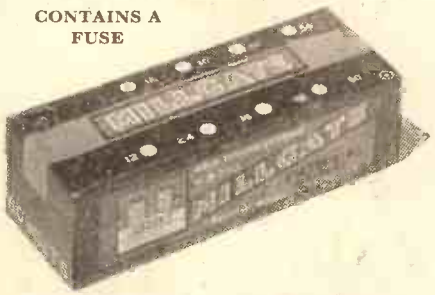
Thus the battery itself is protected against short circuits at the same time as its current flow to external circuits is definitely limited, except, of course, through intermediate positive tappings.

But you cannot guard against that at the battery without having a fuse for each of the tappings. However, the usual "single-leg" safeguarding is provided at a most convenient point, and if there is a fuse in the set as well, then there will be double protection.

Still, a battery which won't deliver a dangerous superfluity of current is not all we want. We want, in addition, the power to produce a steady output over reasonably long periods.

In this respect I find the "Millgate," as judged by the sample in my possession, to be quite satisfactory. Within its limits (it is of the small or "standard" type) it measures up convincingly, and I can recommend it to the attention of "P.W." readers.

CONTAINS A FUSE

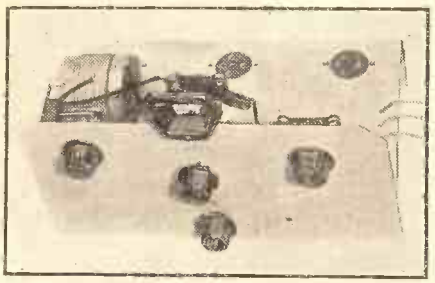


A novel feature of the "Millgate" high-tension battery is the incorporation of a fuse in series with the negative socket.

A SHORT-WAVE SET

Those who desire an immediate and easy access to the interesting and exciting short-wave bands should take note of the Burne-Jones Three-valve Short-wave Set.

This is one of the neatest outfits of the kind I have ever seen.



Complete with valves and cabinet, this three-valve chassis-built short-waver, made by Messrs. Burne-Jones, costs only £3 10s. It goes down to 15 metres and up to 80 metres.

It is built on to a small metal chassis, and I should imagine that its compactness will form one of its greatest appeals, especially to overseas listeners.

Complete with valves and cabinet, it costs only £3 10s.

As can be seen from the photo, its panel controls are few and simple. There is a combined on-off and wavechange switch. The wavebands covered are 15–35 and 35–80 metres. And in so far as station accommodation is concerned, that is a wider coverage than 200 to 2,000 metres.

The tuning condenser is of the solid dielectric type, and, as would be anticipated, the receiver does not quite reach the heights of "hot-stuff" efficiency achieved by the specially built "fan" outfits.

All the same, its results are very good, and I have no hesitation in saying that, irrespective of size and price, it is equal to if not actually superior to the best commercial short-waver I remember having tested.

ABSOLUTE ZERO

Its possibilities applied to radio.

FROM Holland comes the report that Professor de Hass, of Leyden, has astonished the scientific world by producing a temperature which is only one-eight-hundredth of a degree above the absolute zero temperature of space. Absolute zero is, of course, the coldest cold that can exist, and is 270 degrees below our ordinary freezing point.

The possibility that this temperature will soon be produced is of great interest to the wireless and electrical world generally, for all sorts of queer things may happen to our wireless sets when the coldest cold is discovered and applied commercially.

For example, every wireless set depends upon the fundamentals of resistance, capacity and inductance; the latter two, which are the essentials, cannot exist without the former. But it can be shown theoretically that a length of wire which is reduced to the absolute zero temperature—i.e. 270 degrees—would have no resistance whatsoever, although it might still retain capacity and inductance.

The chief drawback of resistance is that it tends to prevent the flow of an electrical current through a wire. Resistance is therefore an undesirable characteristic of an electrical circuit except when it is deliberately inserted for a specific purpose, such as cutting down the voltage applied to the anodes of valves.

If resistance is eliminated or reduced, then the efficiency of our sets will increase tenfold, and that is what is likely to occur when the discovery of absolute zero has been made and commercialised. G. H. D.

Let the opinion of experts guide you

This famous reproducer is now available in five different models, and in each construction and performance are identical, the difference consisting of the input transformer, which is specially designed to match the impedance of a given output valve, and thus ensure the finest possible reproduction.

STANDARD MODEL. For use with Pentode and Super Power Valves; A 3 ratio Transformer is fitted.

TYPE "B." For Class B Operation. (Model B8 for Low Impedance and Model B15 for High Impedance Valves.)

TYPE "P." An extension instrument for Commercial receivers which incorporate an output transformer.

TYPE "Q." For Quiescent Push-Pull (15,000 ohms plate-to-plate load).

Your dealer will advise you as to the correct type for your particular output stage.

The fact that the R. & A. Challenger is so frequently specified by Set designers, and is also incorporated in well-known Commercial Receivers, is proof of its high standard of performance. Expert Test Reports have acclaimed the Challenger as "quite definitely above the average," and state, "Balance in music exceptionally good." For these reasons you cannot do better than invest in a "Challenger."

Ask your dealer to demonstrate, and you will realise why it is acknowledged "Britain's Foremost Reproducer."

35/-

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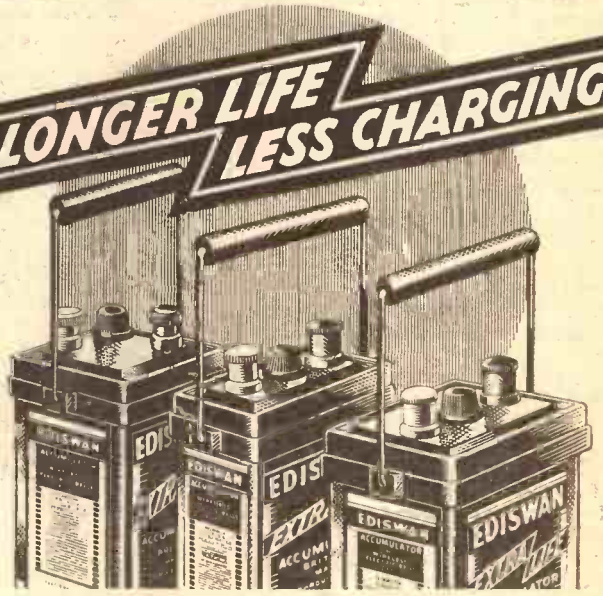
LONGER LIFE LESS CHARGING



. . . the secret is BALANCED CAPACITY

An accumulator with unbalanced plates is like a set with worn-out valves — just as inefficient. Ediswan accumulators are *balanced*. The positive and negative plates are designed to function in exact electrical balance, so that it is possible to charge them quicker and discharge them longer without the slightest risk of damage.

A host of minor improvements, too, are incorporated in these Ediswan cells. Better, from every point of view than ordinary cells, and no more expensive. Get an Ediswan to-day.

*E.L.M.*2. 20 *a/h* - 4/3	*E.L.S.*5. 40 *a/h* - 11/-	*E.L.*7. 60 *a/h* - 10/3
*E.L.M.*4. 45 *a/h* - 8/-	*E.L.S.*7. 60 *a/h* - 12/6	*E.L.*9. 80 *a/h* - 12/3
	*E.L.S.*9. 80 *a/h* - 15/6	

EDISWAN EXTRA LIFE ACCUMULATORS

THE EDISON SWAN ELECTRIC CO. LTD.
PONDERS END, MIDDLESEX

TUNGAR - the Better Service Chargers

B.274

All the interesting news and views of current short-wave practice.

JUST before settling down to write these Notes, and to comment on the excellent conditions that have prevailed for more than a week, I switched on my own special short-waver. You will have guessed already that I found conditions entirely changed! The 19- and 25-metre bands were more "dead" than they have been for several nights, and very strong atmospherics were spread liberally over the whole band from 15 to 30 metres.

It is rather curious to note that severe static on short waves generally means good conditions. I must have struck the proverbial exception.

How Correspondence Varies.

It is rather amusing to watch the size of my pile of correspondence, and the way in which that varies with conditions. After rather more than five years at "Short-Wave Notes," I have succeeded in evolving certain rules which seem quite infallible by now.

One of them is that a spell of good conditions after a long dead period means busy times for the postman, but that a long good spell means a slackening off. A fortnight ago I was receiving lots of letters telling me that readers were receiving W 8 X K on 25·27 metres marvellously well; but now that he has been pouring in with great regularity for 15 or 16 evenings, the tumult and the shouting have died.

The 20-metre Band.

To-night being the first time he has "missed," I expect I shall receive another big batch! But I have an idea that it is only one freak night, and that the good conditions, like the fine summer, will be the rule once more.

The 20-metre amateur band—always a barometer for radio conditions—has been productive of a good many thrills in the early evenings of late. I have heard India, Java, Japan, Australasia and the inevitable U.S.A. all coming in together with great gusto. I think we may look forward to really reliable long-distance work on this wave for some time now, as the eleven-year cycle is really on the up-grade.

The "people who know" seem to be more and more certain that the short (or, more probably, the ultra-short) waves will prove to be the ultimate solution to the problem of the overcrowded ether.

I can't imagine that our ordinary short waves—thrilling and interesting as they are—will help matters much, for we fans find their very unreliability one of the most fascinating features of them.

Future Possibilities.

The ultra-shorts, on the other hand, don't suffer from "conditions" at all; and although at present the indications are that their DX possibilities are strictly limited, we need not be surprised at anything that happens in the next few years.

After all, who are we to say that radio and broadcasting have settled down comfortably in the best possible position in the spectrum? I mustn't say that "radio is in its infancy," or someone will throw bricks at me and prove that it is a middle-aged gentleman by now, but I do think we are going to see some very startling changes one day.

Many Detail Improvements.

How I hate the people who scream that all existing receivers will be obsolete next year! They certainly won't—not even the oldest and scrappiest of our short-wavers; but the detail improvements of the past two years amount to a good respectable total when taken all together.

As a straw to show which way the wind is blowing, I might quote the fact that Continental amateur transmitters are making far more use of 10 metres than ever before, and that the really experimentally minded men are playing with 2½ *metres* for short-distance work.

A 5-METRE "FIELD-DAY"

Two short-wave enthusiasts conducting outdoor experiments with a five-metre receiver. Interest in this band continues as strong as ever, and there is no sign of activities abating.

THE LISTENER'S NOTEBOOK

Frank comments on recent programmes and on microphone personalities of the moment.

I SAT through the two hours of "Strife" chiefly because I wanted to hear Mr. C. M. Hallard in the part of John Anthony. It wasn't my intention, however, when I switched on at 9.15 p.m. to listen to it all. An hour, I thought, at the most.

But John Anthony's contribution to Act I was so lean that I was beginning to wonder why he preferred playing Anthony *père* to Anthony *fils* (the part he played in the original stage production at the Duke of York's Theatre in 1909).

* * *

In Act I Mr. Hallard had no opportunities at all—an odd sentence here and there was all he had to say. In the later stages he had more, but nothing would rouse him out of the lethargic state he seemed to be in.

Doubtless he felt and perhaps looked the part in the studio, but over the air he was uninteresting. That very much alive eye which is an essential part of his make-up didn't penetrate the ether at all.

* * *

Mr. Hallard hasn't quite the personality for broadcasting yet. This was his first broadcast—we mustn't forget that. One thing that "Strife" proved was that acting on the stage and acting before the mike are two distinct arts.

* * *

I would more readily agree with those who claim that Galsworthy's presentations of social problems make excellent broadcasting if these presentations were not so long and the cast not so big. It was difficult to follow Act I of "Strife." Apart from the two chief spokesmen, one hardly knew who was holding forth. Often there were no indications at all.

I overcame the difficulty by following from a book. I always adopt this expedient when I can. The entry of Frost, for instance, at the end of the act must have perplexed many listeners. This entry, I know, is a detail, but one isn't to know this at the time.

* * *

Mr. Howard Rose (producer) made the best of a difficult task, and succeeded in getting a good deal of the right atmosphere. In this he was helped by a distinguished cast, of whom the two to catch my ear most were Miss Bruce-Potter as Annie Roberts and Hay Petrie as Henry Thomas.

* * *

We are too prone, I think, to criticise announcers. I know I do it myself. We exaggerate the seriousness of an occasional slip, while we hold up our hands in horror when they mispronounce a word.

Recently one of them had the misfortune to pronounce Bass Ratcliffe, *Base* Ratcliffe. What colossal ignorance I we thought. But if we are honest we will admit that to be *au fait* with every noun (common, proper or abstract) that comes an announcer's way in the course of a week requires a general knowledge to which few of us can attain.

* * *

One notices no radical changes yet in the Variety hours. Everything is still very stereotyped, while the applause from the studio audience might be from the wings. I understand that applause is being controlled now; in other words, applause to order. This is only one step removed from recorded applause by some process or other.

* * *

I did notice that Clarice Mayne has introduced patter into her turn. I wasn't greatly impressed with the story of her visit to the Zoo with a talkative youngster, but I'm glad she keeps off the Cockney dialect. We've enough Mabels and Gerts on the air for the present, and there's Mrs. Pullpleasure as well. A good thing can be overdone.

* * *

With those who like the light type of song, Patrick Waddington must be very popular. He's got a good voice and he picks a tuneful song. He can also reach his top notes without having recourse to a falsetto voice.

I think it is a mistake for tenors to sing songs they can't reach without this falsetto voice. The latest and worst example of this was Raymond Thomé in a Sunday-evening concert from Ostend. He spoilt an otherwise beautiful rendering of a song by suddenly producing a note of amazing altitude that was indeed startling.

I don't think he need have gone all that way, either. There were several halting-places in the chord he might have taken, and with more effect, too.

* * *

If you haven't heard a gramophone recital from Hilversum lately, just have another shot. You'll be rewarded if you do—that is, if you listen to their Christopher Stone. Though I don't understand a word he says, I find him quite diverting, and I can recommend his selection of records, too.

* * *

And talking of selective music, what about a recital of the "bits of sugar" from the great composers? I listened to some Handel the other day, and very nice it was, too. And some Mozart on another occasion. Surely all these bits have been recorded; they only need picking out.

A recital of such music would help to popularise the so-called highbrow composers in those quarters where the mere mention of Mozart, and particularly of Bach, produces a frown.

* * *

Nowadays Vienna seems a popular resort for the masquerader, at any rate in the entertainment world. And when the story of the masquerade is sung to Johann Strauss music it is worth listening to. Hence the success of "Waltz Time." Toots Pounds made the production more attractive both in anticipation and realisation. An excellent show all round!

* * *

The morning talks are now well under way. The only one I have been able to sample is Capt. Geoffrey Crawshay's first talk on "Old English Houses and Gardens." Very interesting, but rather too overloaded with history, I thought. However, I should say this series will be popular.

LOUDSPEAKER SOUND-PATTERNS

Dr. J. H. T. Roberts DESCRIBES AN INTERESTING NEW INVENTION

The Film Organ that Plays Anything Under the Sun—and More Besides . . .

Our Scientific Adviser, Dr. Roberts, tells you how an inventor walked into his office, described a wonderful invention, and gave him permission to publish it. What do you think of it? At any rate, it shows that the possibilities of radio are ever increasing.

HERE'S the big idea. An inventor came along to see me with it a few days ago. Perhaps it opens up big possibilities, so I am going to tell readers of "P.W." something about it. You must judge for yourselves.

Of course, you know, all kinds of people come along to me with ideas, inventions, suggestions and goodness knows what besides, and want me to finance them—with the promise of a fortune beyond the dreams of avarice within an incredibly short space of time. I *have* gone into two or three things and—touch wood—have been lucky. Many of the things which come along are very ingenious, but for one reason or another it is impossible to see in them any prospect of commercial success.

Comparison With Cinematograph.

Well, anyway, without going into that, here's the latest, and if it eventually becomes a reality it may quite possibly be a very big thing.

Before describing it directly, let me come to it by way of a comparison with the cinema film. You know that a cinema film enables us to make what the Americans call a "potted" version of a stage play. When we have the film made we can produce before an audience the same effect as though the actual stage, players, etc., were all recreated. The result is that we only need to make use of the real players *once*, and ever afterwards we can reproduce their movements, action and so on (and also their voices and other accompanying sounds) by simply taking a roll of film out of a small tin box and passing it through a relatively small machine.

Church Organ Selections.

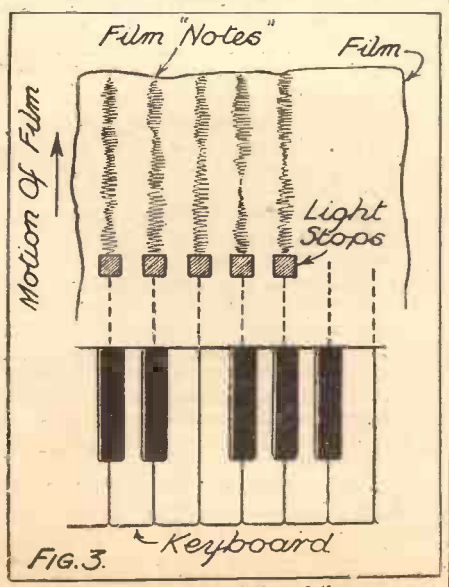
In the same way, if a gramophone record is made of the singer's voice, the voice is "potted" in the record, and thereafter we can always reproduce it, the singer having done his stuff once and for all.

Now consider something more elaborate, such as a church organ. We can in exactly the same way make a record, whether on film or disc, of a selection played on the organ, and this can be reproduced at any time. So far as the particular selection is concerned, therefore, we can dispense with the very elaborate machinery and paraphernalia of the church organ, and we get virtually the same effect by means of a radio set and loudspeaker—that is, by means of an apparatus which is relatively insignificant as compared with that which it reproduces or replaces.

Notes Dealt With Separately.

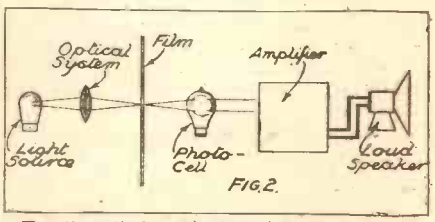
The record enables us to reproduce at any time a particular selection upon an instrument or a particular song or other vocal effort of a singer, and so on. It does *not* enable us, however, to vary the selection in any way; in particular, it does not enable us to play *any* tune we like upon the said church organ.

KEYBOARD CONTROL



A diagrammatic representation of the arrangement of the keyboard, showing how, when the notes are depressed, they operate the light-spots and allow the light to fall on the different notes.

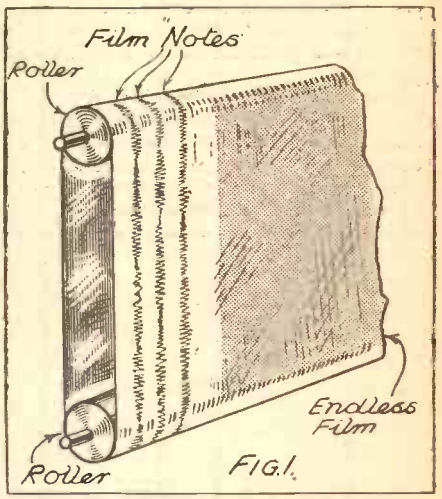
OPERATED BY LIGHT



How the optical system throws a spot of light on to each of the note tracks on the film. After passing through the film the light falls upon a photo-cell, and the resulting "speech current" is amplified and reproduced through a loud-speaker.

Any selection on the organ is made up of a collection of the sounds which can be produced by the individual pipes—modified, of course, by the use of the various stops. Comparing this with a language, we may say that the pipes constitute the "sound alphabet" from which the various composite sounds and musical compositions can be built up, just as a language is based upon its alphabet and the vocal sounds created in the use of the same.

FILM RECORDING



Showing the arrangement of endless film travelling continuously on rollers. The sound tracks are shown corresponding to each of the individual notes.

Now we come to the new invention. Instead of making a record of an actual selection or composition on the organ, for instance, what we do is to make a record—preferably a film record—of the sound of *each individual pipe* on the organ, including the different sounds and effects which each pipe can be made to produce by the aid of the organ stops.

Photo-Electric Arrangement.

You will see at once that, having got on a few inches of film an optical-sound record of each of these individual components of the organ, we have got, so to speak, an optical-sound *miniature* of the entire organ. If this sound record is made to rotate continuously in a small machine and a suitable photo-electric cell arrangement is employed in conjunction with it, all you require is a small manual or keyboard so as to enable you to select the different records of the different pipes, and you can then "play" the entire organ over again from your film record. As you press each key of this miniature organ you are not, of course, playing the *actual* pipe of the organ, but you are "playing" the film record of the pipe, and

(*Continued on page* 72.)

Making RADIO MOULDINGS

Mouldings of insulating material are to be found on the majority of radio components, and they are produced in a most interesting manner. The process and the materials employed are outlined in this contribution

By J. F. STIRLING.

SYNTHETIC resins of the Bakelite type have gone far to supplant ebonite and its imitations in the production of panels and parts for radio sets and components.

Such a fact is not surprising, either. For modern synthetic resins have many very desirable properties. They are hard and durable, damp-proof and heat resisting.

Consequently there is very little reason to wonder at the increasing use of these synthetic resins in the radio and electrical world, as well as in many other branches of industry.

Curious and Unique Substances.

Synthetic resins are curious and unique substances, and it is going to be my endeavour here to give you some brief indications of the manner in which all modern moulded articles of radio use come into being.

We will start, therefore, with carbolic acid and with formalin, two very well-known materials. These are heated up together under special conditions. They interact with each other and give rise to a powdery product, very much like ordinary cocoa in appearance, known as *Bakelite resin "A."*

This resin is soluble in many solvents such as methylated spirit and so forth, and it melts quite readily at a temperature of about 120 degrees Fahrenheit. The very curious thing about this Bakelite resin "A" is that after it has been melted for a short time it hardens into an insoluble, infusible and semi-transparent amber-like material known as *Bakelite resin "C."*

Here, you see, lies the fundamental fact relating to the production of modern moulded articles: the fact, I mean, that the very heat which serves to melt the Bakelite resin "A" also, after a time—that is, within a few minutes—serves to solidify it again to a hard material which no amount of heat will afterwards melt.

Simple Process of Manufacture.

All moulded articles used in radio work—panels, condenser cases, valve bases, coil sockets, etc.—are made according to the above principle; and, owing to the simplicity of the manufacturing process, they can be turned out quickly and cheaply. In the manufacture of moulded articles, Bakelite resin "A" is mixed with various "fillers," whose rôle it is to give the final character to the finished articles.

A whole article could be written on the different types of "fillers" used in the manufacture of moulded products. Some of these "fillers" take the form of "wood flour" (very fine sawdust) when the moulded article is required to be very light in weight but to possess great mechanical strength. These mouldings have a clean, sharp appearance, every surface detail in the mould being rendered clearly in the finished article.

Other moulded products contain asbestos "fillers." The purpose of these articles, as you will at once infer, is to be highly fire- and heat-resistant. Still further moulded articles contain flaked and shredded fabrics as their constituent "fillers," the idea here being that these "fillers" render the moulded products more shockproof than others.

All the above products are termed "Bakelite" mouldings, because they are made from materials supplied by the British Bakelite Company. Other synthetic resins are of the "Glyptal" type. They are made in America by the General Electric Company, and in this country by the British Thomson-Houston Company. They employ mica as a "filler." Thus they are used exclusively for the production of moulded articles required for insulation purposes.

The Bakelite Company in this country also produces "Formite" moulding resins, which contain specially prepared insulative "fillers." It is from this resin material that the majority of the highest class of moulded articles used in the radio and electrical industry are produced.

Rough or Polished Finish.

Now let us see briefly how the process of resin moulding is accomplished. The operation is the same in principle, no matter what the particular type of synthetic resin in process of moulding may be.

Moulding resins are moulded in specially hardened tough steel moulds, which are the exact negative of the article to be moulded. If the surface of the mould is rough, the surface of the moulded article will, likewise, be rough.

If, on the contrary, the surface of the mould is highly polished, the surface of the finished article will also be highly polished. Consequently, in the production of moulded articles for radio use, no final finishing and polishing process is necessary.

Hydraulic presses equipped with gas, steam or electrically heated plates are used. The moulding resin powder is charged into the heated steel mould (either by hand or automatically), the press is closed, and the pressure applied slowly and steadily.

The necessary pressure rises from approximately 500 lb. to about 2,000 lb. per square inch of moulded surface, the requisite temperature being some 300 degrees Fahrenheit. The action of heat and pressure is maintained for a period varying between one and seven minutes, depending upon the size and bulk of the article which is being moulded.

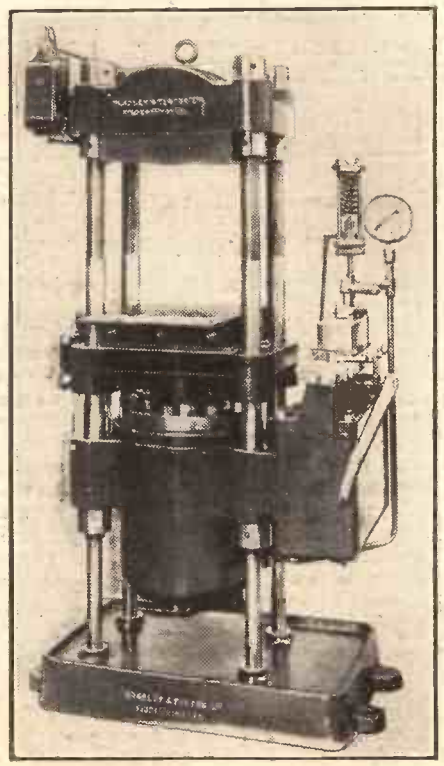
The Reason for Increasing Pressure.

During this space of time the moulding resin melts, shrinks in volume (hence the gradually increasing pressure in order to follow up the volume change), and then hardens to the final infusible product, which is thereupon removed from the mould—a complete and finished article.

Panels, switches, lampholders, ceiling roses, coil plugs and sockets, valve holders, connectors, screwdriver and plier handles, flanges, fixed condenser cases—indeed, a hundred—or perhaps it would be more accurate to say a thousand-and-one, articles of everyday radio and electrical use are manufactured in hundreds of thousands by the above method.

It is a wonderful and unique method, this synthetic resin moulding process—wonderful on account of the many applications which it possesses, unique in view of its utter simplicity and of the extremely satisfactory and durable nature of the products which are turned out by it.

A FIFTY-TON PRESS



This hand-operated press for Bakelite and similar materials is electrically heated to the necessary temperature of about 300 degrees Fahrenheit, and provides a pressure of approximately 2,000 pounds per square inch.

G.E.C. H.T.

A new range of Wireless Batteries

TESTED AT EVERY STAGE OF MANUFACTURE

GUARANTEED CAPACITY • 120 volt • 144000 milliwatt hours

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99V.	9/-
108V.	10/-
120V.	11/-
150V.	14/-
60V. Triple Capacity	12/-

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RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos.

Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article.

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

All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

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

QUESTIONS AND ANSWERS

SWITCHING OFF TO CURE A LOUD HOWL.

S. R. (Bermondsey).—"What causes a set to howl too loud to listen to? Mine does this sometimes, and I have to shut off for a few minutes, but when I switch on again it is O.K.

"Nothing else is wrong, and the howl sometimes goes a week without giving trouble. But I can never be sure when it is going to break out."

Probably the cause of the trouble is that you keep your loudspeaker too close to the set. If this is placed so that sound from it is strong enough to shake the detector valve slightly, it will cause the set to build up a kind of a roar which can only be cured by switching off.

If the loudspeaker is one of the type that is built in, and can't be moved, try fitting a valve box stuffed with wadding over the detector (it is nearly always the detector that causes the trouble, but there is a possibility of it happening to other valves).

Another cure is to use a well-sprung valve holder; but the great thing is to remove the cause by preventing the valve from being shaken by the sound waves from the loudspeaker.

NEW FRENCH BROADCASTING STATIONS.

J. H. (Amersham, Bucks).—"As a student of the French language I am specially interested in the French broadcasting stations and the possibility of regular reception from one or other of them.

"I understand, however, that France has no equivalent to our own B.B.C. system, but that some of the stations are privately owned, and they are shortly to be taken over by the State, under a plan recently completed.

"Can you give me any details of the main lines of this scheme and of the power that will be used? Will any of the stations, for instance, employ as much as 50 kilowatts, like our own Regionals?

"And how will Radio Paris (my best French station) be affected? Any information regarding future developments will be greatly appreciated."

It is true that the French Government has at last decided to exercise State control of broadcasting, and the scheme which has been drawn up and approved is known as the Ferrié Plan. (So called after the French radio pioneer, General Ferrié.)

Under the new Plan France is to have one high-powered long-waver, ten medium-wave "Regionals," one short-wave high-powered station, and one medium-powered medium-waver, auxiliary to the "Regionals."

The long-waver will be Radio Paris, and it will be taken over officially on November 1st, 1933.

Its power will be increased from 75 to 100 kilowatts. The ten medium-wave Regionals will each employ a power of 60 kilowatts, and the medium-wave auxiliary station will use a power of 20 kilowatts.

Half of these medium-wavers will be ready this year and the remainder will be working before the end of 1934. The power of the new short-wave station will be 50 kilowatts, and the whole scheme

(*Continued on page 68.*)

DO YOU KNOW—

the Answers to the following Questions?

There is no "catch" in them; they are just interesting points that crop up in discussions on radio topics. If you like to try to answer them, you can compare your own solutions with those that appear on a following page of this number of "P.W."

1. **What is the correct name of the German long-wave station working on 1,635 metres?**

* * *

2. **How many broadcasting stations are there at Paris?**

* * *

3. **What is the voltage drop across an anode resistance of 100,000 ohms through which a current of ·25 milliamp is flowing?**

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page 66.*)

will thus place France definitely amongst the leading European broadcasting countries.

FAULTY VALVE HOLDER CAUSES A "SEEPING" NOISE.

G. G. M. (Benenden, Kent).—"I thought you would like to know the cause of a very trying fault. I say *trying* with an emphasis, because I have been trying to cure it for about three months.

"The only way I can describe it is to say it was a sort of soft whispering or "seeping" noise. Not very loud at any time, but enough to give anybody the creeps after a while, for you never knew when it would come on.

"Otherwise, and in between-times, the set was O.K., but this horrid scratch took away all the pleasure from the programmes. And nobody seemed to know what could be done.

"My first ray of light was at Olympia (what a show !), when one of your experts kindly listened to my story. I don't know the gentleman's name, but I should like to thank him again for all the trouble he took in explaining how I could test the set out stage by stage to see where the faulty part was situated.

"From the notes I made at his suggestion I was able to go over the set at home step by step, and to find out it was definitely in the S.G. stage where the trouble was. But even then I nearly missed it, because after I had tested the components in that part of the set the noise still came on as before.

"I almost gave it up, and worked the set permanently as a Det., Pentode, instead of S.G., Det., Pentode, when I remembered that he had said, 'You will have to test *everything* to be sure'; but I had not tested the S.G.'s valve holder—it was a new one.

"Just to give it a fair trial I put another new one in, and there hasn't been a sign of the trouble since—the only week of real trouble-free reception since the noise started.

"I want you to know how much I appreciate the help given ; and I should like to know how such a simple thing as a valve holder can cause a noise of that kind. I had got it into my head that it must be something moving somewhere, possibly inside the valve, and I still can't see how a simple thing like a valve holder could be responsible for a noise at one moment and then be all right the next."

We are glad that you found the fault, and can quite understand your reluctance to blame a valve holder, for at first sight it does not seem to be a likely source of an intermittent noise of the type you suffered from. But in many cases of the kind we have found that faulty insulation or dust or dirt between a pair of closely adjacent contacts has caused the trouble. This is fatal to good, clear reception, because after a time, due to atmospheric changes or some unsuspected cause, the insulation fails for a moment sufficiently to allow a small current to leak across between the electrodes which are supposed to be insulated from each other. And the current leak is accompanied by the sound that you found so difficult to trace.

The actual current flow was probably very, very minute indeed, but owing to the high magnification of the set it produces this particularly disturbing type of interference.

THE ANSWERS

TO THE QUESTIONS GIVEN ON PAGE 66 ARE GIVEN BELOW.

1. **Deutschlandsender. It was formerly called Konigswusterhausen, but the Hitler government has now banned that name.**

* * *

2. **Six. Ecole Superieure, Eiffel Tower, Poste Parisien, Radio L L, Radio Paris and Radio Vitus.**

* * *

3. **25 volts. (Voltage drop can always be calculated from Ohm's Law, V = I × R. In this case the current I is ·00025 amp., and the resistance R is 100,000. So I × R = 100,000 × ·00025 = 25 volts.**

DID YOU KNOW THEM ALL ?

HOW A BIASING RESISTANCE WORKS.

T. H. (Glasgow).—"Although I have proved that it is satisfactory in operation, I still do not see how a resistance can be used to provide grid bias instead of a battery. How does it work up the right voltage ?"

Whenever current is passed through a resistance a certain amount of voltage is "lost" across the resistance.

It is easy to calculate (from Ohm's Law) what this voltage will be when the current and

(*Continued on page 70.*)

"P.W." PANELS, No. 137. MOTALA.

The great Swedish long-wave station at Motala works on 1354·4 metres, employing a power of 30 kilowatts.

* * *

It usually relays the Stockholm programme, and the name of the originating station is generally incorporated in the announcement—e.g. "Stockholm-Motala."

* * *

The "good-night" is given by the words "God-natt, God-natt," and the Swedish National Anthem is frequently played as a closing tune. Distance from London, 886 miles.

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 68.)

resistance values are known. And it is also easy to arrange the wiring of a mains set so that the anode current of any valve shall pass through such a resistance, which can thus be made to develop the correct grid-bias voltage.

You will notice that, unlike the battery, the resistance really has no voltage of its own, but merely develops a voltage when the current is flowing through it. This is no disadvantage, however, because it is only when the anode current flows that we need the grid bias.

IS YOUR SET BEHAVING ITSELF?

Perhaps your switching doesn't work properly? Or some mysterious noise has appeared and is spoiling your radio reception? Or one of the batteries seems to run down much faster than formerly?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers its unrivalled service.

Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do. On receipt of this an Application Form will be sent to you post free immediately. This application will place you under no obligation whatever, but, having the form, you will know exactly what information we require to have before us in order to solve your problems.

LONDON READERS PLEASE NOTE: Inquiries should NOT be made by 'phone or in person at Fleetway House or Tallis House.

NEW VALVE AND PLOPPY REACTION ADJUSTMENT.

E. D. S. (Gravesend, Kent).—"My valve for the short-wave set was over two years old, so I transferred one of the new ones to it, with disappointing results at first on account of ploppy reaction. Nothing else on the set was touched except the valve.

"It then occurred to me that I had a potentiometer on hand and it could easily be wired across L.T. to take the grid leak return, as recommended by W. L. S. After fitting this the improvement was wonderful, and just as an experiment I tried the old valve once again in the altered set.

"There was no improvement here until I found that it required quite a different potentiometer adjustment for the old valve to work well, and then it was very nearly as good as the new one. But if I change the valves over I always have to change the potentiometer setting to suit. Is this usual?"

Yes. Different valves are liable to want different potentiometer settings, especially if they are not of the same type of valve. And even valves that are supposed to be similar in all respects may need slightly different potentiometer settings in order to obtain maximum sensitivity or freedom from plop—both of which factors are of importance in short-wave reception.

But once the correct setting for any given valve is found the potentiometer should not then need resetting, unless, of course, operating conditions are fundamentally altered by greatly increased H.T. voltage or some similar variation.

OUTPUT CONNECTIONS WHEN USING A PENTODE.

W. K. (Sanderstead, Surrey).—"After hearing how superior the pentode's volume is to that of an ordinary small output valve, I am convinced that all I need is to fit a pentode instead of my power valve to get the extra power I need. But I do not see why I need the condenser and resistance recommended across the output transformer's primary.

"Is there really any need for this extra apparatus, in view of the fact that the output transformer has already worked well without it on its other ratio terminals?

"In other words, is it necessary to use the extra apparatus just because the last valve will now be a pentode instead of a power valve?"

The fitting of a pentode instead of an ordinary power valve is not just the changing of one valve for another—it is the change from one *class* of valve (low impedance) to another class of valve (high impedance).

And because by means of a suitable ratio of output transformer one can easily match the loudspeaker to the new conditions, one should not forget that these conditions are quite different from those formerly obtaining.

You will find that, in addition to increased volume due to the higher magnification of the pentode, you will get an increased "brilliancy" of reproduction. The high-note response may quite conceivably become even too pronounced.

Also, a feature of high-impedance output circuits is that comparatively high voltages are developed in the anode circuit, so more care has to be taken to prevent damage to the apparatus there. In practice one of the best methods of dealing with these two conditions is the fitting of a resistance and fixed condenser in series with one another across the primary terminals of the output transformer.

We advise you not to omit these. And also to take care that in future the output connections are not interfered with when the set is switched on.

With an ordinary power valve as the last valve in the set there is little or no harm in disconnecting components; but when the high-impedance pentode is used there is a possibility in so doing of damaging the valve itself, or the output transformer, or choke.

INTERFERENCE FROM TRAMS PASSING THE HOUSE.

G. D. S. (London, S.E.5).—"In this house the set has always worked just as strong as before, but there is a loud crashing sound in the loudspeaker which we never got at our last house. And the neighbours get the same noises, but they say nothing can be done, because it is the trams which pass along the end of the road.

"How can we cut out these noises?"

If the trams are the cause of the trouble, as certainly seems to be the case, the best thing that you can do is to write to the B.B.C. at Broadcasting House, London, W., giving details as to times, type of interference, etc.; also any addresses of neighbours who are similarly interfered with, if they are willing to co-operate with you in complaining. The B.B.C., in conjunction with the Post Office, will then see if anything can be done to eliminate the trouble.

THE "P.W." VALVONIUM

An interesting suggestion from one of our readers.

To the Editor, POPULAR WIRELESS.

Dear Sirs,—As a reader of "P.W." since No. 1, I was very interested in Mr. G. V. Dowding's article this week on the "Valvonium."

I have just been thinking that the following information might be of use to readers making this up. I believe that on some of the old junk stalls in Farringdon Street various types of old house telephones incomplete can be picked up for a few pence. The thing to try to get hold of is a 14-line of over desk or wall-type instrument with the push-button form of line selection (*not* the lever type, which is of no use).

Inside the instrument will be found two bars on to which the button plungers engage. When a button is pushed right in, the plunger makes contact on the top bar, which in the ordinary way would be the ringing bar of the instrument.

When the finger is removed, owing to the angle at which the bars are fixed, the plunger on its return to "off," engages on the bottom bar, or speaking bar, while the action of pressing down button No. 2 automatically releases No. 1.

The effect of this, as you will understand, would be that the note produced by pressing No. 1 button would not cease until No. 2 was pressed and that note would start.

I quite understand that with this two-bar stunt one would not get a clear break between each note; anyhow, I myself am going to try it, and if it is of no use all that need be done is to throw the bottom bar out of adjustment (which is only a second's work) so that the plunger will not engage on it on the return, then we should have the simple push-button which would break contact when the finger was removed.

I have started making up my "Valvonium" in an old 14-line instrument case, which is big enough to hold the presets, while I shall mount the valve on top, where in the ordinary course the hand-microtelephone combination would be.

I should like to thank you for the "something new," which I have noticed before now, you are always the first to bring out.

I am quite expecting that within a week or two I shall be seeing in one of the other wireless papers particulars of their "Valvonium."

Yours faithfully,
Kingsbury, N.W.9. J. JONES.

MIRROR OF THE B.B.C.

(Continued from page 40.)

who this year won several challenge cups as soloists at the Cheltenham Festival. They also had the highest percentage of marks in the two-piano class.

On Saturday, September 30th, Michael Payne, a blind pianist, who writes his own music, will play five syncopated pieces by himself, and the popular MacGowran Quartet from Coventry will sing.

Northern Economics.

Without going too deeply into preliminary details, for the excellent reason that it is dangerously easy to get out of our depth in dealing with economics, we must call the attention of Northern listeners to an important series of six talks which are to begin, under the title of "The Structure of Industry," on Monday, October 2nd. The talks will be given by Professor G. C. Allen, of the Economics Department in the University of Liverpool.

For Western Farmers.

Farmers as a class are sometimes disinclined to accept without a certain amount of misgiving what is offered to them from "Lunnon," and so the West Regional headquarters of the B.B.C. are tempting agriculturists with a little of the home-grown produce.

A series of special talks for farmers will be started on Friday, September 29th, when Mr. J. G. Inglis, vice-chairman of the Somerset Farmers' Union and a member of the provisional Mid-Western Regional Milk Board, will describe his visit to the Peart Breeding Station of Wales at the University College, Aberystwyth.

No doubt many farmers will be influenced by what Mr. Inglis will have to say about the work on different varieties of grasses and grassland for which this station is famous, and take his word for much that the average farmer can expect to find economical.

Mr. Inglis is certainly an authority himself, since he farms about two hundred and fifty acres in East Somerset, where his main products are milk, prime Easter lamb and eggs.

Midland Winter Plans.

The Midland Region is characteristically advanced with its plans for next season. Three counties still remain to have their own special week of programmes in the scheme which ran so successfully last winter—Shropshire, Nottinghamshire and Staffordshire—and these will take place in November, December and January respectively.

As with the counties already dealt with in this series of programmes, pageants will form a feature; and with the summer months causing a break in the list, plenty of time has been available for gathering the necessary historical material, and the pageants in draft form are already in the hands of Charles Brewer, the Midland Regional producer.

To all appearances our friend Charles is in for a very busy time. Apart from producing pageants, he is putting on another series of "Nine-Thirty Novelties," which are certain to make a refreshing monthly attraction. Then, on top of this, he is

(Continued on next page.)

MIRROR OF THE B.B.C.

(Continued from previous page.)

arranging another helping of "Vignettes of Variety" and quite a number of plays.

Some of the latter are brand new; but others, like Walter Pitchford's "The Doctor's Day" were so successful when first put on that it would be almost a crime not to repeat them.

A New Talks Series.

Another side of Midland Regional's activities is to have a lot more attention than hitherto—namely, talks. One particularly important series has been designed to show the Midland contribution to English life in various fields—civic, industrial and artistic.

This series will be started on Monday, October 9th, in an introductory talk by the Earl of Dudley. The earl is closely associated with the two basic industries of the Region as owner of extensive mineral rights in Staffordshire and Worcestershire and as chairman of iron and colliery companies.

Agriculture will be dealt with by the Rev. E. Moore Darling, of Shrewsbury, who will review the changes of the last century; while as a strong contrast Professor W. Cramp, of Birmingham University, who once made a "penny-farthing" bicycle, when most of us were very young, will describe the development of the cycle trade.

LOUDSPEAKER SOUND-PATTERNS

(Continued from page 63.)

this is being reproduced through a loudspeaker.

The result is that you can play on your film organ (or "film piano," as the inventor calls it) a selection which will come through a loudspeaker in exactly the same way as you hear a church organ through a loudspeaker on your radio set at present.

Turn to another musical instrument, say the violin, If an expert violinist plays the entire range of notes and these are recorded on the film record in the same way, it is obvious that this will enable us, by depressing the keys of the film piano, to play the violin without any violin being there at all. I cannot play the violin myself, but I can play the piano, and, according to this invention, I should be able, by the same token, to play the violin as well, which I should find very gratifying! In fact, it goes further than that, because it seems that anyone who can operate a pianoforte keyboard can play pretty well anything which is capable of being divided into notes in the same way.

Human-Voice Effect Available.

The human voice can similarly be recorded in individual notes; and although this would not enable a song to be "sung" on the film piano (owing to the necessity for the words and enunciation), at the same time it would enable the *vox humana* effect to be obtained much more realistically than on the church organ as at present.

Without going further, you can see that there is scarcely any limit to the sounds which can be potted and put into this miniature manually-operated reproducer.

It seems to me that it has two outstanding advantages.

The first of these is that it enables practically an unlimited variety of sounds and "effects" to be recorded and made available for reproduction by simply operating the keyboard.

In this respect, as compared with any existing instrument where the sounds have to be actually made by the instrument itself (as in the church organ or cinema organ) it enormously increases the range and variety. In fact, a cinema organ, to get the same range and variety of effects, would have to be increased to such a size that it would practically fill the cinema by itself!

The second advantage is that not only can this enormous extension of the existing keyboard-operated instruments be obtained, but actually the cost of such a film organ or film piano would be only a small fraction of the cost of an organ.

Great Scope For Its Use.

It is very difficult to estimate whether this invention will have far-reaching effects in its particular field, but, if it proves to be all that it appears, you can easily see the great scope for its use. A small and inexpensive instrument with this extraordinary versatility might well find a place in a vast number of churches, cinemas, theatres, other places of entertainment, etc., and personally I think that something on this principle is bound to come. Some people said that the automatic piano would never "take on," but the lie is given to this by the enormous number of these pianos which have been sold and their present-day popularity. It appears to me that this film piano is an infinitely better thing than an automatic piano, and therefore there seem to be the best of reasons for believing that it should become popular in course of time.

Some of us get pretty case-hardened these days, but I must say that, after hearing of the above invention and thinking about it for a bit, I began to wonder where everything was going to end. Before we have finished we shall have so much "unreality" served up to us in one form and another that we shall have to keep pinching ourselves to see whether we are awake or dreaming!

THE MYSTERIES OF SPACE

(Continued from page 54.)

Professor Appleton noticed that there were other echoes a fraction of a second later. He formed the conclusion that there must be another electrical layer higher still. His research proved that some short-wave radio transmissions pass clean through the Heaviside Layer, but are reflected back to earth by another layer 175 to 220 miles up, while very short waves appear to pass through both. The second reflector is known as the Appleton Layer.

The B.B.C. and Post Office services to distant parts of the world work on short waves (below 100 metres), because these waves have been found to reach other hemispheres best. Actually they are reflected round the earth by the Appleton Layer, as Fig. 2 shows.

The ground ray from a wireless transmitter cannot get completely round the earth at all. Reception depends entirely on the reflected ray. But readers who have listened to short-wave transmissions will point out that fading of a peculiarly rapid "surging" kind is experienced on these

(Continued on next page.)

THE MYSTERIES OF SPACE

(Continued from previous page.)

waves. Obviously, this is not occasioned by any clash between reflected and ground rays, as in the case of fading on medium waves. Investigation shows that short-wave fading is largely due to a peculiar distortion and splitting of the waves, consequent upon the earth's own magnetism.

It has been suggested that ultra-violet light from the sun is the cause of the electrified layers in space, the argument being that this light causes ionisation of the electrons in the atmosphere, thus producing a condition causing reflection of radio waves. This explanation is now generally accepted in regard to the Heaviside Layer, but there is some disagreement about the Appleton Layer. Alternative theories have been put forward.

Waiting for an Eclipse.

One school of scientists believes that the Appleton Layer is caused by streams of electrified particles, cathode rays, expelled from the sun. But the only convenient way to prove or disprove their case is to take observations by wireless during an eclipse of the sun. An attempt to do this was made in August last year, but it was inconclusive because the time at which the eclipse occurred was unfavourable. And the next eclipse, would have necessitated the dispatch of an observational party to China, so this particular point may not be cleared up for some time to come.

THE LINK BETWEEN

(Continued from page 40.)

A Thousand Extra Workers.

From H.M.V. comes the news that the company has just found it necessary to take on a thousand additional workers to cope with the phenomenal demand for their new models.

In a recent interview Mr. Richard Haigh, the English Manager of the Gramophone Company, said: "When we went into production on our new models last June we estimated for a large output, but we have received orders which double the estimates originally planned for the winter season." That is certainly a very gratifying state of affairs, and it only goes to prove the high esteem in which H.M.V. products are held.

To let you into a little trade secret, H.M.V. are at present turning out more than a thousand complete sets a day, and to make this possible they have to produce something like a million components during each twenty-four hours!

It is all very reassuring, and my only hope is that this continued prosperity will be the means of alleviating a lot of the unemployed hardships.

Moving Coil Speakers for All.

With the advent of the new Peto-Scott range of moving-coil speakers there is now no excuse for anyone putting up with antiquated speakers.

For a matter of fifteen shillings you can obtain from this go-ahead concern a moving-coil speaker which represents amazing value for money, and, moreover, the cost includes the necessary input transformer.

In addition to the permanent magnet model, types are also available for A.C. and D.C. mains.

I am not quite certain whether literature concerning these new speakers is yet available, but if readers requiring further details will kindly make application through our postcard literature service (quoting the number at the end of this paragraph) I will endeavour to see that their requirements are met. **(No. 52)**

OUR POSTCARD SERVICE

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

TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio.

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

Iron-Cored Coils.

READERS often ask me various points about iron-cored coils, particularly questions about the construction of these coils and their efficiency.

So much has been heard of iron-cored coils lately that you might have thought everybody knew all about them; but there seem to be quite a number of readers who regard them as something of a mystery.

I said in these Notes, only a short time back, something about the inductance of a coil and how this could be increased by introducing iron or other magnetic material into the core instead of air. For low-frequency transformers this is quite satisfactory and is the method in universal use; but when it comes to coils intended for high-frequency currents there are various other questions which have to be considered—in view of the very high frequency—and in general it has not been found practicable to use an ordinary magnetic core.

The Magnetic Core.

It has long been known, however, that if the magnetic core can be divided into very small particles, and if these can be electrically insulated from one another, the core should act very differently from an ordinary continuous or laminated core, and should be more suitable for use with high-frequency currents.

Some time ago transformers were made with iron filings for the core, the filings being coated by a special process, so that, although they formed a whole magnetically, they were electrically distinct and insulated from one another. As you know, high-frequency currents in the coil tend to set up eddy currents in the core, but if the core is divided into separate parts the eddy currents have less effect, and their effect is smaller the more the core can be divided up into smaller sections or particles.

Size and Inductance.

The transformers made with these granulated cores were fairly successful, but never seemed to rival the ordinary air-core coil for H.F. currents. I should perhaps mention in passing that, owing to the much higher magnetic permeability of the iron, a coil of given inductance can be made very much smaller in size with an iron core than with an air core.

So if the iron-core coil can be made as efficient, or practically as efficient, as an air-core coil, it will show a very important saving in size; it is quite definitely something to be aimed at if the object can be achieved without too much sacrifice in efficiency.

Avoiding Eddy-Current Losses.

The Ferrocart type of coil is, in a sense, a step further on the idea of the iron grains. In this latest type of core material strips of special paper are taken, and these are covered with iron filings.

The filings are arranged in rows (something after the fashion of sowing seeds in furrows in the fields), and by exposing the strip with the lines of iron filings on it to a magnetic field the filings are arranged or "orientated" all in the same direction. They are then, of course, fixed in position, and a number of layers of this paper strip are used for the "iron" core of the H.F. coil.

Efficiency.

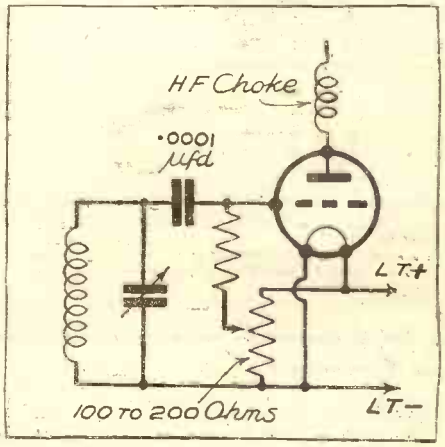
This special arrangement of the filings has been found to give a very efficient coil of relatively small size, and it is for this reason that the Ferrocart coils have become so popular. Personally, I never could see why the same, or practically the same, result cannot be obtained much more simply by the use of very fine iron wire wound on the strip and then suitably collapsed like a folding map or, if necessary, severed so that there is no continuous electrical circuit in it.

On the question of efficiency, there is no doubt that this type of coil represents a considerable advance, and, as I have indicated above, a coil can be made with this granulated iron core which is the equivalent in inductance and efficiency of an air-core coil several times the size.

Potentiometer Reaction Control.

Often you will find the reaction control is unstable, and the set goes into oscillation if the grid is connected to either L.T. plus or L.T. minus. In such a case you can get an intermediate value and a very fine control by connecting a potentiometer of,

GIVES SMOOTH REACTION



A potentiometer connected across the L.T., as shown, enables intermediate values of grid potential to be applied to the grid of the detector valve.

say, 100 to 200 ohms across the low tension and connecting the grid leak to a tapping on this potentiometer. In this way the exact intermediate value of grid potential can be obtained and the reaction control rendered steady.

(*Continued on next page.*)

TECHNICAL NOTES

(Continued from previous page.)

Choke Coils.

When you put a choke coil into the anode circuit of the detector one object of this is to stop H.F. currents from getting into the L.F. amplifier. This it does by reason of the fact that its impedance to H.F. currents is so enormously greater than its impedance to L.F. currents.

You can, in fact, take the impedance as corresponding very roughly to the frequency, at any rate, when you compare a fairly high speech frequency with an average value of a radio frequency, such as the frequency at broadcast wavelengths. Inasmuch as broadcast frequency is perhaps a hundred times as high as a reasonably high speech frequency it means that the impedance to the H.F. will be enormously greater than the impedance to L.F.—so much greater, in fact, that the impedance to low frequencies can be altogether ignored.

H.F. Impedance.

Whilst the choke has to serve this purpose of preventing high-frequency current from finding its way into the low-frequency amplifier, it must nevertheless allow the anode current to flow to the valve and also allow the low-frequency current an easy path in the detector circuit. You will see, from what I have just said, that it automatically discriminates between the H.F. and L.F. currents, owing to its enormously greater high-frequency impedance as compared with its low-frequency impedance.

The only other point, then, is whether it allows the anode current to the valve to flow easily, and this depends on its ohmic resistance. It must not have a high ohmic resistance, but must be wound with wire which will not appreciably diminish the anode current. An ohmic resistance of 100 ohms, or even up to 200 or 300 ohms, is not a serious matter, as it is small compared to the other resistance in the same circuit.

Condenser Reactance.

A condenser has just the opposite characteristics so far as H.F. and L.F. currents are concerned. Whereas a choke offers a high impedance to H.F. currents, the impedance or reactance of a condenser becomes less as the frequency is raised. It is for this reason that we sometimes use a condenser in addition to a choke for the purpose of separating the H.F. and L.F. currents.

We have already seen that the H.F. choke tends to stop H.F. currents from getting through. If, in addition to this, a condenser is connected to earth and to one end of the choke, it will allow the H.F. currents to leak away to earth, as they can easily get through the condenser.

The L.F. currents, on the other hand, cannot appreciably get through the condenser, but *can* get through the choke. So, you see, by using a choke and condenser in combination, the choke being the path for direct *passage* and the condenser being the path for *leakage*, we get a further effective separation of H.F. and L.F.

Mains Sets.

You will probably have noticed in the papers recently yet another account of an accidental death due to electrocution while

(Continued on next page.)

TECHNICAL NOTES

(Continued from previous page.)

experimenting with a wireless set. In the ordinary way, mains sets as at present on the market are made just as safe as any other electrical appliance, such as an electric iron or electric radiator, and so on.

In fact, I think it is probably fair to say that with a mains set there is even less danger of an electric shock than with an iron or a radiator. But if you start fiddling about with the inside of the set, then naturally no one can protect you from risk, and it is up to you to take the very simple precaution of disconnecting the set entirely from the mains before you start.

Simple Rules.

Whilst on this subject, perhaps I should mention also that you should never touch an electric-light switch with one hand whilst touching a water pipe, hot-water geyser or any suchlike object with the other hand. You have probably noticed that in bathrooms the electric switch is generally made with an insulating cover instead of a metal one; at any rate, if not, it *ought* to be.

It should also be placed in a position where it is impossible for anyone to reach it whilst standing in the water in the bath. Of all possible ways in the home of getting an electric shock, the best (or the worst) is to touch the electric light whilst standing in the bath, because you have then such a very effective connection to earth.

Some mains sets are so arranged that they cannot be opened until the mains supply is withdrawn or so that the act of opening the cabinet disconnects the mains from the interior.

It is a good rule, no matter how the set may be constructed or whatever safety device may have been introduced by the makers, to disconnect the plug from the mains socket before you attempt even to open the case of the receiver. If this were done accidents of this kind would be unheard of.

Hand Capacity.

In the early days of radio most sets suffered badly from hand capacity. It is surprising how often one comes across this defect even to-day. There are few things more irritating in operating a receiver than hand-capacity effects, and this is all the more a pity because it can so easily be got over.

If you are troubled with this effect on the tuning condenser it may be that it requires to be screened or it may be that the condenser is connected the wrong way round. The moving set of vanes should be connected to earth and the other set of vanes to the grid end of the tuning coil.

If you connect a condenser the other way you are almost certain to get hand-capacity effects. Even connecting it the right way round does not always entirely remove the trouble; but if, in addition to this, you fit a metal shield behind the panel—that is, in a position between your hand, when you are tuning, and the condenser—you should get over the trouble completely.

Shields.

The shield may consist of a small sheet of tinfoil or tinplate, but preferably a sheet of thin copper or aluminium, secured at the back of the panel, "opposite" to the condenser, and having a fairly large clearing hole through which the condenser spindle passes, with plenty of clearance so that there is no possibility of contact. This shielding plate should then be connected to earth, which is most conveniently done by running a wire from it to some handy earth point of the set.

The Modern Method.

Talking about tuning, in the days of inductive control of reaction the trouble was that the tuning was upset by the alteration of the reaction; but with the introduction of differential control this was got over. As you know, the current flowing in the reaction-coil circuit is controlled by means of the reaction condenser, which is included in that circuit.

The currents in the reaction coil are of course, set up by the inductive effect between the tuning coil and the reaction coil; but the coils remain fixed, and it is the actual current in the reaction circuit which is then controlled by increasing or decreasing the capacity of the reaction condenser.

"Ploppy" Reaction.

I should mention, by the way, that when using this arrangement—which is now in very wide use—an H.F. choke should be included in the anode circuit so as to prevent the H.F. currents from going "beyond" the anode of the detector—that is, into the low-frequency part of the circuit.

NEXT WEEK

Full details for building a specially economical and right up-to-date receiver

THE NORTHERN STAR

A set everyone should read about

IN

"POPULAR WIRELESS"

One of the most important features of reaction control, either capacity control or any other form, is the smoothness of operation—that is, not jumping into oscillation in a very small movement of the control—what is commonly called "ploppy" reaction.

Although the capacity control has a good deal to be said in its favour, it is rather apt to this particular fault, and for this reason the grid bias applied to the detector should be capable of fine adjustment as explained earlier in these Notes.

Too High a Voltage.

Before leaving this point of fierce reaction it is perhaps worth mentioning that, quite apart from the ordinary reaction control, whatever it may be, you will be in trouble if you use too high an anode voltage on the detector. I have noticed that amateurs are very tempted to increase the detector voltage because it "livens up" the set so much.

This is all very well; but if you make the set more lively by this method you are very apt to get distortion, and—to go back to the point in question—you will almost certainly lose control of the reaction if the detector-anode voltage is too high. It is far better to keep the detector voltage down to a reasonable value, as this will make for much smoother working.

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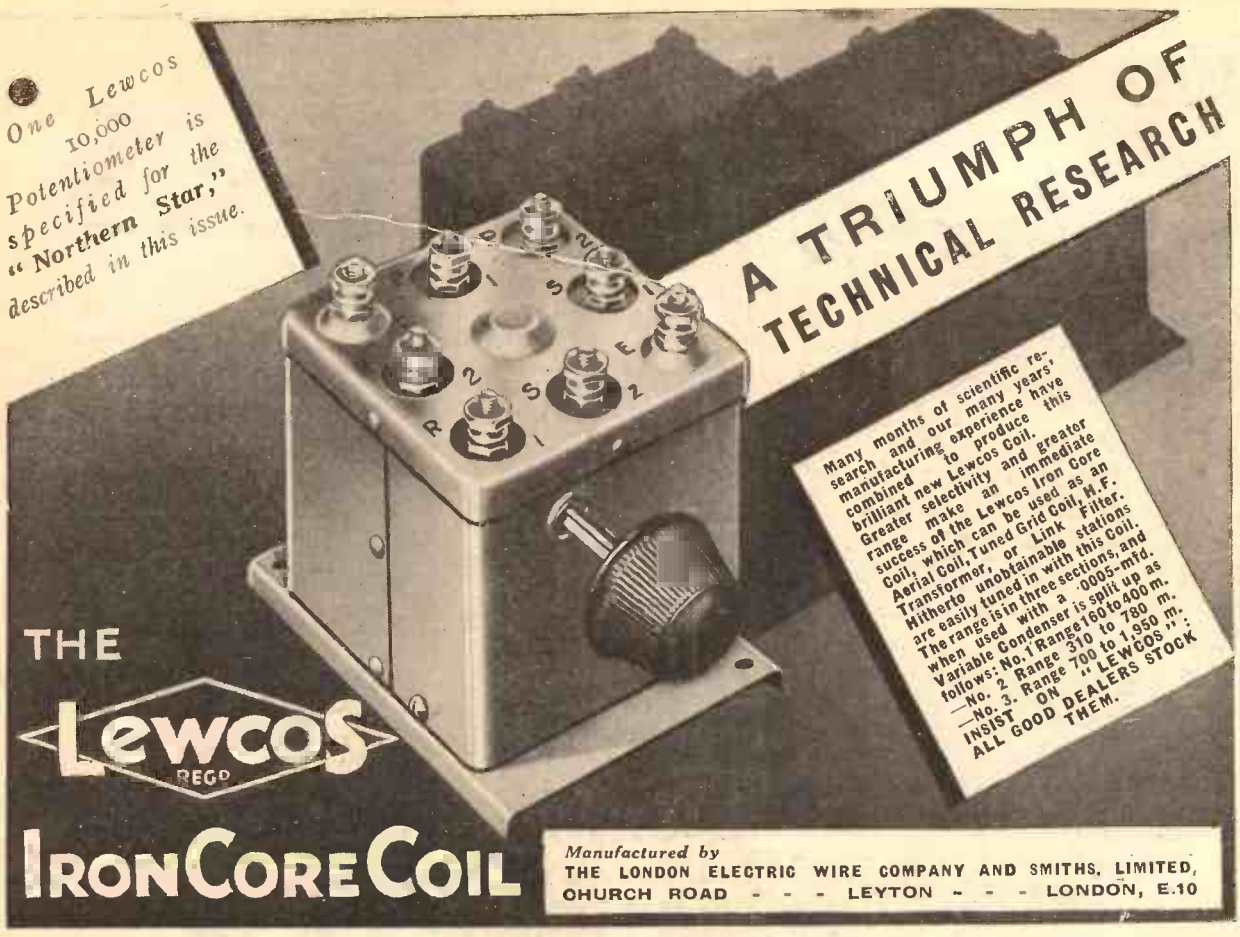

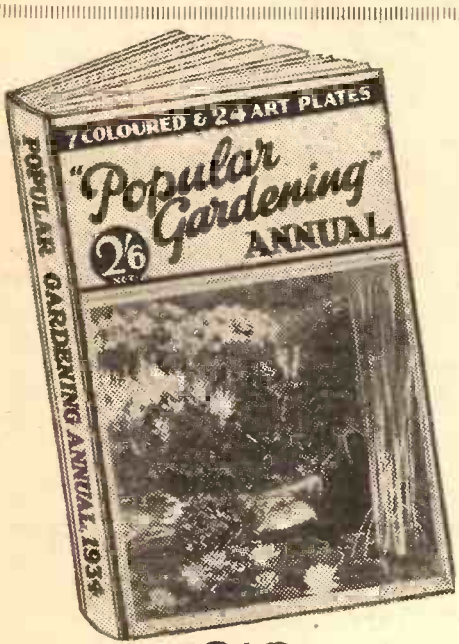

2/6

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The Paper that Made Wireless Popular

VALVES AS GOLF BALLS
INCREASING POWER
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RADIO NOTES & NEWS

AVOIDING DUTIES
A LOFTY AERIAL
FÉCAMP APPROVED
AMERICAN OPINION

The "Theremin" Again.

IN these Notes I have from time to time referred to the "Theremin," a new musical instrument. It is a two-valve, H.F. tuned circuit in duplicate, one circuit being fixed, the other being varied by the player, who alters the "howl" or "beat note" by movements of his hands.

The volume is controlled by a pedal, and the *glissando* can be avoided by an interruptor. I hope that Queen's Hall will in time to come harbour a Theremin player, but I hope, too, that he will be hidden behind the big drum, for he would remind us irresistibly of a man trying to mesmerise the conductor.

By the way, my colleagues inform me that the "P.W." "Valvonium" has created an enormous amount of interest.

A Re-echo of the Catkin.

I HOPED that the maltreatment of the Catkin valve, for advertisement purposes, had ceased and that the wretched thing was free to live its own life. But no! At Coleford, Forest of Dean, at a carnival on behalf of the unemployed, they had to use a Catkin for the ball in a clock-golf competition.

Heavens! what putting! Well, they put Cat through the course—and, *of course*, he worked as well as ever after the socking he had received. When will somebody design a valve suitable for firing out of a cannon?

Germany to Increase Power.

IT is stated by the German Post Office that Deutschlandsender is to be promoted to 150 kw. and Breslau, Munich, Hamburg, Mühlacker and Langenberg to 100 kw. each—unmodulated carrier-wave power. All this is in conformity with the Lucerne Plan.

I hope that there is not going to be a Franco-German radio war in conformity with the Hitler plan, though Nation sometimes speaks a large piece to nation by radio.

Small Beginnings.

A FELLOW writes to me complaining that he has got a footing in radio, but thinks that progress is slow and the top of the tree a long way off. Is radio in that respect different from any other job?

I am not going to give my friend a lot of "self-help" sentiment, and I never was a believer in the "make-your-own-opportunity" doctrine; but I will say that, given good luck, a man will rise if he is conscientious, reliable, polite, ambitious and thorough in his work.

The "good luck," of course, is the unknown factor. My first job in radio was to go out and buy seven pounds of soft soap and to clean a floor with it! I did not reach the top, but I have no complaint about my luck, because it was fifty good, fifty bad. That's life, that is!

SHORT WAVES

NOT YET.

There is a secret wireless station in Roumania which broadcasts scandalous gossip.

So far, no British station has put a sewing-guild tea-party over the ether.—"Birmingham Daily Mail."

* * *

The question is raised whether the majority of listeners-in would rather hear politicians or crooners.

Couldn't the B.B.C. compromise by persuading politicians to croon?—"Punch."

* * *

A professor suggests that we might transform noise into energy.

One method which instantly recommends itself to us is to take the loudspeaker next door and hurl it at our neighbour.

* * *

"Hello! A new wireless set! What is it, old man?"

"A 'Marvell' Twelve."

"What, twelve valves?"

"No, twelve monthly instalments."

* * *

Many people, it seems, listen to music on the radio because they say it is soothing to the nerves. But what is stranger still is the fact that they believe it to be music.

* * *

A wireless critic says he knows one announcer who deserves to be in the Honours List.

Good Knight, everybody.—"Punch."

Troubles of Radio Advertisers.

LIFE must be complicated for Americans who "sponsor" programmes in the interests of sales. One tenor singer, who had been broadcasting for a clothing merchant and who had been the happy target of a heavy "fan mail," found himself summarily "sacked."

On seeking the reason for this monstrous injustice, the merchant mildly explained that for his tenor to chortle a song about second-hand clothing and "clothes don't mean a thing as long as I have you" did not seem to him a very good way of helping to sell men's suits.

Doctor Wireless.

THE International Code of Signals for Shipping, which will come into use on January 1st, 1934, will contain a code covering all the needs of medical diagnosis and treatment by wireless.

A wireless station has been erected at Ostrohone, near Boulogne, for the purpose of supplying medical advice to vessels in the Channel. The first case was aboard the steamer "Amienois," bound from Algiers to Antwerp, and the treatment prescribed was successfully applied. Life-saving is done not by boats alone.

Boosting the Bobbies.

EVERYTHING about the American police and their methods appears to be very different from those of this country, in some instances the difference being one of degree and in others of nature.

I have, however, never noticed much publicity about its methods on the part of Scotland Yard, so that it is astonishing to learn that the New York State Police gives a programme once a fortnight through W G Y, its purpose being to acquaint the

(*Continued on next page.*)

RADIO NOTES & NEWS

(Continued from previous page.)

public with what constitutes crime and to advertise the work of the State police. Clues are examined and the solutions of crimes are worked out.

How very much obliged the crooks must be, for they are being taught how not to leave clues!

Smuggling Up-to-Date.

THE romantically minded, such as I, think of smuggling in terms of "baccy for the parson, brandy for the clerk," kegs, preventive officers and riders, coves and "runs." Lace and silk I was never taken up with—silly stuff for bold smugglers!

But now all the romance has been knocked out of "the Trade" by the news that on the south coast of Ireland they smuggle radio sets because of the heavy duties imposed upon those articles. If radio has a romance of its own it has certainly killed the older and, to many of us, more colourful kind.

Any Orders, Gents?

P. J. W. (Plymouth), after expressing appreciation of the "Economy" Three and Four, gaily whirls up with a request for an "Economy" Super (5 valve). Not beyond the powers of human ingenuity—so we made a note for the consideration of the Technical Staff.

But then we noted, with growing apprehension, that P. J. W. went on to admire the vogue for "midget" sets, and, sure enough, he packed the final blow in his final words—he wants a Midget Economy Super Five! When I have decided whether this request is for the Brobdingnagian or Lilliputian Departments I will pass it on.

A Notable Club.

WHILST we are unable to publish regular reports of amateur radio clubs, I am always pleased to give a club or society an occasional paragraph, and so I devote this one to the Midland Amateur Radio Society, which is one of the most vital and successful that I have heard of. Of its 150 members, 46 have full transmitting licences.

Its members have won the B.E.R.U. Trophy for the best performance of any station in the Empire; the Receiving Test Challenge Trophy; the Senior Transmitting Tests and the Junior ditto. No entrance fee; subscription 5s. p.a. Apply to the Hon. Sec., Mr. W. H. D. Nightingale, "Winswood," Beaks Hill Road, King's Norton, Birmingham.

Jubbo's Last Word.

MY unfortunate correspondent, Jubbo, of Faversham, whose young life has been so embittered by the wicked piano-tuner, has said his last word. He says that if the tuner is right, and if his (Jubbo's) loudspeaker is not flat, then the B.B.C. is flat and Sir Henry Wood is flat and Jack Payne, Henry Hall and Bach are flat. That's flat!

Well—*phew!*—it's *something* to find the truth at last! Especially about Bach! It has, apparently, not occurred to Jubbo that perhaps Jubbo's ear may be a flat-tuning receiver. Oh, another thing! His (Jubbo's) name is really TOMBS. He has printed it as plain as plain can be. That accounts for it all.

CAN YOU WRITE A RADIO PLAY?

"P.W.'s" £50 PRIZE OFFER

The B.B.C. to Co-operate

We are now able to announce full details of the Radio Play Competition which Popular Wireless has organised in co-operation with the B.B.C.

We have pleasure in offering a prize of

FIFTY POUNDS

for the best original radio play written by a reader. The B.B.C. has undertaken to produce the prize-winning play.

There is no doubt that the B.B.C.'s Play Festival has aroused widespread interest.

The Festival will begin with the revival for broadcasting of DANGER, by Richard Hughes, and THE WRONG BUS, by Martin Hussingtree, in the first week of October, 1933, and will end with THE THREE MUSKETEERS, by Guthrie and Riddell, from Dumas, in the last week of December, 1933.

Mr. Gielgud, the B.B.C.'s Productions Director, advises readers to listen to the whole series before starting to write a play, because each play selected for the Festival Programme has certain definite merits. If all the merits in all the Festival plays were successfully combined and utilised in *one* radio play, that would certainly be *the* best radio play ever written.

But perfection is, of course, outside human experience. We can only *aim* at perfection. And budding radio dramatists entering "P.W.'s" competition will be well advised to study the Festival plays as they are broadcast before setting out on the exciting but thorny road of authorship.

Entrants will have plenty of time—and practically no "red tape" to get tangled up in. No entrance forms are required. All you have to do is to write a radio play and submit it to the Judges by a certain date. That is all. Such rules and regulations as are necessary for the conduct of a competition of this nature are briefly set out as follows:

1. **POPULAR WIRELESS** will give a prize of £50 for the best original radio play—comedy or drama—written by a P.W. reader.
2. **The B.B.C.** will undertake to produce and broadcast the winning play.
3. **The plays submitted will be judged by a member of the B.B.C.'s Productions Department, the Programme Critic of MODERN WIRELESS, and the Editor of POPULAR WIRELESS. The decision of the Judges must be accepted as final.**
4. **The latest date for submitting a play has been fixed for March 31st, 1934.**
5. **Plays should be addressed to The Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4. Envelopes should be marked "Radio Play."**
6. **Whilst every care will be taken of MSS. submitted, the Judges cannot guarantee return of MSS. Plays submitted must be accompanied by stamped, addressed envelopes.**

Five Metres on a Kite Aerial.

THE International Short-Wave Club, London Chapter, carried out an interesting experiment this month when it sent up a 30-ft. aerial by kite to a height of 1,500 ft. and listened in on a 5-metres receiver and some ordinary short-wave sets. On 5 metres several stations were heard—a pity their names are not mentioned!—and on the other wavelengths stations in twenty-two countries came in.

Quite a good bag, considering; but I should not describe the experiment as "novel," except as to the 5-metres aspect of it, for Marconi once did a little bit of work with kites which startled the world.

"Listening Foreign."

A. D. (Newcastle-on-Tyne) expresses his pleasure at the gramophone records broadcast by Radio Normandie after B.B.C. hours, and says that he would be sorry to lose them, "due to the machinations of the B.B.C." I should be sorry for him to lose them from any cause.

He compares unfavourably some B.B.C. singers with records of first-class artistes, and winds up by hinting that I defend the B.B.C. because it exerts a heavy "pull." No pull on Ariel or on "P.W."! No franker criticisms of the B.B.C. than those published in "P.W." could be found; more unreasonable and petty ones—yes! And as for the "friendly" late programme of Fécamp, what could be friendlier than a Christopher Stone item?

Indian Conditions.

AN Indian fellow-subject—I hope that he is not a sympathiser with Mr. D. A. Ghandy, of Bombay, whose scurrilous letter is being framed at my expense—J. D. M. (Mooltan), does not agree with E. T. L.'s description of Indian listening as a nightmare.

He points out that in the summer European medium- and long-wave stations are a "washout," but not so in the winter; moreover, on short waves all the year round India can get Daventry, Radio Colonial, Rome, Moscow, Holland and Bandoeng, besides Calcutta. In fact, he does all this on an ordinary four-valve receiver. Thanks for the letter, J. D. M., and for your good wishes.

The Zoo Television Programme.

RARELY is this island, its folk or any of their works able to impress the citizens of the United States. For all practical American purposes we are effete, exhausted and "way back." But the B.B.C.'s television programme, featuring some of the effete aristocrats of the Zoo, was generously acknowledged to be the "weirdest television yet scanned."

This is praise indeed, even though the superlative is only "weirdest." However, as soon as television has emerged into a paying proposition I am sure that the U.S. will pull level with us by televising an execution or a lynching!

"Missing From His Home," etc.

THE B.B.C. is to abandon its SOS service for missing persons, the reason being that only about one of every five cases has been successful. That a Government-subsidised, public-utility concern should discontinue such a service on so superficial a pretext is well-nigh incredible.

(Continued on page 131.)

Extending Loudspeaker Wiring

Feeding a loudspeaker from a receiver distantly situated in another room of the house presents several problems which are here solved in a simple and satisfactory manner.

By GRAHAM H. WATSON.

IN limiting their reception to one room owners of modern radio receivers are not availing themselves of the full advantages of such equipment, and the purpose of this article is to describe fully how your radio may be made available in any part of the house.

Modern receivers, whether a product of the factory or of the listener's own ingenuity, invariably incorporate the speaker in the cabinet, and it is this practice which has led to such limitations to its utility.

A Self-Contained Unit.

In addition to the small quantity of materials required for the actual extension wiring, details of which are given later, the listener possessing such a self-contained receiver must of course purchase a separate loudspeaker or loudspeakers. In this connection he is advised to obtain one of the many excellent types of permanent-magnet moving-coil instruments, complete with input transformer, either in cabinet form or as a chassis for mounting on a baffleboard.

At this point it is advisable to state briefly the procedure to be adopted.

Various types of output circuits in use at present will be discussed, with any modifications necessary dealt with, followed by a detailed description of the actual wiring.

The wiring provides simply for speaker plug points in as many rooms as is desired. It does not allow for remote switching on and off of the receiver as this is a specialised job and, incidently, it is the subject matter of another article appearing elsewhere in this issue.

Choke-Capacity Output.

It will be seen from the detailed notes that follow that it is desirable to employ choke-capacity output in the receiver, following which any reasonable number of balanced armature or moving-coil speakers incorporating their own input transformers can be used.

(a) Receivers using triode output valve (power or super-power types).

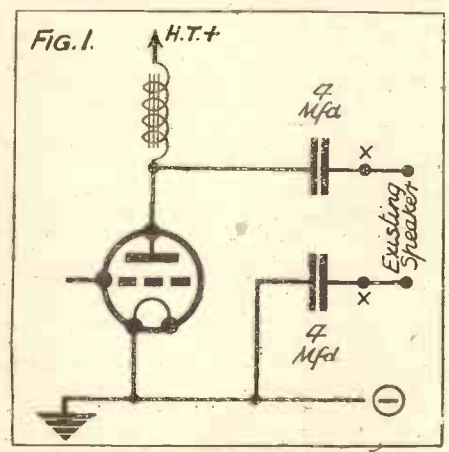
If in such a receiver a choke-capacity output is employed it is only necessary to connect the extension circuit in parallel with the existing balanced armature speaker or primary of the transformer of a moving-coil instrument.

Should the speaker or the speaker transformer be connected directly in the anode circuit of the valve it will be necessary to add a choke-output unit as shown in Fig. 1. The low-frequency choke should have an inductance of 20 or 30 henries when carrying the normal anode current of the valve. The condensers should be of 4-mfd. capacity and should be ones tested to a pressure of 250 volts D.C. in the case of a battery receiver or 500 volts D.C. for a mains-operated set.

(b) Receivers using a pentode output valve.

As with a triode valve, if the receiver does not already incorporate a choke in the anode circuit of this valve the necessary modifications should be made as shown in Fig. 2. In this case the choke should be of the special tapped type intended for use with pentode valves. If an output transformer is already used the extension circuit should be connected across the secondary winding.

AN ESSENTIAL PRELIMINARY



If the existing speaker is directly connected in the anode circuit of the power valve, a choke filter must be fitted before extending the wiring to another external loudspeaker.

Either Type Suitable.

Incidentally, it is immaterial whether the moving-coil speaker incorporated in the receiver is of the permanent-magnet or mains-energised types. If it is of the latter type care should be taken to differentiate between the connections to the input transformer, which are the ones concerned, and the connections to the field coil.

(c) Receivers employing Q.P.P., or "Class B" output valves.

Many battery receivers now incorporate these latest refinements, but their adaptation for use with more than one speaker is usually quite a simple matter. It will be found that quite often a transformer is used in the construction. This may be a separate component for use with a balanced armature speaker or an ordinary moving coil, or will be the actual transformer on the moving-coil speaker, specially wound for Q.P.P. or "Class B" output.

Special Chokes.

If the former is the case the transformer should be replaced with one of the special tapped chokes now available for this type of circuit, such as the R.I. DY.40.

If, however, the input transformer on the speaker is specially wound for "Class B" or Q.P.P. it is not easily possible to arrange for the connection of external speakers. The best course to adopt in this instance is to replace the existing speaker with one not wound for use with these valves and incorporate one of the special tapped chokes referred to in diagrams (Figs. 2 and 4). In all the above cases the external circuit should be connected to the points marked "X X" in the diagrams.

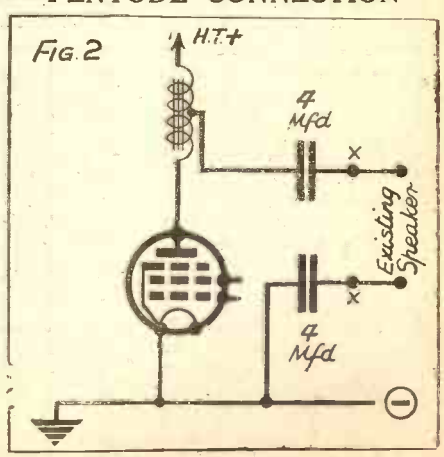
Material Required.

Having dealt with the question of making the output of the receiver suitable for use with extension speakers, the actual construction of the wiring of the points can be considered.

The materials required are not expensive and can be obtained from any good electrical contractor or stores.

(Continued on next page.)

PENTODE CONNECTION



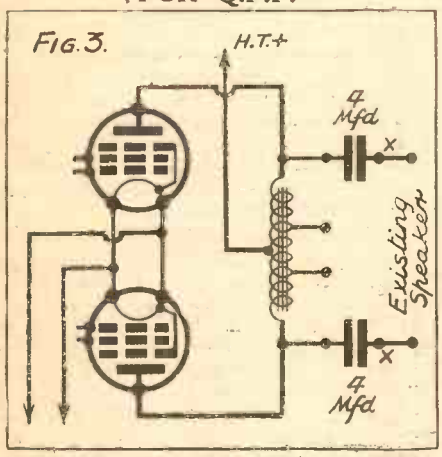
When the last valve is a pentode the output filter must incorporate a special tapped pentode choke.

EXTENDING LOUDSPEAKER WIRING

(Continued from previous page.)

In the first place, the choice of wire to be used is important, and it is recommended that twin flex be not used. By far the most suitable conductor for this work is I.R., S.C.C. flameproof cotton-braided wire, 2 × 1/·0255, which is manufactured by the G.E.C. This sounds formidable, but it actually consists of two copper conductors, enamelled, rubber and cotton insulated, one red and one white, the two being encased in a single covering of white flameproof cotton, giving it the appearance of a single wire about ⅛ in. diameter. This is easily handled,

FOR Q.P.P.



With Q.P.P. output it is best to employ an ordinary loudspeaker in conjunction with a special Q.P.P. output choke.

is efficient, inconspicuous and cheap. In addition you will require a supply of ⅜-in. insulated staples. For each room to be wired you will need one standard bakelite or porcelain 2-pin, 5-amp. socket and one round wood block, 3½ in. × ½ in. These can be obtained in white or imitation walnut finish. For the room in which the receiver is situated another socket will be required, together with an oblong wood block, 6½ in. × 1 in., and two Belling-Lee insulated terminals.

For fixing the blocks in their various positions you will require 1 in. × No. 8 countersunk screws if the fixing is on wood or 2 in. × No. 8 countersunk screws and a supply of 1½ in. × No. 8 Rawlplugs where the fixing is to be on plaster or brick. For screwing the sockets to the wood blocks obtain No. 6 screws of length according to the type of socket purchased. In addition to the ordinary tools you will require a No. 8 Rawlplug bit and holder, a brace with ¼-in. centre bit, and a tool known as a bell-hanger's bit, ¼ in. This last tool is required for piercing door frames, where the thickness of the frame does not allow the use of the brace and bit.

Fixing the Points.

First prepare your blocks by drilling two 3/16-in. holes in each for the wires to pass through, and two ⅜-in. holes, which must be countersunk, for the fixing screws. These last two holes must be drilled in such a position that they are covered by the socket when it is fixed on the block. Finally, cut a slot in the edge of the block for the wire to lay in. For the large block place the socket at the top with the two terminals below it.

Having progressed so far, carefully decide on the position in each room where you wish to fix the block and socket.

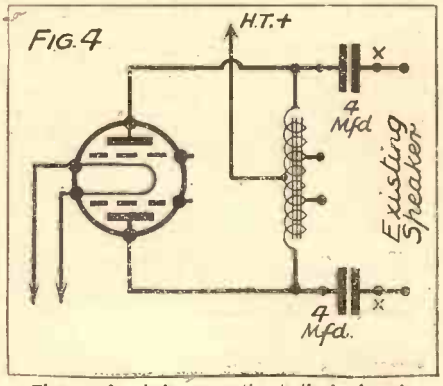
Now, the wire recommended is most easily run, and is most inconspicuous when stapled to the wainscot or picture rail, the wood providing a sound fixing. Consequently the most desirable position for the block is closely adjacent to a door frame or window frame, so that the wire does not, so to speak, have to cross the open wall. Mark the positions 4 ft. 6 in. from the floor. Of course, the blocks may be fitted to the wainscot, but this position proves awkward when it comes to inserting or withdrawing the speaker plug.

Work to a Plan.

Bearing the above in mind, plan out the wiring. From any socket, for instance, another length of wire may be run to the next room, and so on, which means that from the point of entry to a room to the block two wires must be laid side by side. The method of taking the wire into or from any room is to bore a hole through the frame of a door at the top or at the level of the wainscot. Do not be tempted to "shut the wire in the door." It will certainly be broken before long.

Fix the wire in position with the staples, using a light hammer, with one staple every yard, pulling the wire taut before driving home each staple. At bends or corners the staples must be placed as close together as will fix the wire firmly and neatly. Upon reaching a door through the hole in which the wire must be threaded, carefully measure the length required inside, cut it off and pass the end through. If a lead is to be brought out from this particular room to another, run the two together under the same staples.

CHOKE OUTPUT



The use of a choke connection to the loudspeaker is also recommended with Class B.

Having completed the wiring, the next step is to fix the blocks. Remove the outer cotton insulation for about 4 in. by sharply but gently scraping towards the end of the wire.

Push the ends of the wire through the holes in the block and screw it firmly in position, seeing that the wire or wires enter the block through the groove. If the position of the block, for instance, by the frame of a door is on brick faced with plaster it is necessary to mark the position of the fixing holes with a bradawl, remove the block and, using the Rawlplug tool, "jump" the two holes in the brick by giving the tool sharp blows with the hammer, at the same time turning the tool. Then insert a Rawlplug in each hole, which should be a close fit.

A Neat Job.

Insert the wires through the block and, holding it in one hand, start the 2-in. screws into the plugs. Screw home firmly, when the block will be perfectly secured.

To fit the sockets scrape the enamel and insulation from the end of the wire with a knife for about ¾ in. and just bend the end double. If it is a position where a "feed" to another room is taken from the same point, twist the bared wires together, *i.e.*, white to white and red to red.

MATCHING DIAL READINGS

How the principles of "trimming" may be applied to receivers which do not employ ganged tuning.

IN a receiver with two tuning dials the advantages of having the dial readings as nearly the same as possible are obvious; and whilst it is well known that ganged condensers are usually fitted with "trimmers" to keep the individual condensers balanced, it is perhaps not so generally realised that two independent condensers also lend themselves to similar manipulation.

All that is required is a foot or so of double silk-covered (d.s.c.) copper wire of about 26 gauge (the thickness is not critical).

Double cotton-covered wire would also serve, although the d.s.c. makes a somewhat neater job.

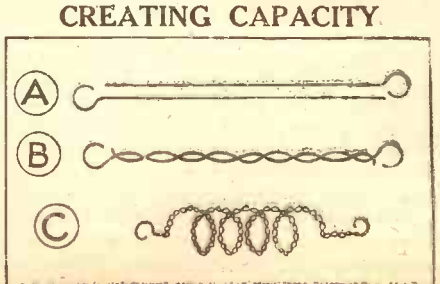
Cut the wire into two equal lengths and (after removing about half an inch of the insulated covering) make a small loop at one end (only) of each portion, as (A).

Place the two lengths side by side with the loops at opposite ends, and twist the wires tightly together (see B).

Wind the twin wires round a lead pencil so as to make the small spiral coil shown at (C).

It only then remains to connect one loop of the spiral to the "moving vanes" terminal and the other loop to the "fixed vanes" terminal of whichever tuning condenser shows the *higher* reading. The twisted wires form a condenser of small capacity which is added in parallel across the tuning condenser. The spiral formation is merely to avoid an unwieldy length of wire, and has little effect upon the capacity.

CREATING CAPACITY



The simple construction of the home-made trimming condenser.

THE FUTURE OF THE U.I.R.

The next meeting of the International Broadcasting Union takes place in October, and some of the difficult problems that it will be called upon to solve are dealt with below.

By OUR CENTRAL EUROPEAN CORRESPONDENT.

THE Union Internationale de Radiodiffusion is definitely "up against it."

The situation in Europe at the present moment, as far as broadcasting is concerned, presents a number of problems which a strong U.I.R. could help to solve. The agenda of the next meeting, to be held in October in Holland, ought to include the following points:

The problem of the unlimited use of broadcasting stations in certain parts of Europe for direct propaganda intended for listeners on the other side of the frontier, and the erection of an international station in Luxembourg.

Keeping Clear of Politics.

These are only two points which *ought* to be on the agenda of the U.I.R. Knowing this body, however, it will, I have no doubt, not touch on political questions. It *may* consider them very privately and may express some long-winded opinions—which are of no practical use whatever.

If the U.I.R. shirks its duty to European ether peace in October I see but little use for it, beyond the function of its office in Geneva as the central point for privately studying broadcasting technique and of its control station at Bruxelles for policing the European ether. This would mean that the main weight of the Union would in future centre at Bruxelles and that the real use of the Union would be of an engineering character.

Our Own Motto.

The B.B.C. has a motto: "Nation shall speak peace unto nation." This motto was in practice observed by all members of the Union. Beyond that there was a "gentlemen's agreement" between members not to interfere with each other's listeners by means of broadcasting stations. But during the past months the understanding has been violated many times. For instance, in spite of diplomatic protests, a certain station continues to concern itself in no undecided manner with the inner affairs of a neighbouring country. The broadcasting company in that country had, I think, some vague hope that the machinery of the U.I.R. would be able to help in this matter. I have heard of no such intervention.

On the other hand, the U.I.R. has taken a very decided attitude against one of Europe's smallest States on the question of the erection of an international broadcasting station. If, on the other hand, the U.I.R. considers incidents of political propaganda beyond its sphere, then surely it ought also to consider matters such as the erection of an international station as equally beyond its jurisdiction.

There are broadcasting problems and questions which are continually arising in Europe. The U.I.R. must either take them up or it will have to sink back into the comfortable armchair of the "expert" adviser.

I think it is time that both members of the U.I.R. and European listeners realise once and for all what this Union is good for. I am not speaking of the excellency of its work in the past or of its attempts at making European peoples better known to each other by means of broadcasting programmes; but when I hear of members thinking that the U.I.R. could help, and when it obviously does not do so, that is regrettable and only lowers the prestige of the U.I.R.

What is our court of appeal in all matters concerning international broadcasting? If the U.I.R. finds itself incompetent, then we only have the usual diplomatic channels and the usual machinery of international understanding (perhaps the machine of the League of Nations) to cope with such matters. But experts are obviously needed. Years ago it was proposed to create an international convention for broadcasting, and an international conference just held in Rome again discussed this idea. But the official journal of the Union of Postal Administrations *congratulated* this particular congress that it should have decided not to hasten the solution of this difficult problem!

Diplomatic Protests.

If a broadcasting station chooses to spit fire at its neighbour it can do so. If it chooses to incite the population of a neighbouring country into open revolt against that country's government the only thing will be a diplomatic protest. And so far such protests have had little or no effect. The U.I.R. has the means of bringing a recalcitrant member to heel. It could boycott it; the other U.I.R. members could refuse to supply it with their programmes. On the other hand, the U.I.R. would probably immediately lose the unruly member!

As things stand to-day, we have to wait and watch developments. Perhaps a miracle may happen and the Union may, beyond discussing the arrangement of international concerts, etc., etc., and the ways and means of long-wave distribution, eventually concern itself with the growing danger of broadcasting stations being used for unfriendly propaganda purposes.

It is at the meeting in October that the Union will have to prove its worth or sink into ignominious oblivion.

SPEEDING UP PRODUCTION

The most up-to-date production methods are employed at the H.M.V. factories at Hayes. Receiver assembly is greatly facilitated by the use of a special form of lift which enables the worker to reach every part of the set without undue fatigue.

WHY H.T. BATTERIES FAIL

An article of interest to all battery users.

IT is sometimes a source of wonder to a great number of listeners why the dry type of high-tension battery fails to deliver its specified voltage after only a few week's service.

In practice, of course, there are several reasons why a battery can drop below its rated voltage after a comparatively short period of use, and the first of these is possibly due to the fact that it has had a long shelf life prior to being put into practical service. In this way the various chemicals used in the manufacture of the battery have been slowly deteriorating,

Test the Set First.

Another reason can be due to a fault in the receiver itself, such as a leaky dielectric in one of the condensers causing a partial short-circuit across the high-tension battery; insufficient grid bias on one of the valves causing a high anode consumption, or a faulty valve.

In spite of the foregoing, however, perhaps one of the most common reasons for the life of a battery being short is due to the fact that when a replacement is necessary insufficient attention is given to the type required to operate the receiver satisfactorily.

In this respect it should be explained that the primary consideration in the choice of a battery should depend upon the combination of valves incorporated in the receiver and the current required by them. For instance, if the total anode current consumption is 15 milliamps the standard 10 milliamp type of battery would be unsuitable, and the use of such is not only inadvisable but uneconomic.

For the guidance of the listener the total anode current required can quite easily be verified by referring to the characteristic curve pamphlets of the various valves used, or alternatively, this information can be ascertained by inserting a milliammeter in the H.T. negative lead.

A. W. Y.

THE MIRROR OF THE B.B.C. By O. H. M.

REGIONS GAIN GROUND

Captain Graves' Future—A New Book—The B.B.C. to Pay More? Efficiency of Technical Branch.

AS the new organisation of the B.B.C. takes shape it is clear that the Regions are at last coming into their own. Regional Directors are now much more important than they have ever been in the past. Curiously enough, this was not intended. It came about in the following way:

Headquarters officials have always looked upon the Regions with a combination of jealousy and mild contempt. So, when the opportunity came, they decided to send special nominees to strengthen the Regional programmes and presumably to bring them more into line with London policy. But the result has been different. As might have been expected, the transferred officials have identified themselves with the Regions, have relieved Regional Directors of a great deal of work and incidentally increased their status to more of the position of ambassadors. Thus ends the long-drawn-out conflict between the "Regionalisers" and the "Centralisers," with the latter in complete rout.

The B.B.C. Empire Service.

There is much discussion at Broadcasting House as to whether or not Captain Cecil Graves will continue as Empire Service Director, now that he has inherited the considerable estates of his uncle, the late Viscount Grey. My information is that Captain Graves intends to carry on at the B.B.C. at least for the present. Next year, however, he may have to reconsider the position, in which event there will be a real scramble for his job, which is one of the plums of broadcasting.

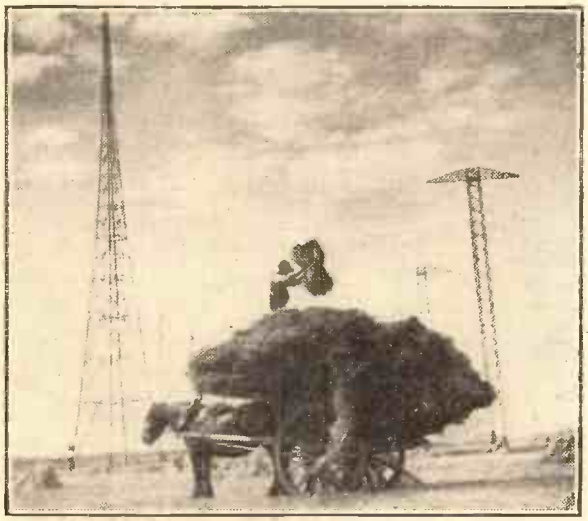
The Wandering Microphone.

The talks direct from America by Mr. Mais, which will be given regularly on Friday nights represent an interesting experiment for the B.B.C. But other broadcasters, notably the N.B.C. and the Columbia System, have been doing this from Europe for the past two or three years. If the B.B.C. American experiment is a success it will be extended to other countries, the wandering microphone becoming a normal part of accepted programme arrangements.

"The B.B.C."—by Ex-Employees.

I have just heard of what promises to be a very interesting book on broadcasting which owes its origin to the enterprise of Mr. Cleghorn Thomson, formerly the B.B.C. Director in Scotland. Mr. Thomson has secured the co-operation of, among others, Captain P. P. Eckersley, former Chief Engineer, and Miss Hilda Matheson, former Talks Director. The book promises to be a frank exposition of all that the authors think is wrong with the B.B.C. and how they would repair it.

A RURAL RADIO SCENE



Taking home the harvest of wheat grown beneath the giant masts of the beam station at Ongar, Essex. This station provides communication with many far-distant parts of the Empire.

More Money for Artistes.

It is good news that the B.B.C. is at last considering a voluntary upward revision of its fees for artistes, musicians and instrumentalists not under regular contract. If this is carried into effect it will be a boon to the artistic and musical community and will enhance the prestige of broadcasting.

Apprentice Engineers.

I am glad to hear that the B.B.C., on the advice of Mr. Noel Ashbridge, its Chief Engineer, has embarked on a new scheme to recruit likely engineering talent. Suitably educated youths are to be taken on for a period of apprenticeship, leading normally to staff appointments on the engineering side. This will not only open out fresh avenues of employment, but will also safeguard the average standard of efficiency of the engineering staff of the future.

Mr. Sarnoff at the B.B.C.

During his recent visit to Europe, Mr. David Sarnoff, head of the Radio Corporation of America and its numerous subsidiaries, spent a busy half-day going round Broadcasting House. He was particularly interested in the Blattnerphone on which he heard his own voice recorded and reproduced. Mr. Sarnoff expressed admiration for the building, and surprise at the ultra-modern character of much of its internal decoration.

Mr. Iremonger at Work.

Mr. Iremonger is making rapid progress in developing religious broadcasting. He is extending the scope of the talks, and is supporting those who are working for an enrichment of Sunday programmes within the limits

(*Continued on page* 132.)

The LINK BETWEEN

BY G. T. KELSEY

Weekly jottings of interest to buyers.

IT is gratifying to know that in a season of so many new developments the all-important question of H.T. supply for battery users has not been overlooked.

New and greatly improved types of H.T. batteries are available in almost all the leading makes, and although prices are not appreciably lower, your H.T. will actually cost you less in the long run because replacements will be required much less frequently.

Hellesens, for instance, have just produced a new type of battery which, after exhaustive comparison tests, was shown to give no less than 50·2 per cent longer life than ordinary types. Appropriately enough, these new types are known as the "Hi-Life" series, and they sell at very popular prices.

Rather as one would imagine, the demand for them already is tremendous, and the big Hellesen factory at South Wimbledon is working at full pressure—taxed to capacity, in fact!

"The Book of Igranic."

Generally speaking, radio catalogues this year are bigger and better than ever. It's a most encouraging sign of the times.

The latest one to call forth my warm approbation is "The Book of Igranic."

This is far more than a catalogue; it is a really fine literary and typographical achievement.

Its 48 pages tell you all you can possibly need to know about the new Igranic productions, and tell it in such a way that it is a pleasure to read.

As far as I know, this is the first time that any firm has experimented to such an extent with type and layout in a publication which is intended to sell radio components. I have no doubt at all that you will agree with me that the experiment has been well worth while.

"The Book of Igranic" is dedicated to "every radio constructor, professional or amateur," and to make quite sure that every constructor has a copy I have made arrangements for the new catalogue to be sent to everyone who sends me the usual postcard.

(No. 53)

(*Continued on page* 130.)

OUR POSTCARD SERVICE

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

CAN YOU WRITE A RADIO PLAY?

BY VAL GIELGUD

CAN you write a radio play? I use the word "can" advisedly. I have carefully avoided asking, "Do you write radio plays?" or "Do you want to write radio plays?"—for you obviously do. We receive at Broadcasting House between ten and forty plays a week, written by hopeful aspirants to honours in radio drama. And yet, in spite of all that has been written during the last three or four years about the broadcast play, not two per cent of this submitted work is of a standard requiring serious consideration.

Obviously this is a great pity. I find it so because I am continually looking for new plays, and I am not getting them from the quarter where I should most like to find them.

As various unkind critics have pointed out, I am compelled to look to translations of foreign plays, and even to fall back upon the dramatic efforts of my own staff, who, for some reason which I have never been quite able to fathom, are supposed to be peculiarly ignorant of everything concerning the microphone because the microphone is almost their second self!

On another page will be found all the details of the "Popular Wireless" competition for radio playwrights.

Val Gielgud, who, as the B.B.C.'s Director of Productions, is directly responsible for radio drama in this country, sets the ball rolling with some practical advice to intending competitors.

This will inaugurate a series of opinions gathered from well-known radio dramatists and producers which are intended to assist readers of "Popular Wireless" to write for the microphone.

How to Avoid Mistakes.

POPULAR WIRELESS evidently agrees with me, because it is prepared to offer a handsome present to the winner of its radio-drama competition.

The B.B.C. thinks so, because it is prepared to undertake to broadcast the winning play in this competition, and because one of its main reasons for reviving twelve reasonably well-known broadcast plays during the last three months of this year is to encourage would-be writers to listen, and learn, if not how to write broadcast plays, at any rate to avoid a good many mistakes in the writing of them.

I should like, in the first place, to give a little strictly practical advice to readers of POPULAR WIRELESS interested in this competition. First of all, don't dig out from bottom drawers of your desks dusty scripts which have unsuccessfully made the rounds of London theatrical managers, put them into clean covers and call them "plays for broadcasting."

Don't Write on Tissue Paper!

The B.B.C. Dramatic Department should not be considered as the proper recipient for what has been despised and rejected by theatrical managers; and a play written for the theatre—particularly if rejected by the theatre—is most unlikely to be of the slightest use for broadcasting.

In the second place, type your script on normal paper. This may seem a grotesque piece of advice, but I can assure you that I have received plays written upon brown paper, tissue paper and even upon circular pieces of cardboard!

Not Too Long.

Thirdly, remember that a pure radio play, as opposed to a Shakespearean classic or an adaptation of a novel, should not play for more than an hour and a quarter, and that the majority of good radio plays are timed to between forty minutes and one hour. A minute and a half of playing time to one sheet of typed quarto paper is a rough indication of practical timing.

Then do not forget the organisation for

The author, besides being in charge of radio drama at Broadcasting House, is himself a writer of repute and has been responsible for many plays and novels.

which you are writing or the audience which is to listen. It is well and generally recognised that the B.B.C., owing to its constitution, has certain definite responsibilities. It is necessarily bound to a reasonable degree of political and religious impartiality, and to reasonable consideration for the feelings of all its listeners. It cannot, therefore, deal with propaganda disguised as drama, with tracts disguised as drama, or with plays concerning living persons. It is bound to eschew both the strongly sexual, the violently political and the blasphemous.

And then your audience. It is not a West End theatre audience; it is not an audience of so-miscalled "highbrows"; and, conversely, it is not a music-hall audience in the North of England. It is an audience which may well include on the same evening a duke, a dustman and the crew of a drifter in the North Sea. And though it is probably the biggest dramatic audience in the world, it is, at the same time, in the strictest sense of the word, not an audience at all, but a collection of individuals isolated from each other. This is important, because the ordinary play depends enormously for its effect upon the mass emotions of a number of people gathered together in a single place and simultaneously reacting in the same way. One person laughs; the theatre bursts into a roar.

One person shudders, and from the back of the stalls you can see heads and shoulders moving like corn under the wind. But the radio play is entirely deprived of this mass reaction, and you are therefore writing simultaneously for an enormous number of people and for each one of them as a single person.

Allow for Interruptions.

Then remember the conditions under which a broadcast play is heard. Obviously you cannot cater for people who will only switch on in the middle. But even the most conscientious listener in his own home is liable to every kind of interruption. His neighbours will call to play bridge; his wife will want to wash the dog; Jones will ring up on the telephone, or the children may want to play bears.

Unless you can not only make your listener interested from the very beginning of the play, but also steadily maintain that interest, it will not be able to stand out against these multitudinous demands which insist that he shall switch off and do something else—or, worse still, not switch off and do something else.

I must apologise for these various hints, which may seem too obvious to be necessary; but though they may seem obvious to you, they may not have been equally obvious to all those friends of yours whose dramatic efforts I confidently expect to receive early in the New Year.

ABOUT YOUR GRAMOPHONE

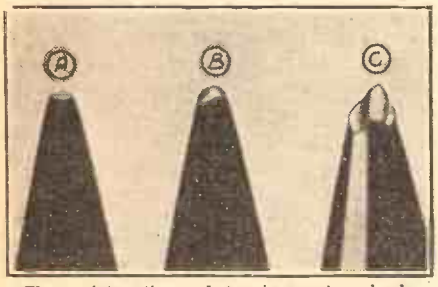
HOW TO USE NEEDLES.

Here are some practical hints on a subject of vital importance to radiogram enthusiasts. Those who wish to get the very best results from their pick-ups should make a special point of reading this illuminating article.

AT first sight it would seem that the proper way to use gramophone needles was self-evident. This, however, is not quite true, and much enjoyment may be lost and, indeed, much damage can be done by using your gramophone needles in a careless or thoughtless manner.

Although every precaution is taken by needle manufacturers, it will nearly always be found that there are one or two faulty specimens in every box. These fall into three main groups—blunt point, no point and "hooked." Each needle should be

THE EFFECT OF WEAR



These interesting photo-micrographs clearly show the effect of wear on the needle point. "A" is an unused loud-tone needle, "B" the same needle after playing one side of a 10-inch record, and "C" how it appears when eight tunes have been played.

carefully examined before use, and if it exhibits any fault whatever it should be rejected. The first two groups are generally obvious to the naked eye, but a needle with a minute "hook" is not always easy to detect in this way.

Easily Detected.

Such a fault may instantly be discovered, however, by holding the needle by the butt end and then drawing it gently along the sleeve of the coat. It will then be found that the tiny hook will almost certainly catch in the cloth. Needles of the semi-permanent type, in which the actual point only is made of very hard metal, often get bent and hooked, and in such a condition are capable of ruining a record with one playing.

An ordinary commercial steel needle may be used for playing *one* side of *one* record only. When using a "permanent" or tungstyle needle, however, care must be taken to ensure that if it is once removed from the pick-up it is not again replaced. The reason for this is that it is almost impossible to replace it so that it registers with the record groove exactly as it did before.

Whilst a needle is playing a record, shoulders are worn on the sides, and it is easy to see that a slight displacement will do considerable damage to the grooves of the record. It is well to remember, also, that a "permanent" needle must not be taken as such too literally.

It is very desirable not to use such a needle for playing more than a dozen sides. Always buy good quality needles made by a reputable manufacturer—even if the cost is a little more.

A great many people seem to find it troublesome and unsatisfactory to use non-metallic needles, but all these difficulties disappear when the real nature of the needles is properly appreciated.

The three principal types of non-metallic needles are the triangular fibre, the round "thorn" type such as the Burmese Colour Needle, and the composition type such as the New Electrocolour Needle. Each type needs its own special treatment if it is to give of its best.

There is no doubt whatever but that the use of fibre needles prolongs the life of the record. Whether the reproduction, however, is as good or better than that of a steel needle has been a matter for controversy among gramophone and radiogram enthusiasts for many years.

Good Point Essential.

The ordinary commercial type of triangular fibre is inclined to be somewhat soft and oily, whilst the hard shell is on the inside (i.e. the side nearer the motor spindle) when placed in position in the pick-up. This position, of course, should be that with the longest edge nearest the record face and the sharpened tip of the hard shell in the groove.

In order that it may properly fit the pick-up it is usually cut by the makers with a round shank. Great care must be taken to see that the point is cleanly cut and free from "whiskers." Suitable cutters are on the market, but care must be taken to see that the cutting knife is razor sharp and that the movement is clean and decisive. A sharp, quick cut is the best method of obtaining a good point.

A good test of the efficiency of the cutter is to examine the triangular face of a newly-cut needle—the higher the polish the better and more lasting will be the point. The reason for this is a little obscure, but it *is* so in practice.

A better type of triangular fibre is that in which the hard shell is on the *outside* when in position in the pick-up. These are easily obtainable commercially, and the makers usually subject them to a simple chemical process which removes most of the residual oil and gives them a very hard consistency. Thus, not only do they last for playing many sides, but the recutting operation results in a really excellent point.

Needless to say, the hardening process does not cause the needle to damage the record in any way. Care should be taken to see that the right type of cutter is obtained for these needles, having regard to the fact that the shell is on the "outside." The makers of the needles will supply cutters which do the job admirably.

Complete With Cutter.

Needles like the Burmese Colour and Electrocolour consist of a very sharply pointed round shank which fits comfortably in the pick-up. They are sold all ready pointed, together with little devices specially made to repoint them. The most satisfactory of these ingenious little machines is the "Meltrope," which consists of a disc of fine glass paper against which the needle, set at an angle, is lightly pressed by a spring. The needle, held in a small chuck, revolves simultaneously in the opposite direction, and the result of a few turns is a beautifully polished conical point.

The time taken to repoint a needle is not more than twenty seconds. When the needle is removed from any sharpening

(*Continued on page* 128.)

RESTING IN ITS GROOVE

This greatly enlarged photograph depicts a steel needle resting in one of the grooves of a record. A worn or faulty point will cause damage to the grooves and considerably shorten the life of the record.

ECKERSLEY EXPLAINS-

A single-valve all-mains loudspeaker receiver is the main item with which our Radio Consultant-in-Chief deals this week. He uses a pentode valve and advises a good aerial and earth system.

W. B. R., who lives in Hadley Wood (and if my memory serves me rightly this isn't more than 10 miles from the London station) wants to know if he could use a crystal and one L.F. stage "purely for the London stations." Is a crystal any good?

My advice would be against using crystals any more. They are rather nasty little things, really; when they're sensitive and use cat's-whiskers, the whisker and the spot seem to have an essential incompatibility and are always breaking off relations with one another.

Very Unstable.

The excuse for this may be as feeble as someone going to bed upstairs and dropping his tired boot from an upraised foot, or the irate slamming of a door. So the crystal is an unstable-ish sort of thing. I know a lot of people will write in and praise their crystals—"never given a moment's trouble"—but by and large I am right; vide their gradual disappearance in favour of the valve.

Then, again, the crystal "damps" a tuned circuit rather badly. True, one can tap down the inductance coil and get optimum volts for optimum selectivity; but it's all a bit laborious, and damping varies with different crystal settings.

Now, if I lived at Hadley Wood I should have a garden and an electric supply, and with these two adjuncts I should try to design a single-valve pentode receiver, using the pentode as detector and L.F. magnifier all in one.

A Good Circuit.

I should set up the circuit of Fig. 1, but I should do everything to have a good aerial and particularly a good earth. I expect the magnification of the aerial circuit to be about 20, and I should require 1·5 to 2 volts across the grid and filament of the valve (H.F.), so I want a tenth of a volt or 100 milli-volts.

If the field is of the order 10 milli-volts, I want 10 metres = 30 feet effective height about. Thus an aerial about 30 feet high and having, say, 50 feet of vertical top hamper would give me enough volts to work a loudspeaker direct. The valve would consume about 30 milliamps at 250 volts, and I should require 200 volts on the screen.

If I couldn't erect the aerial, or if I had to work off batteries, I should tackle the job quite differently. If I couldn't get a big aerial I should require better amplification. This could be very easily come by in terms of a high-frequency valve between the pentode input and the aerial. If one only wanted the London station the aerial could be very small: even a frame might do, because one ought to get a magnification of from 20 to 30 easily out of a well-designed H.F. stage. But this would all assume having mains power, because the pentode is to take quite a few watts.

An Economical Scheme.

Now, battery watts are terribly expensive. But by using Q.P.P. magnification one can economise. The POPULAR WIRELESS staff are very expert in getting lots of power from little battery watts, and the most economic thing to do is to use one of their standard sets designed for local station work and batteries.

Anyhow, I would not use a crystal; and, by the way, I could *not* just listen to the two London stations only—not much, anyway!

* * *

N. K. T. talks of steam impinging upon an aerial, and says he understands that if it does so "there is a likelihood of atmospheric noises occurring."

It's a question of what is meant by "impinging." If the kettle boils and a wispy streamer of steam goes wandering round the down lead, there is no risk of atmospheric noises unless by a secondary effect the insulation of the lead-in insulator gets bad.

But if a steam engine with pounds and pounds of steam pressure in its boiler came and blew jets at your aerial, there might indeed be severe danger of atmospheric noises. It is true that a fierce jet of steam rushing out of a nozzle does generate a very high voltage. Never mind why now, but it does. And this would make nasty crackles if the metal nozzle was not earthed.

Electric Shocks!

Steam wagons with rubber tyres usually drag a chain attached to the chassis along the ground, so that the metal may all be earthed, otherwise the whole engine becomes charged and people who touch it or step off it on to the earth get electric shocks. This is not a leg-pull—it's true. Few people have heard of this. Eckersley is always ready to explain.

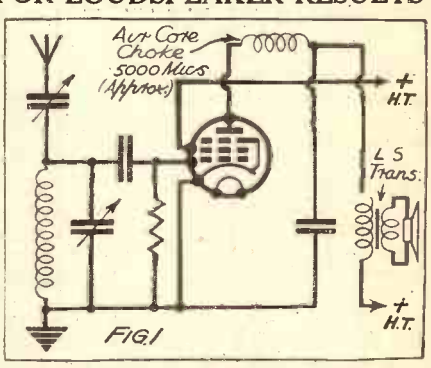
So those living on main roads and having aerials near or on the road, beware of non-earthed steam wagons! Meanwhile, let them beware of confusing magneto noise in petrol engines with anything to do with steam jets! Steam engines do not carry magnetos, but some petrol engines carry steam jets!

I wonder if a "boiling" petrol engine charges a rubber-tyred vehicle?

ROSES ROUND THE AERIAL

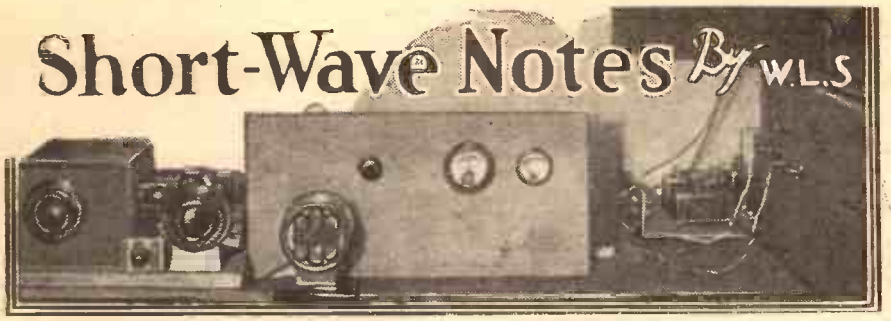
A good outdoor aerial is sometimes highly desirable, as explained on this page. Its appearance can be improved by the arranging of a trellis work, on which rambler roses may grow, as in this photograph.

FOR LOUDSPEAKER RESULTS



With 250 volts high tension and a sufficiently good aerial, this pentode detector circuit will work a loudspeaker without any stages of L.F. amplification.

Short-Wave Notes By W.L.S



JUDGING from the sudden influx of logs and data from readers, short-wave interest is assuming its "winter proportions" very rapidly. There is no sign of winter conditions as yet, except perhaps for the fact that W 2 X A D and the other 19-metre stations don't last quite so long at night as they were doing a month ago.

It seems hard to realise that in two months' time the 19-metre stations will be fading out before 8 p.m. and the "31's" and "49's" will assume the position of first importance once more.

It is strange how people cannot get it out of their heads that local weather conditions ought to have an effect upon radio reception. In my experience that only happens when one has doubtful insulation on the aerial. That is the only reason I have ever come across for abrupt changes in signal strength, according to whether it happens to be raining or not.

Very Unlikely.

It is conceivable that a deep depression over the whole of Europe might cause some serious change in reception, but local showers—no! As a matter of fact, I have never been able to trace any reliable connection whatever between weather and radio, except that thunderstorms are bad for headphones and their wearers.

"C. J. B." (Maidstone) writes to me on the old familiar theme. "Why," he asks, "do you constantly make a distinction between a loudspeaker short-wave set and a headphone receiver? Surely they have to do exactly the same job?"

No, my dear C. J. B., nothing like it! This point is worth going into, for it is really important. The man who uses a short-waver with headphones has, I submit, an entirely different set of requirements from those of the loudspeaker listener.

Take myself as a representative example of the "headphone" category. When I hear a programme of music that absolutely fills my headphones, I assume a bored expression and tune in something else. Why? Because the chances are that it is coming from a station that one can receive any day or night (even if it's fairly distant), and it brings me no thrill at all to know that I'm getting him again.

Keep on Trying.

The occasion on which I prick my ears up comes along when I find a very, very weak carrier wave coming in on a dial setting that usually is associated with complete silence. "Ah, another scalp!" say I, and proceed to hang on like grim death until I can make something of it.

If it happens to be so weak that there is no understandable speech or music, I go back to the same spot night after night until I'm lucky. "It may be for years and it may be for ever——" but I usually make something out of it!

I don't, like Mr. Brown, look up the published list of stations, see which one it *ought* to be and write to the papers claiming first reception of X Y 2 Y Z.

Surely the loudspeaker listener doesn't indulge in this sort of amusement at all. He searches round the dial for something that is sufficiently strong and interesting to enable him to loosen his grip on his extension handles (if any) and sit back in his comfortable chair with a sigh of enjoyment. A weak carrier wave is as much of a bore to him as a loud programme is to me.

The wide difference between telephone and loudspeaker reception forms one of the themes of our popular contributor's notes this week. Other items include the latest news about stations and reception conditions and reference to a young Dutch enthusiast's 5-metre 'plane experiments.

Easily Added.

But, of course, we headphone listeners have the last laugh, because we only need a neat little L.F. amplifier and loudspeaker tucked away somewhere on a shelf out of sight, and if we don't happen to feel like D X-hunting, then we, too, can sit back and be amused by the Woggins Brothers from W 2 X A D or whatever we feel like.

To put the whole thing in a nutshell, the loudspeaker listener wants a big set and a loud signal; the headphone listener uses one or two valves and revels in things that are so weak that he can hardly hear them at all.

"R. W. R." (Southport), in the course of an interesting letter, mentions that D J B on 19·73 metres is doing the most amazing variations in strength nowadays. Like myself, he finds that W 2 X A D still heads the list of Americans for strength and consistency. W 8 X K, he says (again seconded by myself), has been better in every way this year, especially on 25 metres, and even his 19-metre programmes have been remarkably good.

"R. W. R." has also been receiving W 2 X E on 19 metres quite well, and, in addition, reports an unknown station slightly above W 2 X E. Can anyone identify this? Another thing that he mentions is the 3rd harmonic of Moscow on 16·66 metres. It's funny how these Moscow harmonics land right in the broadcast bands—his 2nd harmonic, on 25 metres, is quite notorious. This 3rd one, naturally, is rather near W 3 X A L on 16·87.

More 5-Metre Tests.

Although it's rather ancient history now, I think I ought to comment on some special 5-metre tests that were carried out on the south coast a few weeks back. Mr. F. van Baerle, a young Dutch amateur staying in England, who happens to be a fully qualified pilot, flew over Folkestone and Dover in a 'plane, with Mr. R. Fereday (G 6 F Y) as passenger. G 6 F Y was operating a small 5-metre transmitter, and received reports of R 9 reception at 50 miles and R 8 at 60 miles, although no really long-distance reports were received.

Mr. van Baerle made all the arrangements for the 'plane and transmitter, and all that Mr. Fereday had to do was to take down the licence and the dry batteries! Mr. Fereday's comment is: "Not a bad bit of work for a sixteen-year-old schoolboy working in a foreign country!"

Don't Do It!

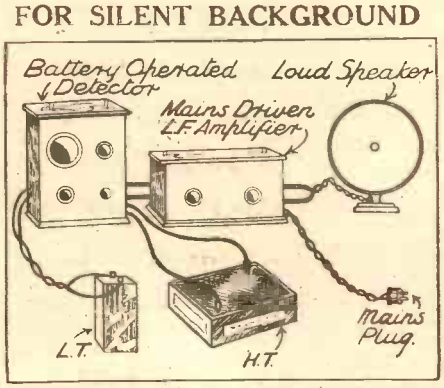
On the subject of 5-metre work the secretary of the R.S.G.B. asks me to breathe a word in the ears of those who are interested, to the effect that any attempt to transmit—on 5 metres or anywhere else—without a full licence from the G.P.O. will lead to sure and certain execution!

Let me assure readers that the G.P.O.'s methods of dealing with this sort of thing are very, very efficient!

USING YOUR MAINS

THE only difficulty that arises when a short-wave set is worked from the mains is in the detector circuit. It is not always possible to obtain complete freedom from hum, although if one takes sufficient trouble this can generally be done.

FOR SILENT BACKGROUND



The advantages of mains working can be fully enjoyed on short waves if this scheme of using a separate battery-driven detector unit is employed.

Rather than run a large short-wave set entirely from batteries on account of this, it is a good plan to run the detector from batteries and to feed it into a separate one- or two-stage L.F. amplifier which is mains driven. Silent background and freedom from mains noises will then be assured, although only one 60-volt H.T. battery and 2-volt L.T. cell are required.

TELSEN

cover

Every Radio Requirement

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TELSEN "313" DISC DRIVE

The main essentials of a complete tuning control unit in a compact artistically grouped assembly. Bakelite knobs, with escutcheon plate finished in oxidised silver, and dial lamp holder ... **3/6**

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1 watt type resistances, of constant value, enclosed in cartridge type cases with nickelled end caps 300 to 200,000 ohms ... **1/-**

Cartridge Resistance Holder for flat or vertical mounting **9D**

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With resistance element entirely wire wound with special alloy wire. Constant in value, noiseless in operation.

10,000 ohms ... **3/-**

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Gear ratio approximately 8-1 the disc being graduated in both directions. In black or brown bakelite **1/6**

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Grid Leak absolutely silent and practically unbreakable. Non-inductive. Produces no capacity effects.

.25 to 5 megohms ... **6D**

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Standard type of pilot lamp, but specially constructed to give maximum illumination with negligible consumption.

.2 amp, 2.5 volts ... **6D**

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Extremely low self-capacity. Anti-microphonic types embody special one-piece contact sockets, with soldering tags and end terminals.

4 pin Anti-Micro. Type **8D**

5 pin Anti-Micro. Type **10D**

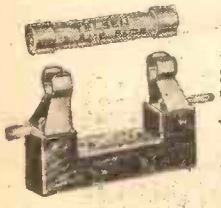
7 pin Anti-Micro. Type **1/9**

Universal Type ... **9D**

4 pin Rigid Type ... **6D**

5 pin Rigid Type ... **8D**

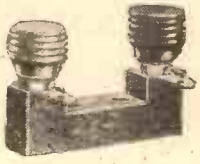
7 pin Rigid Type... **1/6**



TELSEN POWER FUSE AND HOLDER

Special type of power fuse utilising low "timelag" fuse wire. Hermetically sealed in glass tube with nickelled end caps **6D**

Power Fuse Holder, with alternative soldering tag connections ... **6D**



TELSEN TERMINAL BLOCK

With insulated terminals. For use as aerial and earth, loudspeaker, pick-up or extra battery connections, etc. ... **6D**

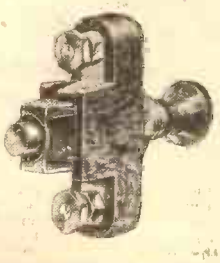
TELSEN PUSH-PULL SWITCHES

With 'knife' type self-cleaning contact and positive snap action. Series gap reduces self-capacity to minimum.

Two Point **9D**

Three Point **1/-**

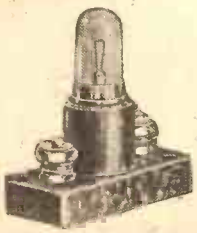
Four Point **1/3**



TELSEN FUSE BULB AND HOLDER

Standard 100 milliamp type Fuse Bulb, with strong nickelled base **6D**

Fuse Bulb Holder, with easily accessible terminals **6D**



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Made from finest nickel chrome wire wound on a pure cotton core, stoved and impregnated against moisture.

300 to 1,000 ohms ... **6D**

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10,000 to 30,000 ohms... ... ... **1/-**

50,000 to 100,000 ohms... ... ... **1/6**

Get the TELSEN RADIOMAG N°5 - Now only 3D

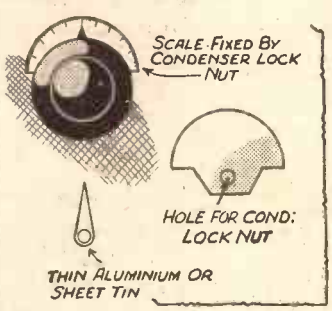
ANNOUNCEMENT OF THE TELSEN ELECTRIC COMPANY LIMITED, ASTON, BIRMINGHAM.

RECOMMENDED WRINKLES

DIAL POINTERS.

FOR constructors using dials similar to those used on the "Airsprite" (Polar) I make the following suggestions:

A pointer to indicate the dial readings can easily be cut from thin aluminium or sheet tin just long enough to leave a small portion of the pointed end showing when the tin is fixed to the panel by means of the condenser lock-nut.



Two suggestions for obtaining dial readings.

A logging scale can be made by purchasing a piece of ivory card from any stationer's and cutting it, as shown in the diagram, of such a size that about ¼ in. overlaps the dial—for use as log. A small piece of card with a pointed end can be stuck at a given point behind the main dial to provide an indicator cursor.

EASY SPEAKER FITTING

HERE is an idea for fixing a cone chassis into a cabinet which will allow of easy removal and replacement, and will also make a good, solid fitting in the case of those cabinets which have thin plywood frets which will not take a respectable-sized screw to hold the chassis direct. The chassis is mounted on to a baffleboard that will fit the cabinet and in each corner is drilled a hole that will clear a 4 B.A. screw.

The baffle is then placed in position in the cabinet, and four corresponding

A speaker fixing which permits quick removal.

holes are drilled through the cabinet front, this time of a size that will enable 4 B.A. countersunk screws to be driven tightly through from the front, the holes being countersunk before doing so. The screws should be about ¼ in. longer than the combined thickness of baffle and cabinet fret.

A little glue put in the holes in the fret will help to keep the screws firm. The baffle is placed in position in the cabinet with the four protruding screws through the holes in it. A washer is then placed over each screw, and then tightened up with a terminal head.

The result: a strong, "non-rattling" fitting. If desired, the screw-heads showing on the front of the cabinet could be hidden by a small wood ornament stained to match the woodwork.

FOR BROKEN SCREWS.

IT often happens that a grub screw holding the dial of a condenser or the knob on a spindle has half its head broken off when it is made of brass and unduly forced when screwing up.

A new screw may be made by taking an ordinary brass screw of the same thread and cutting its head off with either a hacksaw or a fretsaw. The top should then be filed down and a cut made across it again with a hacksaw or fretsaw.

The fretsaw is the better instrument if a blade with fine teeth is used, as it will make a clean and narrow cut. Two nuts of the same thread screwed tightly together in the middle of the screw will give a good protection when the screw is held in either a vice or pliers.

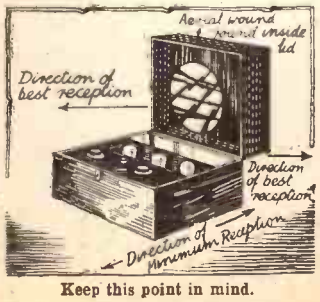
The old screw may often be removed by drilling a hole in it with a fine drill for some distance and then reversing the direction of the drill, when the bite is sometimes sufficient to remove it.

Or a small nail filed down to a tapering square point may be used in place of a drill, when it should be given a turn or two forwards and then reversed.

GETTING THE BEST FROM A PORTABLE.

A PORTABLE receiver, or any set with a self-contained aerial, for that matter, receives best when it is in a certain position in relation to the station being received. Reference to the sketch will make this point clear.

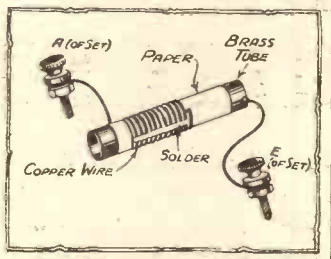
You see, all sets of this type make use of an aerial which is wound round the inside of the cabinet in the form of a coil, and to pick up the maximum amount of energy from a given station one of its edges must point towards the transmitter.



Keep this point in mind.

MAKING SELECTIVITY CONDENSERS.

TO make fixed condensers suitable for joining between aerial and aerial terminal of set, take a small brass tube, about 2 in. long. Wrap a thin piece of paper, 1½ in. broad, once round the tube, and gum.

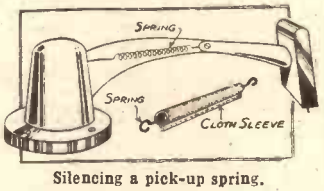


Making series aerial condensers.

Then wind a bare piece of copper wire round the paper. A large number of turns makes larger capacity, and vice versa. Leave one end of the wire for connection, and solder the turns together, as in diagram. Then solder a piece of wire to one end of the tube, forming the other terminal of the condenser. The same can be made with a piece of flat brass, etc., instead of tube, if desired.

THOSE PICK-UP NOISES.

INSIDE the arm of some pick-ups is a spring, which rattles against the arm when loud passages or deep notes are being played.



Silencing a pick-up spring.

This can be stopped. Take the spring out and make a cloth sleeve, or get a rubber tube to fit it.

When the spring is put back with the sleeve on, you will find the rattle has been stopped.

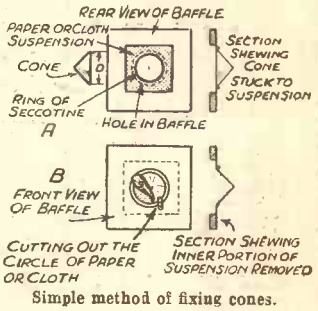
CONE SUSPENSION.

CONSTRUCTORS find that the usual method of suspending a cone in the baffle aperture by using several arc-shaped strips of material requires a good deal of skill to make a neat job.

The following method is simple, neat and more effective: The material may be either thin brown unglazed paper or cloth, such as the yellow "woolly" dusters costing about sixpence.

A square is cut of sufficient size to cover the hole in the baffleboard and leave a margin, and is applied to the baffle, which has been previously smeared on its rear surface with seccotine over a sufficient area. The material is stretched tight to form a drum-like diaphragm when dry.

The cone is now applied to this diaphragm, as in sketch A, and a pencil run round its outer edge to mark on the diaphragm a ring of the same diameter, D, as that of the cone. The latter is then removed, and a ring of seccotine deposited over the pencil mark. The cone is then replaced so that its rim dips into the seccotine all round. The board is placed



Simple method of fixing cones.

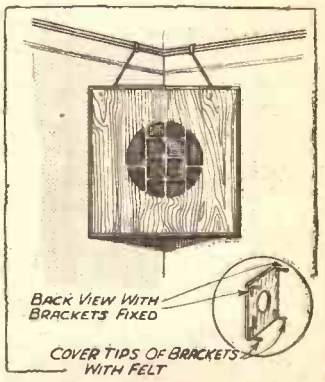
down flat, and a small weight placed on the cone apex.

When the seccotine is dry, the centre disc (S, sketch B) is cut away with a razor-blade, and the job is complete. If paper has been used, a coat of flexile collodion (obtainable from a chemist's) will render it impervious to atmospheric changes.

BEST BAFFLE POSITION.

THE usual position in a room for a baffleboard is in the corner, but this position has almost the disadvantage of a cabinet. The enclosure caused between the board and the angle gives rise to a "drummy" effect, which can be obviated if the board is supported forward about six inches. The volume also will be greater and the tone wonderfully improved.

After several experiments I have found the best way to do this is to obtain four 6-in. brackets and fix two of them on each edge of the board, which would in the ordinary way touch the wall, making a kind of table of the baffleboard.



Improving a corner-mounted speaker.

The tips of the brackets may be covered in felt to prevent vibration.

(Continued on next page.)

ONE GUINEA FOR THE BEST WRINKLE!

Readers are invited to send a short description, with sketch, of any original and practical radio idea. Each week £1 1s. will be paid for the best Wrinkle from a reader, and others will be paid for at our usual rates.

Each hint must be on a separate sheet of paper, written on one side of the page only. Address your hints to the Technical Editor, "Popular Wireless," Tallis House, Tallis Street, E.C.4, marking the envelope "Recommended Wrinkles."

Will readers please note that the Editor cannot, in any circumstances, guarantee to return rejected Wrinkles, and that payment for published hints is not made until ten days after they appear?

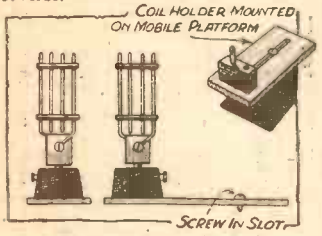
The best Wrinkle last week was sent by Mr. E. L. Kemp, Culverwood House, Nr. Hertford, Herts., to whom a guinea is being awarded.

RECOMMENDED WRINKLES

(Continued from previous page.)

SHORT-WAVE COIL COUPLING.

WHEN plug-in coils are being used for short-wave work, it is essential, for best results, that the coupling of grid and reaction coils be as tight as possible. A small reaction coil, tightly coupled, is better than the reverse.



Firmly fixed, but adjustable.

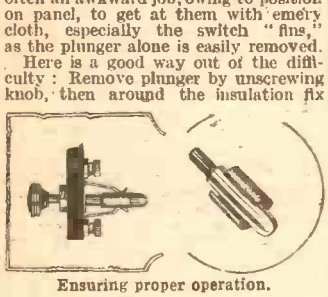
As the space occupied by different-sized coils varies considerably according to the number of turns, some means of adjusting the position of one coil-holder becomes necessary, and the following plan is simple and effective:

A piece of wood of suitable size is slotted down the centre and fixed to the baseboard by a round-headed screw passing through a slot. This can be slid backwards and forwards to accommodate coils of all sizes, and thus maintain a tight coupling on each waveband.

CONTACT CLEANING.

MUCH annoyance and crackling reception are caused by dirty switch contacts on L.T. or wavechange switches (push-pull types), and it is often an awkward job, owing to position on panel, to get at them with emery cloth, especially the switch "fins," as the plunger alone is easily removed.

Here is a good way out of the difficulty: Remove plunger by unscrewing knob, then around the insulation fix



Ensuring proper operation.

a layer of very fine emery cloth by the use of seccotine or other similar substance.

When set, replace plunger and knob, the result being a self-cleaning switch and perfect contact.

GOOD INSULATING SLEEVING.

IN power units, where it is essential that the connecting wires are covered with some form of insulating material, it is usual to use sleeving over 18 S.W.G. bare copper wire. How many of us have found that where sharp bends are made the usual types of sleeving either crack or buckle badly! The result is a not-too-nice appearance and a feeling that we haven't quite got that finish one sees on well-made commercial units—a finish we had intended to produce.

The ideal material to use is oiled silk sleeving, but this costs more than we usually care to pay. An excellent substitute is the rubber tubing which is made for the air valves of bicycle tyres. This material is an excellent insulator, can be obtained in long lengths, and just fits over 18 S.W.G. wire.

A power unit or even a receiver wired with this as the insulating medium looks extremely neat and has a finished appearance unobtainable with other sleeving.

No matter how sharp the bend—the wire can even be bent back on itself—the rubber tubing faithfully takes the shape of the wire. It can also be stretched to cover an extra few inches if a piece has been cut too short.

USEFUL ACCUMULATOR CONNECTIONS.

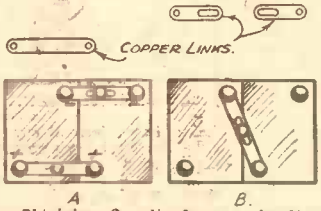
MANY readers will be using either 4-volt or 6-volt accumulators with the cells connected up in parallel for the longer time they can be used when applied to 2-volt valves.

At the charging station they connect them in series, because they can be charged quicker that way. In some instances there is some danger that they may be connected up in series when used on the set, with either damage to the set or burnt-out valves. It is easy to forget to change the connections when there are pieces of insulated wire used as a makeshift.

Although the idea is not foolproof, as shown, it will help considerably to prevent accidents and will help to keep the terminals to the set cleaner.

A shows two connections or bus bars in place on the accumulator and connected in parallel. One is plain; the other consists of two slotted strips of copper, for preference. A heavy terminal fits on the slot and makes it adjustable when used as a connecter. When the accumulator is sent to be charged, the adjustable bar is removed and fixed across the terminals, as shown in B. The plain bar is left out.

It is clear that the accumulator must be fitted with the two bars; and as the plain bar is an exact fit in one position only, any one of the family can be

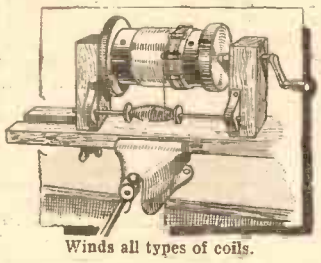


Obtaining 2 volts from a 4-volt accumulator.

trusted to connect it up properly. Each bar is provided with a terminal in the centre, and the contact is kept clean.

HOME-MADE COIL-WINDER

THE coil-winder shown in the accompanying sketch is easy to make and use. I have wound "Titan," "P.W." Dual Range and the Eckersley Tuner, also H.F. choke, by drilling holes through centre of former. The winder can be held in a vice or screwed on to the end of a bench or table.



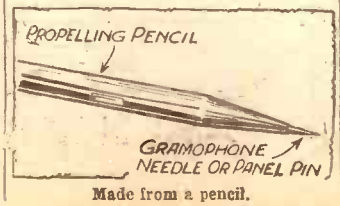
Winds all types of coils.

Dimensions are: Pillars, hardwood, 1½ in. × 1½ in. × 4½ in.; two discs, 4½ in. diameter; base, ¾ in. × 2 in. × 14 in.; brass rod, ¼ in. Whit. × 8½ in., screwed full length; two small wood brackets.

Any diameter tube is easily centred and screwed up with a nut at each end.

A HANDY SCRIBER.

FEW constructors possess a really serviceable scriber for marking their panels, etc. Still fewer, however, are without the necessary material for making a really serviceable tool.



Made from a pencil.

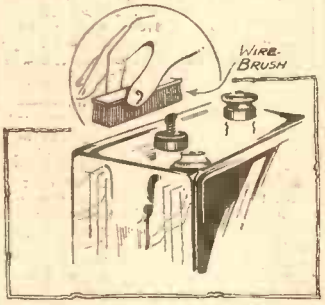
The sketch shows how, and needs very little explanation. This will be seen to consist of a propelling pencil, with the lead removed and a gramophone needle put in its place.

The most useful type of pencil is one that is split at the end, thus holding the needle rigid and preventing wobble in use.

Should, however, the gramophone needle be too big for the pencil in hand (they vary), a suitable-size panel pin, with the head nipped off, can be used instead.

CORRODED TERMINALS.

EVEN the most ardent radio fan dislikes cleaning corroded accumulator terminals and vainly trying to pick the corrosion from the screwed part with a knife. To do this quickly



Making a quick job of terminal cleaning.

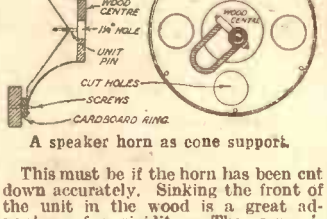
and efficiently, one has only to take a small stiff wire brush, such as is used for cleaning files. (A handy size is supplied in puncture outfits). A few quick strokes will thoroughly clean the terminal, and the knob will run on quite freely afterwards.

A NEW SPEAKER FROM AN OLD HORN.

TAKE the unit from the horn. Cut the horn down square. This is very important. Cut must be equal distance all round from the outer circumference. Depth of the chassis will depend on the size of cone one wishes to make. Next a piece of good wood (not hard), ½ in. thick. After levelling the cut edges of the horn, mark out a ring to fit. Find out how much chamfer there is on the inside of the horn. Cut larger, to allow for the chamfer, and file with wood file to fit.

In the centre of the wood drill a 1¼-in. hole. Fit the wood in with ¾-in. round-head screws. Cut four holes, 3 in. diameter, in the sides of the horn; make a pattern for these with thin cardboard. Drill six holes in the edge of the horn to fasten it to the baffle-board.

If a Blue Spot unit, fasten the cone-washer on the pin, place the pin in the hole, and centre the unit with the washer and the sides of the 1¼-in. hole. Fasten in this position, and if the washer is in the centre of the hole the pin is in the centre of the chassis.



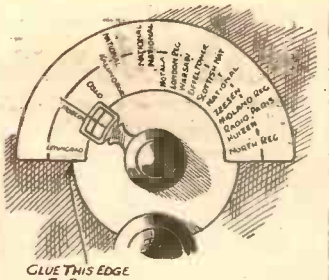
A speaker horn as cone support.

This must be if the horn has been cut down accurately. Sinking the front of the unit in the wood is a great advantage for rigidity. The cone is made as usual.

STATION IDENTIFICATION

HEREWITH are particulars of my method of station identification.

Four things are necessary: white card (postcard will do); long needle, pin or piece of wire; list of names of stations; glue or Durofix (Durofix preferred for gluing to dial).



Instantaneous station identification.

An opening should be cut out, as diagram, size about 2½ in., width as large as possible without interfering with any other panel components. This is fixed to dial with a little Durofix, about ½ in. being sufficient.

A needle pierced through the celluloid of the moveable arm (which can be taken off by unscrewing the grub-screw) should be as long as width of card.

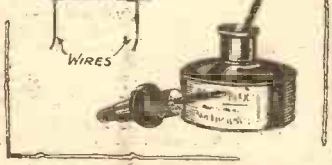
Then once a station is found and identified a mark can be made on card and the name affixed; then it will be easy to find again, and if you are absent the members of the family can hear the programme they desire.

MAKING JELLY ACID.

MANY readers, no doubt, having built a portable wireless set, are in need of an unspillable accumulator, and this costs several more shillings than the ordinary accumulator. Most experimenters will have an ordinary accumulator in use; this may be converted into a jelly electrolyte accumulator by the following means: Obtain some sodium silicate from the chemist's and add the crystals to the acid whilst still in the accumulator, slowly until jellification takes place. Then you have a useful unspillable accumulator.

EMERGENCY GRID LEAK.

TO make an emergency grid leak: Soak a match stick in Indian ink, and when dry wind a thin piece of bare copper wire tightly round each



Made in a few moments.

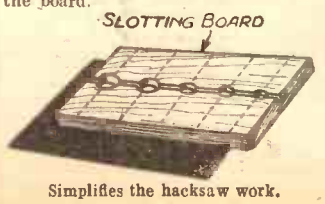
end, leaving two ends for connections. This leak is often suitable for connecting across terminals of an L.F. transformer to stop L.F. howling.

SLOTTING TERMINALS.

THERE are still many components made that are not fitted with terminals of the hexagonal or slotted-head type, and when the constructor has to tighten one up in an awkward place in the set he finds it difficult.

If there is room for pliers to be used it generally results in a badly mauled terminal-head. As sometimes they are difficult to hold in a vice while slotting with a hacksaw, the little slotting board shown will make it easy.

Wood of about ¾-in. thick will be suitable. The dimensions of same, diameter and depth of holes, etc., must, of course, be left to the maker, and the heads of the terminals should drop a little way below the surface of the board.

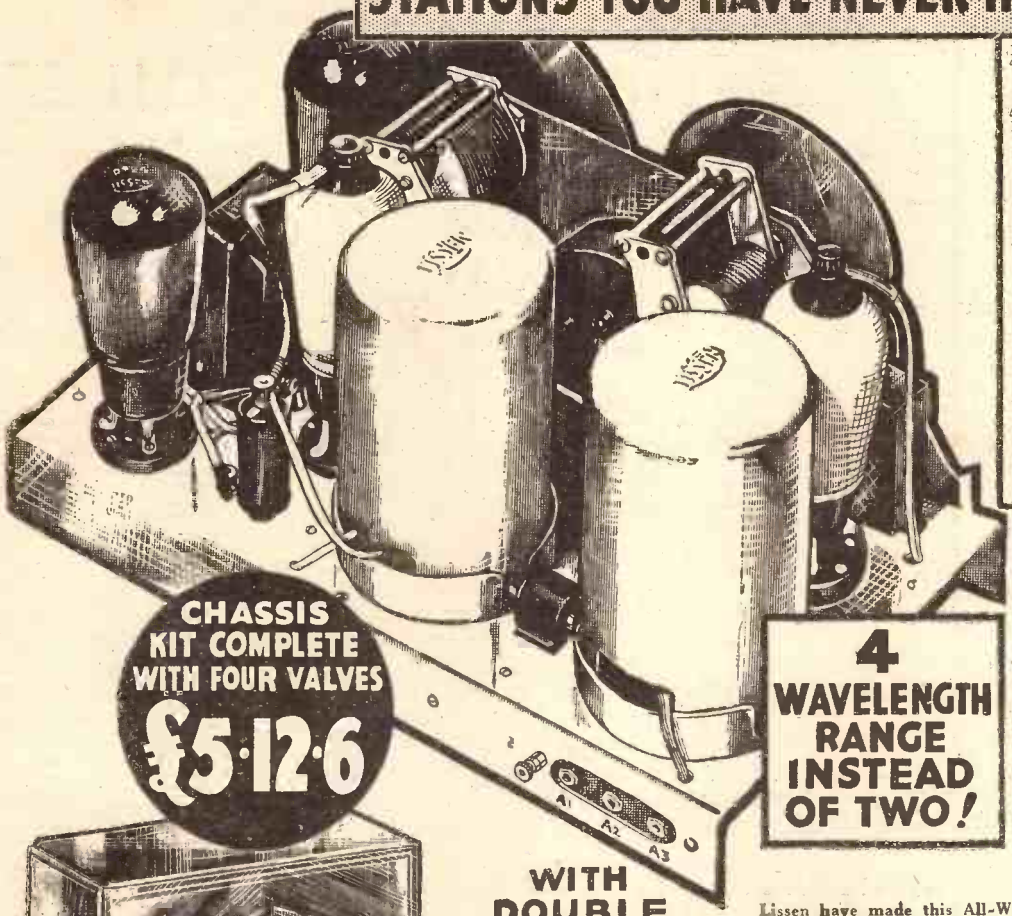


Simplifies the hacksaw work.

ALL-WORLD RADIO RECEPTION ON ULTRA-SHORT-SHORT-MEDIUM & LONG WAVES

Metres.	On Ultra Short Waves. Metres.
58. BANDOENG, Java.	30. MADRID.
50·26. VATICAN CITY, Rome.	25·63. PARIS, Radio Colonial.
50. MOSCOW.	25·6. WINNIPEG, Canada.
49·83. ZEESEN, Berlin. DJC.	25·57. EINDHOVEN. Holland.
49·67. MIAMI BEACH, Florida.	25·53. DAVENTRY. GSD.
49·5. CINCINNATI, U.S.A.	25·51. ZEESEN, DJD.
49·5. NAIROBI, Kenya.	25·4. ROME, 2RO.
49·18. BOUNDBROOK, New Jersey.	25·28. DAVENTRY. GSE.
49·18. CHICAGO, U.S.A.	25·27. PITTSBURG, W8XK.
49. JOHANNESBURG, S. Africa.	23·39. RABAT, Morocco.
48·86. PITTSBURG, U.S.A., W8XK.	19·48. VATICAN CITY, Rome.
48. CASABLANCA, Morocco.	19·82. DAVENTRY. GSF.
32·26. RABAT, Morocco.	19·73. ZEESEN, DJE.
31·55. DAVENTRY. GSB.	19·72. PITTSBURG, W8XK.
31·55. MELBOURNE, Australia.	19·56. SCHENECTADY, W2XAD.
31·48. SCHENECTADY, N.Y.	16·89. ZEESEN, DJE.
31·38. ZEESEN, Berlin. DJA.	16·88. DAVENTRY. GSG.
31·35. SPRINGFIELD, Massachusetts.	16·87. BOUNDBROOK, N.J. W3XAL.
31·3. DAVENTRY. GSC.	13·93. PITTSBURG, U.S.A., W9XK.
31·28. SYDNEY, Australia.	

STATIONS YOU HAVE NEVER HEARD BEFORE



CHASSIS KIT COMPLETE WITH FOUR VALVES £5·12·6

4 WAVELENGTH RANGE INSTEAD OF TWO!

WITH DOUBLE BALANCED PENTODE OUTPUT AND MOVING COIL SPEAKER

WITH WALNUT CABINET & MOVING COIL LOUDSPEAKER £8.2.6

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Publicity Dept.,
ISLEWORTH.
Please send me FREE copy of All-Wave All-World "Skyscraper" Chart.

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Address .....
..... Pop. 834

CHART FREE POST COUPON

At last the day of All-World Radio has arrived, and you can build with your own hands the first receiver to give you not only England and Europe, but America and Australia direct. The Lissen All-Wave All-World "Skyscraper 4" tunes from 12 to 2,100 metres. It brings two complete new wavelength ranges within reach of the ordinary listener—stations and programmes which before he was never able to receive—Ultra Short and Short-Wave transmissions from the ends of the earth. And, remember, you get these stations through Double-Balanced Pentode Output, giving brilliant reproduction on a Moving-coil Speaker—as much power as a Mains Set from ordinary high-tension batteries.

Lissen have made this All-Wave All-World Radio available to Home Constructors first, because it brings back the thrill of conquest to hear America and Australia *direct* on a set you have built yourself; it makes you an enthusiast to realise what a wonderful thing you have created!

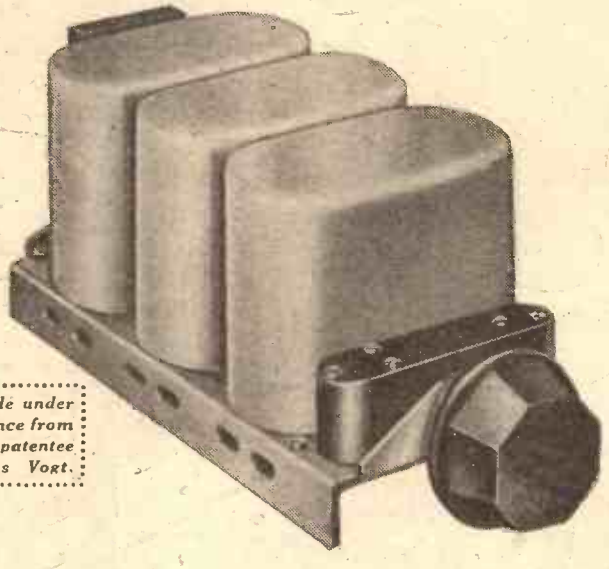
When you see the Great Free Chart of the All-Wave All-World "Skyscraper 4," which tells you how to build it and how to work it and why it gives such marvellous results, you will agree at once that it will be wise of you to build for yourself rather than buy a factory-assembled receiver which cannot give you these new and intriguing short-wave stations. The FREE CHART simplifies everything; there are pictures of every part, with every wire numbered, every hole lettered, every terminal identified. YOU CAN'T GO WRONG! But get the Chart and see for yourself—then build the Lissen All-Wave All World "Skyscraper 4," the SET THAT SPANS THE WORLD!

LISSEN ALL-WAVE ALL-WORLD 4 "SKYSCRAPER"

". . . and performance proves there's none as good as

COLVERN FERROCART COILS"

STAND No. 32 MANCHESTER RADIO SHOW September 27 to October 7



Made under licence from the patentee Hans Vogt.

There are very definite reasons for the efficiency of Ferrocart Coils. Their advantages are fully explained in a booklet which we have written. May we send you a copy? It's free.

Fit Ferrocart Coils in your next receiver . . . . . note the difference . . . . . the high selectivity . . . . . the improved performance

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COLVERN

THE NORTHERN STAR

DESCRIBED BY K. D. ROGERS

ONCE MORE "P.W." IS FIRST

THE ordinary radio receiving valve can be a wasteful thing, not due to any culpable inefficiency but because it is so basically designed that only a fraction of the energy it dissipates is usefully employed.

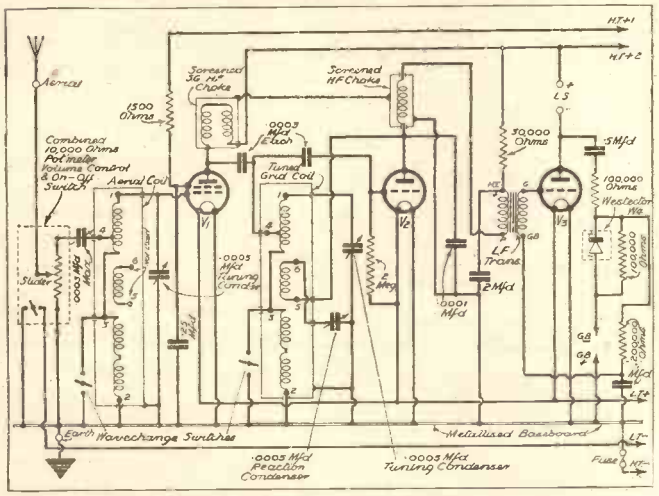
This is particularly true of the normal type of L.F. valve, Class B and Q.P.P. valves being excepted, for a remarkably small fraction of the anode current consumption is used for speech or music reproduction.

The emission goes steadily on at, say, some 12 or more milliamps, dependent on the individual valve, whether or not any modulation is being received. Thus, during the intervals of the broadcast programme, just as much H.T. power is being dissipated as when the heaviest parts of a brass band concert are being received.

Here is "P.W.'s" Latest "Economy" Three. It incorporates an ingenious device which automatically adjusts the H.T. current consumption in accordance with the programme volume.

The "Northern Star" is a particularly efficient receiver of the S.G., det. and L.F. type, with a very strong appeal to all battery users. At the same time it may be run from mains when these are available, and details are given of a special unit for accomplishing this.

VOLUME CONTROLLED AT THE INPUT



The components which provide the economy of H.T. current can be seen indicated between the anode and filament of the power valve. Among the other features of the receiver is the potentiometer volume control connected in the aerial circuit and incorporating the L.T. switch.

Problems of Waste.

And it must not be forgotten that the full grid swing of the valve, resulting in the full modulation of the anode current, is only reached on occasions when the programme is very loud—unless the set owner is a habitual noise fiend and constantly overloads his output valve by "turning the wick up" too much on his volume control.

Thus, for at least three-quarters of the running time of the valve, we use only some third or so of the energy it dissipates. Not exactly an economical state of affairs.

And to a lesser degree the same holds good where the detector is concerned, and the H.F. valve, too, when distant stations are being received. But these are not greedy with anode current like the output valve, so that we need not worry much about the unused current there.

With the output valve the waste is serious enough to require much consideration; and a great deal of thought has been given the subject. Class B, with its high maximum power and its "pay-for-what-you-use" characteristic, is one answer, but that does not solve the problem directly. It is an alternative.

Accumulated Saving.

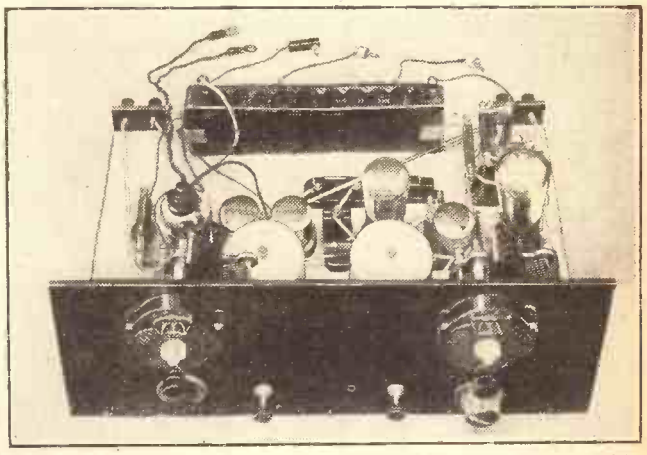
There is a direct solution, however, which is well worth consideration; and though the cost of the necessary components to act as the economising agent is in the neighbourhood of 15s. or 17s., the addition is well worth it, for a saving of something like 50% of the H.T. current consumption of the output valve results, with a total H.T. current saving for all the valves of an average three-valve set of some 35 to 40%.

It may be argued that 15s will buy a new 120-volt battery and leave something over. It will, but the economising parts do not wear out, and so one rapidly commences a direct saving in expense that becomes more and more noticeable.

Anyhow, to give readers the chance of incorporating such economy in their sets

(Continued on next page.)

SELF-REGULATED CURRENT SUPPLY



Seen in the top right-hand corner of this illustration are the condensers, resistances and Westector which provide the adjustment of H.T. current in accordance with the strength of the reproduction. Maximum current is only taken when the set is giving its maximum volume, so that during the course of a normal programme the average power comsumption is very low.

AUTOMATIC CONTROL OF H.T. CONSUMPTION

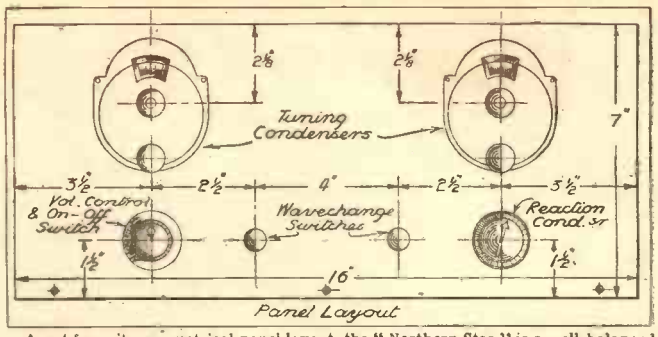
THE "NORTHERN STAR"

(Continued from previous page.)

we have recently described the construction of an H.T. economiser that can be added to an existing set, while at the moment of writing Benjamin Electric have produced a component expressly for that purpose, to be added to an existing receiver or incorporated in one that is to be built. That component should be available to the public shortly, though it was not in time to be included in the set described here, wherein we have also incorporated an H.T. economiser.

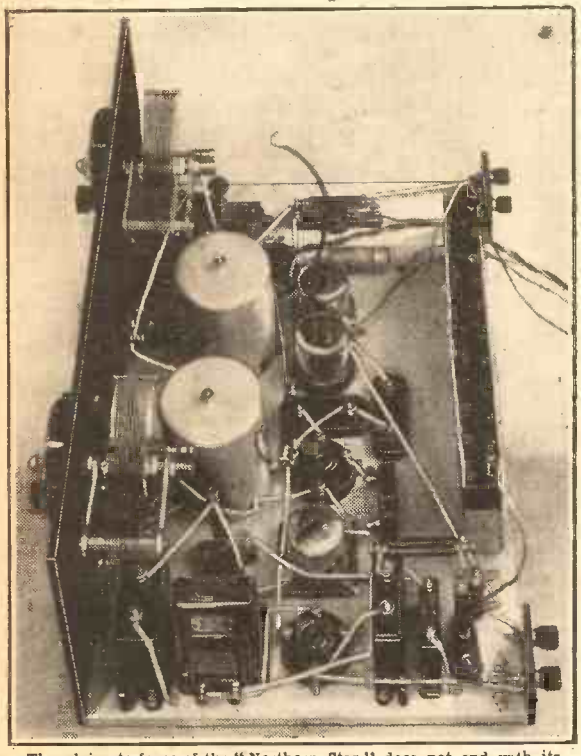
This particular set—the "Northern Star"—is a good example of economical running, for the total anode current taken with 120 volts H.T. and no broadcasting being received is about 5 milliamps. This with quite an ordinary output valve of the order of the P.M.2A. or P.220, which would, without the economising circuit, take by itself a matter of some 9 or 10 milliamps.

WELL BALANCED IN ALL WAYS



Apart from its symmetrical panel layout, the "Northern Star" is a well-balanced design in many other respects, including the balancing of high-tension consumption with volume.

ECONOMICAL AND EFFICIENT



The claim to fame of the "Northern Star" does not end with its automatic H.T. Current control. The design throughout is entirely in keeping with the modern ideas of all that is best in radio reception.

Varying Bias.

A large valve can be used, if desired, without the quiescent (or no-reception) current going up very much, but with the capability of a greater power output when strong reception is obtained.

The action of the economiser was fully explained in our issue dated Sept. 16th, and it will be remembered that briefly it is an automatic grid-bias adjuster for the output valve, which allows the bias to be increased to its limit consistent with good-quality reception, thereby reducing the anode current passed by the valve.

When a strong impulse arrives, necessitating a large grid-voltage swing, the bias is automatically decreased to its normal (or near normal) value, thus avoiding partial rectification and maintaining good-quality reproduction. During weak reception the bias is increased and the mean anode current falls accordingly.

This control is obtained by means of a Westector rectifier fed with L.F. impulses from the anode of the output valve, and controlling by a resistance-voltage feed the amount of negative bias applied to the output valve.

To start with, the valve is biased well down, with a much greater negative bias than is usual. This causes no distortion on weak reception, but would, if left, be fatal to quality on loud "signals." So the Westector rectifier is applied to control automatically the bias by adding positive bias to the grid when the strength of reception goes up, and *in proportion with that strength.*

Controlled by the Programme.

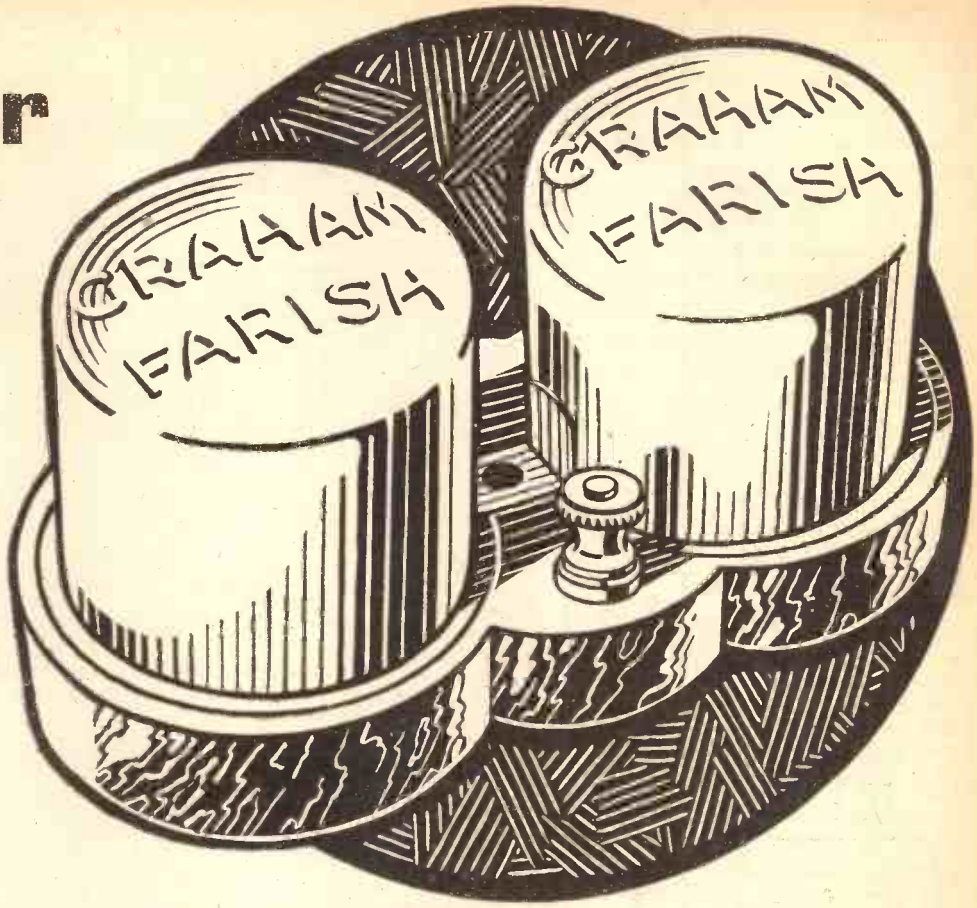
Thus is the negative bias reduced as and when required, being controlled automatically by the strength of the received programme at any given instant. It is akin to A.V.C. (automatic volume control) in

(Continued on page 100.)

BUILD YOUR SET WITH THESE PARTS AND DUPLICATE OUR FINE RESULTS

Component.	Make used by Designer.	Alternative makes of suitable specification recommended by Designer.
2 Dual-range shielded coils	Lissen	—
2 ·0005-mfd. tuning condensers	Graham Farish	Telsen, Polar, Utility, J.B.
1 L.F. transformer	Lissen Hypernik	R.I., Telsen, Varley, Ferranti
1 Screened binocular H.F. choke	Graham Farish L.M.S.	Telsen
1 10,000-ohm potentiometer, with on/off switch	Telsen	Bulgin, Lewcos, Igranic
1 ·0003-mfd. (max.) preset condenser	Goltone	Polar, Igranic, Telsen
1 Screened H.F. choke	Graham Farish H.M.S.	Telsen, Wearite, Bulgin
1 ·0005-mfd. reaction condenser	Graham Farish	Polar, J.B., Telsen, British Radiogram
1 2-mfd. fixed condenser	T.C.C.	Dubilier, Igranic, Telsen, Ferranti, Lissen
1 ·5-mfd. fixed condenser	"	
1 ·1-mfd. fixed condenser	Telsen	T.C.C., Ferranti, Dubilier, Lissen, Igranic
1 ·25-mfd. fixed condenser (wire ends)	T.C.C., type 250	Dubilier
2 ·0003-mfd. fixed condensers	Dubilier, type 610	Telsen, Graham Farish, Lissen, T.C.C.
1 ·0001-mfd. fixed condenser	Telsen	Lissen, Dubilier, Graham Farish, T.C.C.
2 100,000-ohm resistances with terminals or wire ends	Graham Farish "Ohmite"	Dubilier, Telsen
1 200,000-ohm resistance with terminals or wire ends	Graham Farish "Ohmite"	Dubilier
1 100,000-ohm resistance with vertical holder	Graham Farish "Ohmite"	—
1 30,000-ohm resistance with vertical holder	Graham Farish "Ohmite"	—
1 1,500-ohm resistance with horizontal holder	Graham Farish "Ohmite"	Ferranti
1 2-megohm grid leak with terminals or wire ends	Graham Farish	Telsen, Dubilier, Igranic, Lissen
1 Westector	Westinghouse W.4	—
3 Four-pin valve holders	Telsen Anti-microphonic	W.B., Benjamin, Lissen,
2 2-point push-pull switches	Goltone	Lissen, Telsen, Wearite, W.B.
2 Slow-motion condenser drives	Telsen (oyster type)	Ormond
4 Terminals	Belling-Lee	Bulgin, Clix, Igranic, Eelex, Goltone
4 Wander-plugs	Goltone	Bulgin, Belling-Lee, Clix, Igranic
1 Wander-fuse	Belling-Lee	—
2 Accumulator spades	Belling-Lee	Goltone, Clix, Igranic, Bulgin, Eelex
1 Panel, 16 in. x 7 in.	Peto-Scott	—
1 Metaplex baseboard	Peto-Scott	—
4 yards insulted sleeving	Goltone	Lewcos
6 yards 18-gauge T.C.C. wire	Goltone	Lewcos
1 Pair G.B. battery clips	Bulgin No. 1	—
2 Terminal strips, 2 in. x 1½ in.	Peto-Scott	—
Flex, screws, etc.	Peto-Scott	—

Superior at every point



H.M.S.
Single Screen
H.F. CHOKE

A small but efficient screened choke which will be found satisfactory in use in all types of circuits where the extra high efficiency of the L.M.S. Twin Screened Choke is an unnecessary extravagance. Suitable for long, medium and short wavelengths. PRICE **2/6**

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LONG MEDIUM SHORT L M S H.F. CHOKE

TWIN SCREEN

the very latest in high-frequency practice, embodying the advantages of the binocular with the screened type. Its efficiency on long and medium wavelengths is of a very high order, while it may satisfactorily be employed for wavelengths as low as 12 metres.

Impedance at 500 metres, 400,000 ohms. Inductance 200,000 microhenries.

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THE "NORTHERN STAR"

(*Continued from page 98.*)

its conception, and might well be termed A.B.C. (automatic bias-control).

This, then, we have incorporated in the "Northern Star," ensuring that it shall be economical in operation while using ordinary valves.

The rest of the set is perfectly straightforward, being of the screened-grid amplifier and leaky-grid detector type, with tuned grid feed from the S.G. valve to the detector.

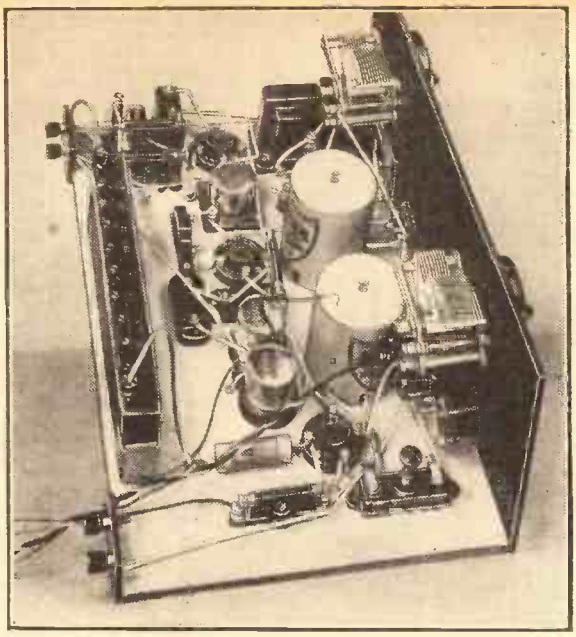
The aerial input is controlled by the potentiometer and preset condenser feed, the potentiometer also having incorporated with it the filament switch. Reaction is non-differential, a straight type of reaction control being employed with the reaction condenser on the earth side of the reaction coil.

The detector anode feed is decoupled by the well-known resistance-capacity method and the detector is coupled to the output valve through an ordinary 1 : 3 ratio L.F. transformer.

The whole set is built on a "Metaplex" baseboard, the metallised surface of the baseboard being used as connection between many of the earthed points, such as L.T. negative.

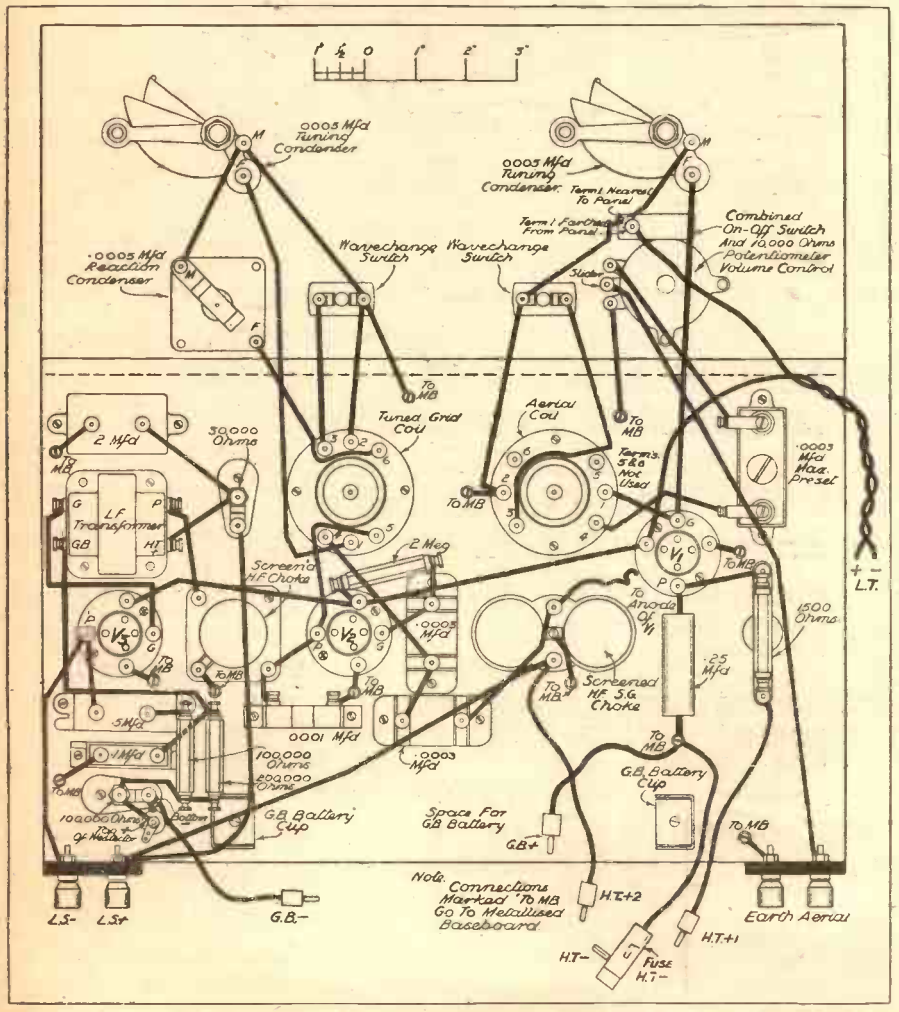
RECOMMENDED VALVES FOR THE THREE STAGES

Make.	S.G.	Detector.	Output.
Mullard	P.M.12A	P.M.1H.L.	P.M.2A. or P.M.202
Cossor	220S.G.	210 H.F.	220P.A. ,, 230X.P.
Mazda	S.G.215	H.L.2	P.220 ,, P.220A.
Marconi	S.22	H.L.2	L.P.2 ,, P.2
Osram	S.22	H.L.2	L.P.2 ,, P.2
Hivac	S.G.210	H.210	P.220 ,, P.P.220
Eta	B.Y.6	B.Y.2020	B.X.604 ,, B.W.602



Both the preset condenser for adjusting selectivity and the potentiometer for controlling volume are visible in this view taken from the high-frequency end of the receiver.

THE METALLISED BASEBOARD SERVES A DUAL PURPOSE



By employing a metallised baseboard, screening is obtained in an easy manner, and, at the same time, wiring is simplified because certain leads may be attached to it direct.

Grid-Bias Requirements.

The operation of the "Northern Star" on battery H.T. (we are, later in the article, to discuss a special mains unit for the set) is quite normal. There are two H.T. plus taps, one for 75–80 volts and the other for 120 volts, and labelled H.T.+1 and H. T.+2 respectively.

The grid-bias battery should be a large one, having about 15 volts to allow the output valve to have as much bias as is consistent with good results.

The S.G. valve is of ordinary type, as are the detector and output valves, any of those mentioned in the valve list being suitable.

YOU WILL ALSO NEED:—

BATTERIES.—H.T., 120-volts: Lissen, Ediswan, G.E.C., Marconiphone, Pertrix, Ever Ready, Siemens, Drydex, etc.
G.B., 16½ volts: Ever Ready, Lissen, Siemens, Ediswan, Marconiphone, Drydex, Pertrix, etc.
L.T., 2 volts: Ediswan, Block, Exide, Lissen, Pertrix, G.E.C.

MAINS UNIT.—Special "P.W." Northern Mains Unit designed for this receiver is described on page 102 of this issue.

LOUDSPEAKERS.—Blue Spot, Rola, W.B., R. & A., Marconiphone, Ormond, Ferranti, H.M.V., Celestion, G.E.C., Magnavox, Epoch, Atlas, etc.

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

The first thing to do on connecting up the set is to place the grid-bias tap for the output valve in the correct voltage in accordance with the makers' recommendation for normal working.

When this is done turn the volume control to the right, switching on the set, and tune in the local station. It may be a little distorted on loud passages, due either to overloading or the action of the

(*Continued on page 102.*)

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"Better than wire wound."

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HEAVY DUTY TYPE 2/3

1/6

Safe maximum current carrying capacity of "Ohmites."

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
4,000	24	50,000	5·5
5,000	20·25	60,000	5
10,000	12	80,000	4·24
Other values pro rata		100,000	3·5

Safe maximum current carrying capacity of "Ohmites" Heavy Duty Type.

100° F Temperature Rise

Ohms.	Milliamps.	Ohms.	Milliamps
1,000	80	20,000	16
2,000	70	30,000	13·5
3,000	58	40,000	12
4,000	48	50,000	11
5,000	40·5	60,000	10
10,000	24	80,000	8·48
Other values pro rata.		100,000	7

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THE "NORTHERN STAR"

(*Continued from page* 100.)

economiser, which as yet is not set for proper operation.

Now tune in a more distant station until you get quite weak reception in the loudspeaker. Switch off and then reduce your bias to just under twice the amount. Switch on and try the same station again. If it is now distorted reduce the bias 1·5 volts and try again. Repeat until a bias point has been found where the weak reception is undistorted, but with as much bias as is consistent with undistorted results.

Then retune your local, reducing the volume control, if necessary, to avoid distortion due to overloading. Adjust the bias once more, if necessary, on quiet music or speech, and then the set is ready for normal operation.

Always switch off before removing the bias plug, and remember that as much negative bias as possible should be used.

THE NORTHERN MAINS UNIT

Specially Designed For the "Northern Star."

MANY constructors of the "Northern Star" will have the opportunity of using the electricity supply in their houses as source of H.T., and to these we would make strong recommendations that they do so.

Here, as in the case of the economiser, the initial outlay (for the mains-power unit) may be more than for an H.T. battery or two, but the final saving of money and the increased power available at low cost make the outlay well worth while.

With the mains unit the set can be used exactly as it stands, except that there is no need for the economiser. There is no sense in economising from the mains: the power taken from them is so small.

So we have designed an A.C. mains unit that will fit on to the "Northern Star," and incorporating in it not only the mains rectifier and smoothing equipment, but an output choke filter to isolate the loudspeaker from H.T.

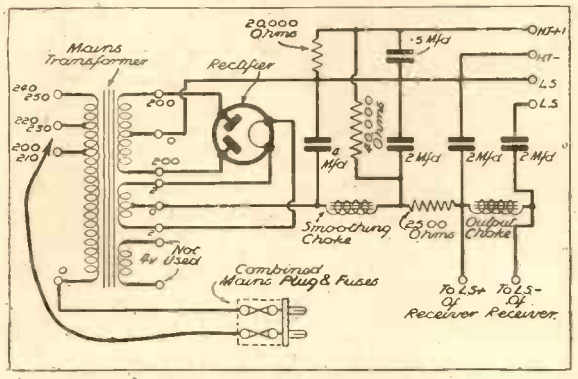
The unit will provide 150 volts of clear power to the set, and the attachment of it is extremely easy. We will suppose you have built the "Northern Star," just leaving out the Westector, its ·5 mfd. condenser, two 100,000 ohms and the 20,000 ohms resistances and the ·1-mfd. condenser. These can all be omitted without disturbing any of the other connections to the set. G.B. should now be taken direct to G.B. on the transformer.

Now for the mains unit. This is constructed on a piece of baseboard, without panel, but preferably with some form of well-ventilated box into which it can be placed out of harm's way.

SPECIALLY DESIGNED

A view of the completed unit, which has been designed specially for supplying H.T. to the "Northern Star" when mains are available.

A FILTER IS INCORPORATED



One of the features of the circuit is the inclusion of an output filter, the leads from the loudspeaker being taken direct to the terminals on the unit itself instead of to the receiver.

It consists of the mains input plug and the two fuses, a mains transformer, rectifier valve and valve holder, reservoir condenser (4 mfd.), combined H.F. and L.F. smoothing choke, smoothing condenser, resistance potentiometer for the S.G. tapping (H.T.+1), a further smoothing condenser and a voltage-limiting resistance, output filter choke and output condenser. A few terminals complete the whole affair.

Isolating the Speaker.

So there is not a great deal in it, though you can get a great deal out of it. It will enable the user to employ a large output valve in the "Northern Star," and using the normal bias (for no economiser is now used) get the full output power of which it is capable, giving it the full 150 volts H.T.

The output filter in the mains unit automatically comes into position in the anode circuit of the output valve when the power pack is connected to the set, and immediately isolates the H.T. potential from the loudspeaker.

As the maximum H.T. feed in the receiver is connected to the L.S.+ terminal there is no need in the mains unit to have an H.T.+2 terminal, so that the H.T. + 2 flex lead and plug on the set are not required, H.T. + 2 being fed to the set via the loudspeaker filter connection in the unit, which is joined to L.S.+ terminal on the set.

Satisfactory Regulation.

Thus there are only two H.T. terminals on the unit. One is for H.T.— and the other for connection with the H.T.+1 flex lead, which is joined to the screening-grid resistance feed of the S.G. valve holder.

In order to obtain a centre-tapped rectifier L.T. winding on the mains transformer the 2–0–2 L.T. winding has been used in this unit, the other winding being left unconnected. The regulation is perfectly satisfactory with this alteration, while a centre-tapped filament feed for the rectifier is obtained.

The wiring of the unit is self-evident, so that there is no need to discuss it fully. It might be advised, however, that good rubber-insulated wire be used for wiring instead of ordinary Systoflex or sleeving, as we have found it will stand higher voltages without risk of breakdown of the insulation.

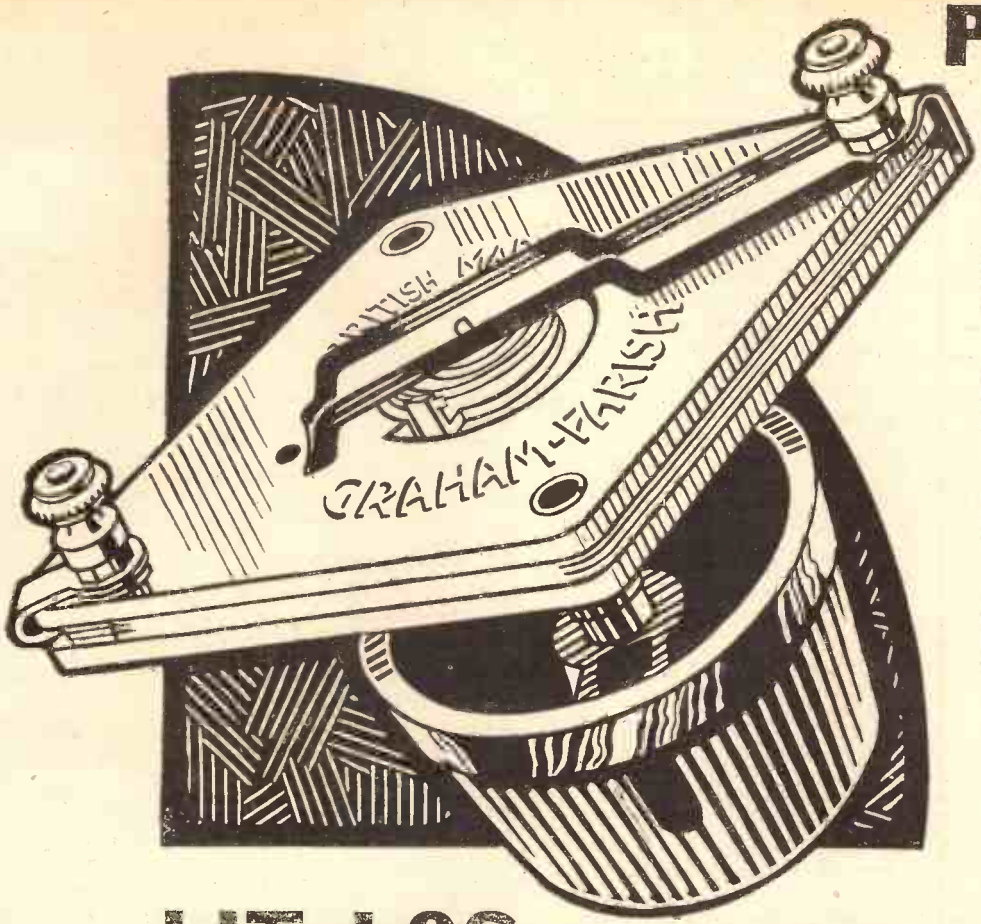
(*Continued on page* 104.)

FULL DETAILS ABOUT THE PARTS TO USE

Component.	Make used by Designer.	Alternative makes of suitable specification recommended by Designer.
1 Mains transformer	Telsen W.300	—
1 Smoothing choke	R.I. Audirad	—
1 Output choke	Telsen W.302	Varley, Lissen, R.I.
1 4-mfd. fixed condenser	Dubilier	T.C.C., Ferranti, Lissen
1 2-mfd. fixed condenser	T.C.C., type 50	Igranic, Dubilier, Lissen, Ferranti, Telsen
1 2-mfd. fixed condenser	T.C.C., type 87	Dubilier, Ferranti
1 2-mfd. fixed condenser	Lissen	Dubilier, Telsen, T.C.C., Igranic, Ferranti
1 ·5-mfd. fixed condenser	Telsen W.228	Lissen, Ferranti, Dubilier, T.C.C.
1 40,000-ohm resistance with terminals or wire ends	Dubilier (1 watt)	Graham Farish
1 20,000-ohm resistance with terminals or wire ends	Dubilier	Graham Farish
1 2,500-ohm resistance with terminals or wire ends	Graham Farish "Ohmite"	Dubilier
1 Four-pin valve holder	W.B., small type	Telsen, Lissen, Benjamin
1 Mains plug, with fuses	Bulgin F.15	—
6 Terminals	Belling-Lee	Clix, Igranic, Bulgin, Eelex
1 Baseboard, 10 in. x 7 in.	Peto-Scott	—
1 Terminal strip, 7 in. x 1½ in.	Peto-Scott	—
2 yards connecting wire	Radiophone Pull-back	—
Flex, screws, etc.	Peto-Scott	—

RECTIFIER. Marconi or Osram U.10; or Mullard D.W.2, Cossor 506B.U., Mazda U.U.60/250.

Preferred and praised by every Expert

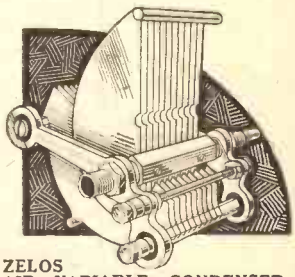


LIT-LOS CONDENSER

A very carefully constructed instrument, compact in size and efficient in design, with accurately gauged bakelite dielectrics and solid brass pig-tail connection to moving vanes. Made in all sizes up to ·0005 mfd. (500 cms.) in log mid line and straight line capacities. Used by many leading manufacturers and specified in sets by famous designers. One hole fixing; supplied complete with terminals. Particularly low loss. PRICE 2/-

LIT-LOS DIFFERENTIAL CONDENSER

A highly efficient condenser, similar in general construction to the Lit-Los Variable type, but having two sets of fixed vanes, enabling the rotor plates to engage differentially between them. The terminals are somewhat differently disposed, but otherwise the instrument is identical in construction with the Log line and Reaction types. All capacities up to ·0005 mfd. (500 cms.) **PRICE 2/-**



ZELOS AIR VARIABLE CONDENSER

A superb component possessing extreme rigidity of construction, mechanical perfection of moving parts, and highly electrical efficiency. Negligible H.F. loss, large accessible terminals, floating shaft for easy ganging and adjustment of spindle length. **PRICE** ·0005 mfd. **5/-**

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THE "NORTHERN STAR"

(*Continued from page 102.*)

The connection of the unit to the set is similar to that employed when an H.T. battery is used, except, as mentioned before, that H.T.+2 is omitted, it being obtained via the L.S.+ terminal on the set.

The actual loudspeaker is taken to the L.S. terminals on the mains unit instead of to the set, and L.S. + and — on the set are joined respectively to L.S. + and — on the mains unit.

The tapping points on the mains transformer labelled 200/210, 220/230 and 240/250 refer to the voltage of the electric light mains, and the transformer should be connected up in accordance with that voltage.

Replacing Fuses.

Should you want to get at the fuses in the combined mains plug and fuse holder used in the unit, access is easily obtained by unscrewing the two thumb screws on the front of the male portion of the component. On removing these from the bolts on which they fix, the front plate of the plug comes away, revealing the two fuses, which are held firmly against the backs of the plugs by means of springs. Normally the fuses should be of the 1-amp. capacity type, and on replacing the cover the greatest care should be taken that the two nuts are tightly screwed up.

Dual Purpose Choke.

A specially interesting feature of the mains unit is the combined H.F. and L.F. smoothing choke that we have mentioned previously. This is the "Audirad" choke, which contains an ingenious arrangement of L.F. and H.F. choke windings to provide efficient smoothing of both L.F. and H.F. ripples.

The result is that, should the unit be used on mains, where there is an unusual amount of superimposed H.F., this will be dealt with on passing the rectifier by the H.F. choke in the special component. The L.F. ripple left by the rectifier will at the same time be smoothed by the L.F. section—in conjunction with the associated condenser, of course.

Thus the output from the "Northern" mains unit is particularly free from mains interference, a point that will be appreciated by large numbers of constructors who are "blessed" with dirty mains supply.

Sure to Arise.

The question is sure to arise as to whether the unit is suitable for use on other sets than the "Northern Star," for some who have sets will wish to use their existing sets for a time, getting the mains unit going and then building the "Star" later.

The answer is "Yes," but with certain possible modifications that may have to be made to the set in order to accommodate the unusual output circuit of the mains unit. It is essential that the output of the set be a direct one, with the anode of the last valve going to one loudspeaker terminal and the other speaker terminal connected to H.T. maximum.

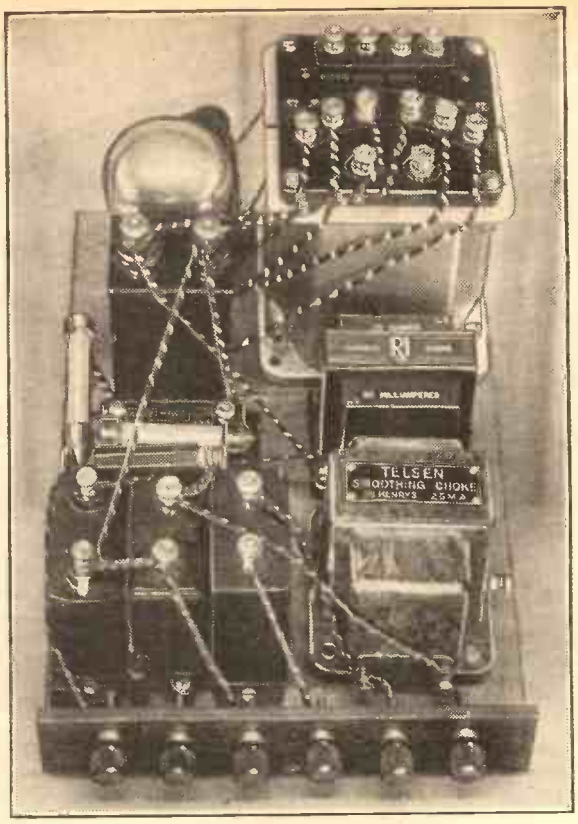
The reason for this lies, of course, in the fact that an output filter is connected in the mains unit in the output circuit, placing this filter between the H.T. supply to the last valve and the loudpeaker.

Simple Alterations.

Another essential is the supply of the points in the set taking the maximum H.T. from the non-plate side of the loudspeaker connection—that is, from the loudspeaker terminal that does not go to the anode of the output valve.

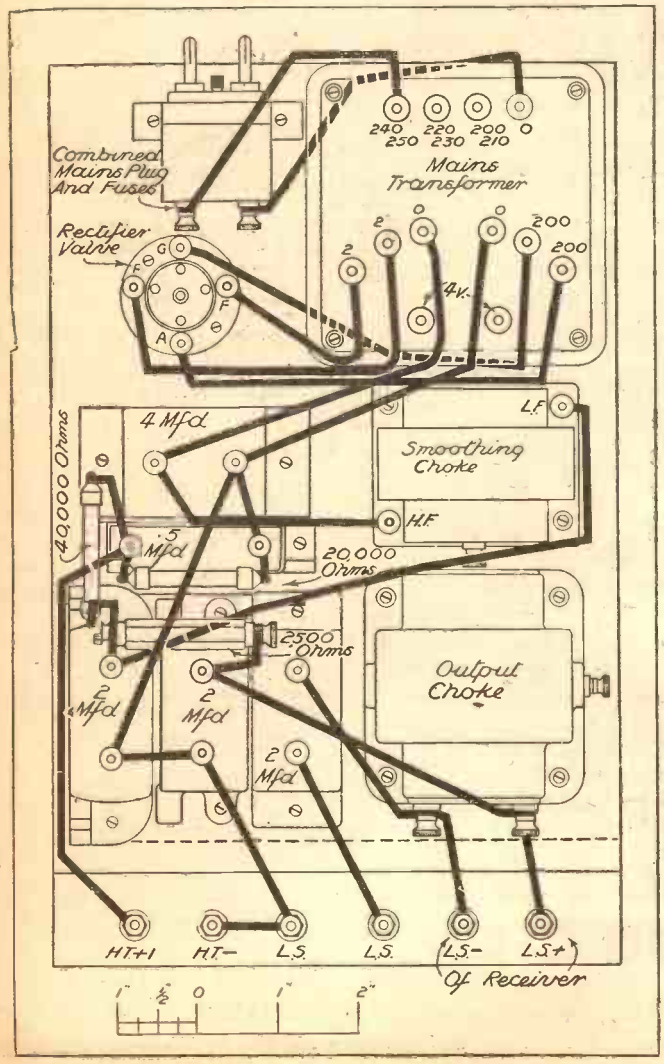
Finally, it must be remembered, if it is considered desirable to use the "Northern" mains unit with another set than the "Star," that there is only one H.T. feed other than the maximum—that for the S.G. screen grid—so that if the set has other H.T. points these must be taken either to the S.G. screen feed or to the maximum, depending on the circuit of the set. In most cases the connection to the maximum, with decoupling where necessary, will be most desirable.

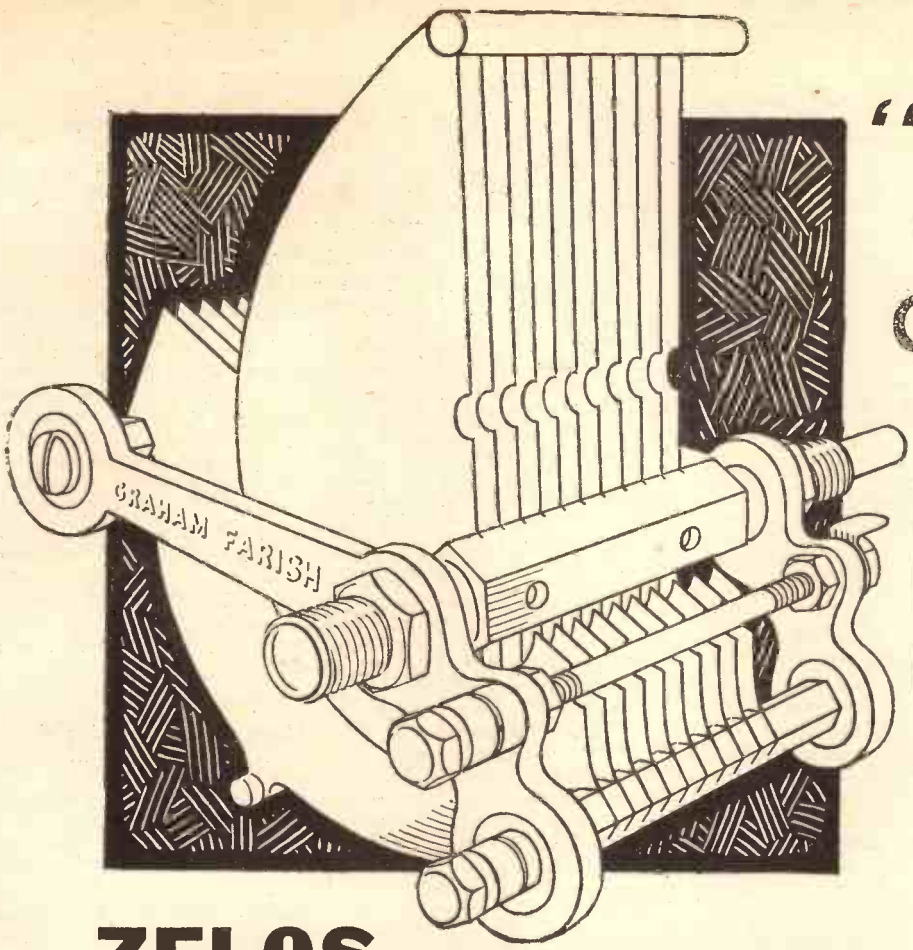
The "Northern" mains unit was not designed to be used with other sets than the "Northern Star," and we cannot guarantee that every set will be capable of suitable alteration to take the unit. In many cases the alteration of the H.T. feeds may be too complicated, but in simple circuits it should be possible to carry them out satisfactorily.



EASILY DUPLICATED BY ANY CONSTRUCTOR

An exact copy of the original unit can be made by anyone who follows the wiring and layout diagram on this page. The photograph above of the completed assembly will prove an aid when wiring if the run of the leads is studied in conjunction with the diagram.





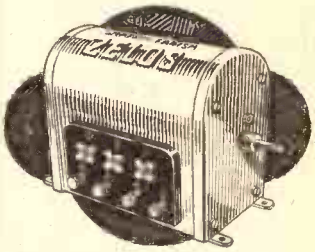
"When better Condensers are possible I'll build them"

Graham Farish.

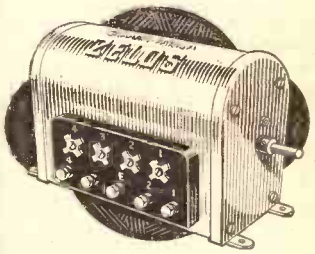
ZELOS VARIABLE CONDENSER

A superb component, possessing extreme rigidity of construction, mechanical perfection of moving parts and high electrical efficiency. Negligible H.F. loss, large accessible terminals, shaft provides easy ganging. Capacity ·0005. mfd. EACH

5/-



ZELOS THREE-GANGED CONDENSER - - 19/6



ZELOS FOUR-GANGED CONDENSER - - 27/6

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BEHIND THE SCENES OF GERMAN RADIO DRAMA

The presentation of plays by radio has achieved greater artistic merit in Germany and Great Britain than in most other countries. Yet the German method differs widely from our own. Exactly how German plays are "put over" is explained by Our Berlin Correspondent.

RADIO drama promises to become a new manner of art expression. Only the other day a well-known Italian dramatist said that the theatre was dead and that radio drama had taken its place.

Even if this is not the case, I have heard uncommonly good radio plays from B.B.C. stations, from German and from Swedish stations. This does not mean that the French don't manage a radio play now and then, and that other countries like Italy and Austria are not well up in radio drama; but I do know that British radio drama and German radio drama are the only two one can compare on an equal basis.

The Production Side.

Even then the basis is not so very equal after all. The financial means in production are equal and the equipment could be, so let us leave authors and their fees and German and British taste in radio plays aside, and turn to the production of radio drama in Europe's two most important and most wealthy—in radio—countries.

The B.B.C. productions director, Mr. Gielgud, was most kind in giving me every facility for studying production in the new and thoroughly up-to-date studios and control rooms at Broadcasting House, after I had already paid a visit to the old Savoy Hill.

On the other side, the Funkstunde in Berlin (which possesses many most enthusiastic radio drama producers and exponents), and the Bavarian broadcasting company gave me *carte blanche* to watch play production in progress. I have stood beside the players at the general rehearsal, have sat next to the producer during the performance—and I only hope I did not make myself a nuisance.

Our Own Method.

The B.B.C. produces from the listener's point of view. After the first spade work is done, the producer goes up to his dramatic control room and does not see anything of the players. During the performance he sits at the dramatic control board with an engineer next to him. Cues are given by flicking a light in the studio concerned.

The producer unites the sounds originating in a number of studios to one mass of sound—the radio play. He can balance the words against a background of music to a nicety. He only needs to turn a knob or two.

In Germany the producer likes the personal touch. In fact, he likes it so much that I have witnessed a producer tugging the heroine away from the microphone during the last rehearsal. The result was that she stopped, broke into tears (she was playing Goethe's "Iphigenie"), and couldn't go on for some time. Luckily, it didn't happen during performance.

How They Do It.

In Germany the practice is for the producer to stand close to the players during the performance. Everybody stands with eyes glued to text books and the producer makes faces at the poor player to encourage him. The idea is that the producer should take the place of the missing audience. But I would like to see an audience making unintelligible signs to a man who is supposed to be dying to go closer to the microphone! In Berlin there seems to be even a smaller number of rehearsals than at Broadcasting House.

The German producer gets his signals as to how things are going from an engineer at the control panel which is situated in a silence cabinet immediately off the studio. The engineer frantically waves his hand and the producer tiptoes up to the cabinet, goes in, hears what is wrong and tip-toes back to his players.

In Berlin the whole paraphernalia—noises, orchestra and players—are all in one huge studio. The players speak in small stuffy tents. The producer stands at the opening with one eye on the engineer at the other side of the window and the other on his players. The noise man eagerly watches for the signal to start ringing the bell or whatever it is. I have seen times when he didn't look at exactly the right moment—and then the bell just didn't ring!

Rather Primitive.

If the music background is too loud, more signs, with a red light next to the microphone. If it is too soft, signs with a white light. The conductor looks round anxiously and makes a face at the man behind the window. The green light flashes, everything O.K. The conductor smiles and doesn't look again—till one of his musicians frantically gesticulates that the red light has been flashing once more!

Crowd noises are very realistically enacted by a crowd of people outside in one of the courtyards, with one of the assistant producers frantically conducting them.

I know this all sounds very primitive. But at the loudspeaker end it seems all right, so why bother to find out which method is best?

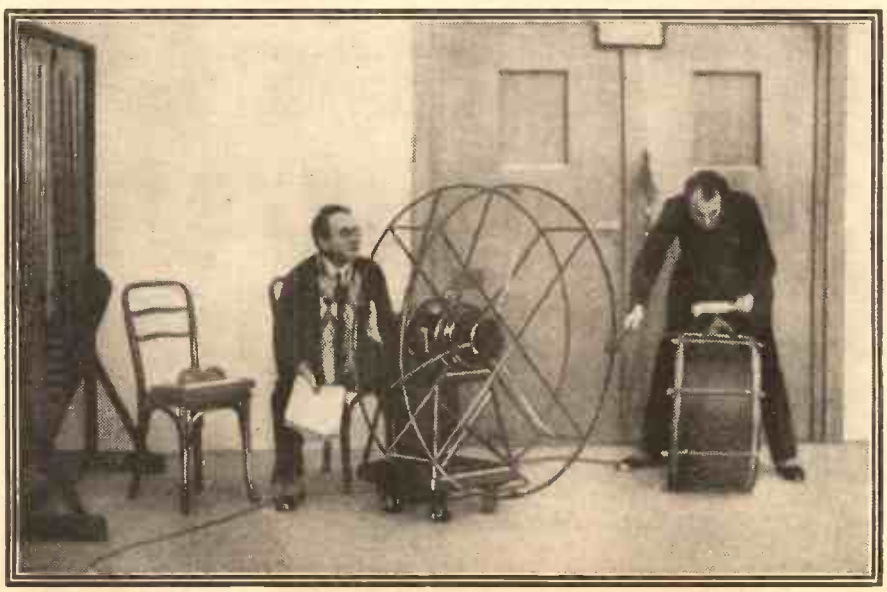
Try a Comparison.

If the producer prefers tiptoeing about and getting into a state because he would like to know what it sounds like in the loudspeaker, but doesn't dare to leave the heroine or the hero alone; if the crowd doesn't mind playing in a cold courtyard instead of using an echo-room; if the players do not mind dying and making love in close and stuffy little tents; and if the listener doesn't mind having the music a little too loud now and then—well, why worry!

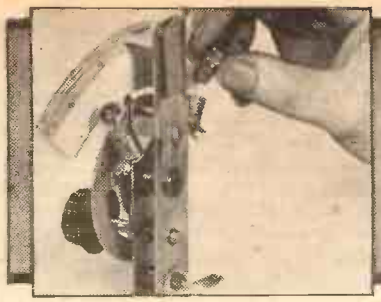
Next time you hear a German station doing one of these dramatic broadcasts, listen carefully, and see what you think of the general effect.

If you are lucky enough to find a British station putting out a similar programme, a comparison should be extremely interesting.

ARTIFICIAL "REALISM" FOR RADIO PLAY LISTENERS



"Noises off" in Germany (as at Broadcasting House) are created by a weird paraphernalia of mechanical devices and musical instruments. Real crowds are employed in an outside courtyard for outdoor "scenes."



ILLUMINATING REFINEMENTS

The fact that a receiver or radiogram is an electrically-operated device makes available to all set owners a readily tapped source of electrical power which can be used to illuminate the dials and shed light on the inner nooks and crannies of one's apparatus, as explained below

By B. AUSTIN.

THE proverbial "ha'porth of tar" is never more valuable than in matters relating to radio. We might, if we wish to be very accurate, use the word "trouble" in the place of "tar"; but the same meaning is implied, and the only reason I have for suggesting such accuracy is that I do not want it to be thought that I have discovered any advantage in tarring radio sets!

When you have at last found *the* set, successfully constructed it and are ready to place it amongst the other "household gods," the time has then arrived for

A LAMP-LIT RECORD

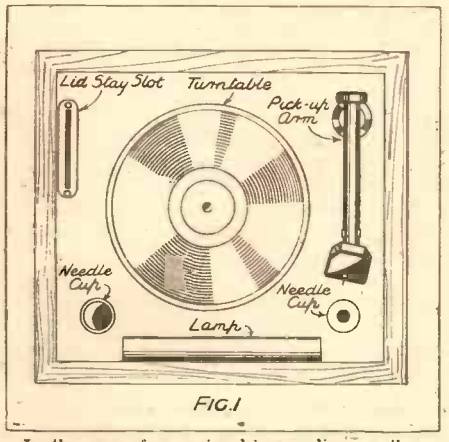


FIG.1

In the case of a mains-driven radiogram the fitting of a shaded lamp of tubular shape on the motor-board is very simply accomplished.

careful and ingenious expenditure of the "ha'porth."

There are always a number of refinements that immediately suggest themselves, and these are usually concerned with the appearance and ease of control of the completed job.

Extremely Useful.

There is, however, one point in regard to home-constructed radio sets that never seems to receive enough attention, in spite of the fact that its possibilities are tremendous.

I refer to pilot lamps and receiver illumination generally.

Many of the finest modern receivers carry no pilot lamp at all, and those that do seem almost to be ashamed of it, for the light is, in most cases, arranged merely to fulfil some necessary purpose, such as to illuminate an otherwise invisible dial or indicate that current is being consumed.

The most extraordinary part about it is that there is usually plenty of current to spare in the receiver for any lamps that may be useful, and that the wiring necessary is always quite simple and straightforward.

I intend, therefore, to mention a number of schemes that I have come across from time to time and which have been successfully and effectively applied to receivers and radiograms.

Two Types Available.

It is highly probable that among them you will find one which will fit in with your own ideas and which will prove to be the most valuable "ha'porth" for your set.

There are roughly two classes of lamps that can be used. The mains-set owner can choose between the full-mains-voltage lamp or the low-voltage bulb of the pocket-lamp type which can be fed off the L.T. supply.

The battery user is, of course, confined to the latter variety.

The first type is to be recommended on mains-driven radiograms.

A really brilliant light to illuminate the turntable and pick-up is almost always a great advantage, and no great ingenuity is required to arrange that the lamp is only on when the cabinet lid is lifted.

COMBINED SWITCHING

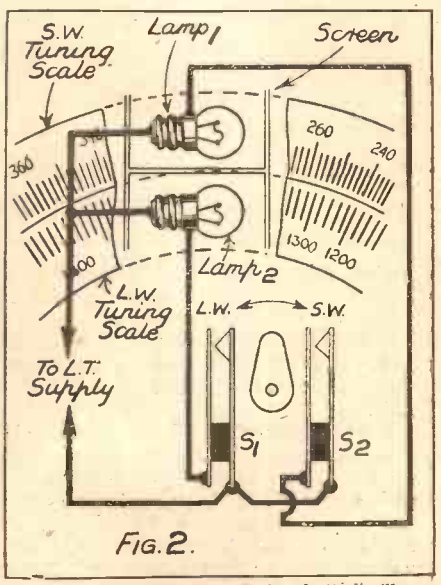


FIG. 2.

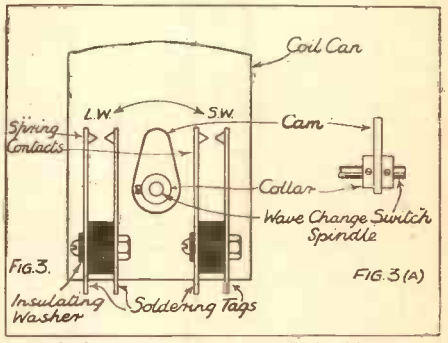
The fitting of a device which selectively illuminates either wavelength scale of the tuning dial, and operated by the wavechange switch, presents very few difficulties to the radio handyman.

A shade of some sort is necessary to prevent dazzle and to ensure that the rays from the lamp are thrown in the required direction.

An ordinary 40-watt bulb can be used for this job quite successfully, but the most effective is undoubtedly the tubular-shaped lamp that is nowadays employed so much for the increasingly popular "concealed houselighting."

These lamps are slightly more expensive than the ordinary kind, but they have the

HOW IT IS DONE



Dial illumination can be combined with wavechange switching by the use of a cam actuating the two lighting switches.

advantage of being unobtrusive and take up very little space.

If this type of lamp is used it should be mounted in the front of the motor-board "well," as shown in the accompanying drawing; this entirely prevents the light falling on the operator's eyes and throws a "flood" over the turntable and pick-up.

Placing The Lamp.

On instruments that are fitted with a raised motor-board a suitable position for the lamp will be found on the inside of the cabinet lid; the light is, in this case, directed downwards on to the motor-board.

A button trip switch can be used to operate the lamp as the lid is lifted; a small bracket can be fastened to the lid tray to strike the switch button in the lifted position.

Another refinement that comes within the mains-lamp category, and which I have personally used to great advantage, consists of fitting inside the radiogram cabinet a power socket which is wired across the incoming main.

This enables you to plug in an inspection lamp when the inevitable breakdown occurs; the advantages are too obvious to require mention.

(Continued on next page.)

ILLUMINATING REFINEMENTS

(*Continued from previous page.*)

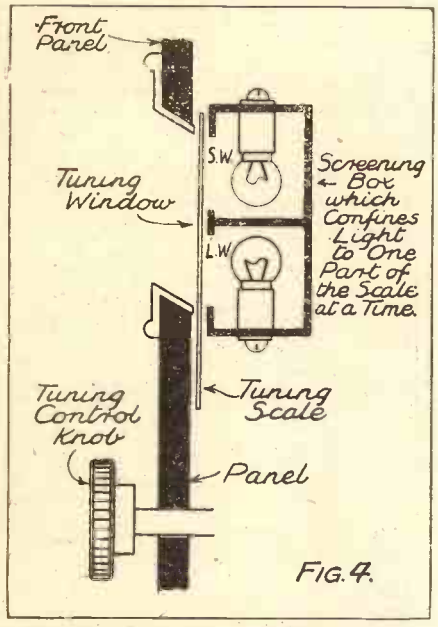
The socket should be wired *before* the receiver switch, so that the lamp will remain alight when the receiver is switched off.

One of the less obvious joys of this arrangement is that an electric soldering iron can be plugged in close to the job.

We can now turn to the more subtle uses of the little pocket-lamp bulb.

One of the most attractive arrangements I have so far seen employing these bulbs allows only that waveband that is being used to be illuminated on the condenser scale.

PREVENTING "INTERFERENCE"



In order that each lamp only illuminates its appropriate scale on the dial, they should both be enclosed in light-tight screening boxes.

This is effected by the use of two bulbs mounted behind the tuning dial, which is, of course, calibrated in two separate bands—long and medium waves.

The bulbs are screened from each other and are wired in circuit with a double-pole switch; this is mounted on and operated by the wavechange switch itself.

Entirely Automatic.

When the switch is in the "Medium-Wave" position the bulb behind the medium-wave dial markings is lit up; when the switch is changed over to "Long" the current is automatically diverted through the other lamp.

I have shown this diagrammatically in Fig. 2, and have also given a drawing (Fig. 4) which indicates a method of mounting and screening the two lamps.

On a radiogram the idea can be carried still further by adding a third lamp which will illuminate a suitably-placed window showing the word "Gram."

In many cases difficulty may be experienced in mounting the switch on to the wavechange assembly.

Providing there is as much as ½ in. of the wavechange switch-operating rod available (I am, of course, referring to an up-to-date ganged switch), the job of arranging a suitable pilot-lamp switch should not present serious trouble.

The easiest method is to make up a flat cam of the shape shown in Fig. 3, and to mount this firmly on the switch-operating rod between two collars.

Two sets of spring contacts are then required, and these should be set up on each side of the rod.

Use Different Colours.

As the cam turns with the normal motion of the wavechange switch, the contacts will be closed alternately so that the two lamps will be correctly controlled and will illuminate the desired portions of the tuning dial.

The effect is enhanced if different colours are used for the two wavebands.

Another useful scheme is to utilise the small pilot lamp as a tell-tale for overloading or anode current—this in addition to its normal duties of illuminating the tuning scale.

The arrangement is confined to fairly high-powered sets which draw an H.T. current of about 100 milliamperes.

The bulb is wired in series with the H.T. negative lead and is shunted with a small resistance.

The value of this resistance must be calculated according to the H.T. current and also to the consumption of the bulb used.

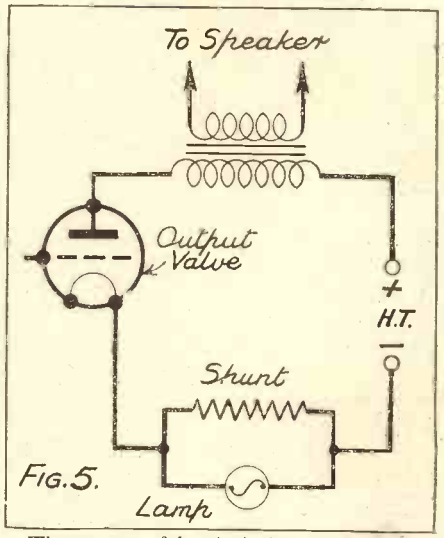
You will have to work this out for yourself.

First of all, measure the total current passing in the negative H.T. lead.

Next you must work out the resistance of the bulb filament; this is quite easy, since it is only necessary to divide its current consumption into its voltage; i.e. if the bulb is rated at 4 volts ·1 amp., the resistance will be 40 ohms.

(*Continued on page* 136.)

DOES TWO JOBS



Where a powerful output stage is employed, the inclusion of a correctly shunted lamp in the power valve's H.T. circuit serves the dual purpose of pilot light and distortion indicator.

SIMPLE ELIMINATOR CONVERSIONS

The changing of one's mains from D.C. to A.C., or even vice versa, does not render a mains unit useless.

By H. CROSS.

THERE is, no doubt, quite a large number of people who would like to use an H.T. eliminator, but being on D.C. hesitate to do so, in belief that the apparatus employed would be quite useless if at any future date the supply were changed to A.C.

This is not the case. All the components of a D.C. eliminator can be used in an A.C. unit, but, of course, the latter type requires additional apparatus.

Moreover, it should be understood that anyone who has a mains unit designed for A.C. can use it, or part of it, should the need arise, on D.C. mains.

Additional Components.

In the case of the man having a D.C. unit which is later required for A.C. work, the additional parts necessary are: (a) rectifier; (b) reservoir condenser or condensers; (c) mains transformer.

The D.C. unit itself consists of one or more smoothing chokes, smoothing condensers, potentiometers and (or) series resistances, according to the output requirements.

Thus it remains only to rectify the alternating current and to obtain a suitable output; this can then be applied to the input or mains terminals of the D.C. eliminator. Should additional smoothing be necessary, this can be added in the positive lead between the rectifier and the D.C. unit.

Now, in respect of the three main additional parts, the choice will be guided mainly by the eliminator's output requirements, and a rectifier giving a suitable output voltage and current should be chosen. The rectifier can be either a metal one or a valve worked on the full-wave or half-wave principle, or, in the case of the metal rectifier, on the voltage-doubler system, as may be necessary.

Reference to the particulars supplied by makers of either type of rectifier will simplify selection of a suitable rectifier.

The size of the reservoir condenser or condensers will be specified by the makers also, while more often than not a suitable mains transformer will be suggested. In any case, once the actual type and size of rectifier for the particular case is decided upon, a suitable mains transformer can easily be chosen.

Comparatively Simple.

Considering the position of the man with an A.C. eliminator, who happens to want it for D.C. operation, the matter is comparatively simple. The D.C. mains leads can be connected (via a fuse) across the terminals of the reservoir condenser or condensers.

That is, join the negative mains lead to the lead of the eliminator, going right through to the negative output terminal, and the positive lead to the end of the smoothing choke connected to the reservoir condenser. The leads from the A.C. rectifier to the reservoir condenser should preferably be disconnected.

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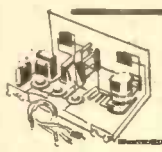

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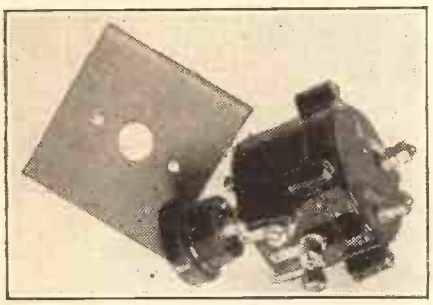
THE HAYNES VOLUME CONTROL

MOST of the components now sold attain a fair degree of all-round "goodness," but the majority are combinations of conventional ideas. It is but rarely that one encounters a component that from start to finish bears an individualistic impress of careful, special design.

When one such does come along it deserves all the



This Haynes component simply bristles with good points of design, one of the most outstanding of which is provision for a minimum resistance to the left permanently in circuit if desired.

prominence that can be given it, for it is upon character in design that real progress depends, and, naturally, its influence is directly proportional to the measure of appreciation it is accorded.

And I think that the Haynes Volume Control is as typical an example of the kind of component I have in mind as any one yet made.

Unfortunately, I haven't the space at my disposal to do it full justice, for it absolutely bristles with good features.

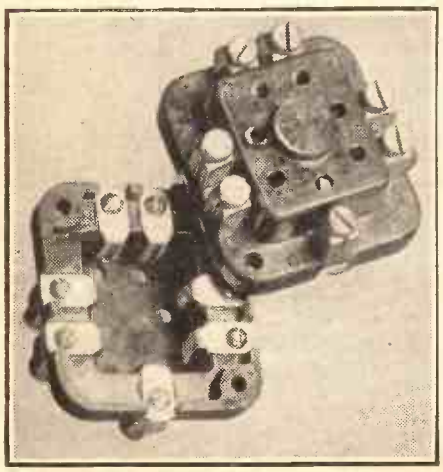
Most importantly it incorporates a form of narrow-edge resistance-element construction which results in an entirely noise-free operation.

The spindle is insulated so that the centre contact can be connected directly to H.F. and grid circuits without capacity or hum troubles developing.

There are adjustable stops so that an initial resistance may remain in circuit if desired.

The potentiometer can be ganged easily, or a low-loss switch can be ganged with it. But this switch is entirely insulated, and the lever snaps over before any resistance is introduced.

There are many other features of greater or lesser importance of both electrical and mechanical natures;



In these seven-pin valve holders, Graham Farish have created a design deserving of great praise, for it simplifies to a remarkable degree the making of correct connections.

but I have said enough to show that this Haynes Volume Control really is an outstanding production.

Nevertheless, it sells at 5s. in a wide range of values up to 50,000 ohms, and the switch action lists at 1s. 9d.

GRAHAM FARISH VALVE HOLDERS

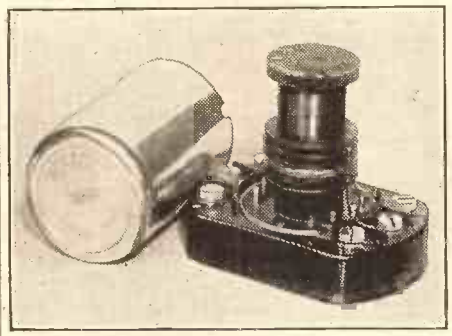
Although the pins of a seven-pin valve are arranged in what is probably the best possible pattern from an electrical view-point, they too closely approximate a circle for the home constructor's comfort in wiring.

I admit without shame that on two occasions I have wired up a seven-pin valve holder incorrectly. But I wasn't using Graham Farish holders, otherwise I do not think I should have made the mistake.

Graham Farish have, in my opinion, made an important contribution to easier set building by a cleverly planned disposition of the seven terminals which emphasises the pin pattern.

Ordinarily the tendency is the other way, and the terminals are usually equally spaced and form a definite circle. Most confusing!

But Graham Farish start right by making the body of their holder rectangular, and then put on



The newly-introduced Telsen iron-cored coils are particularly efficient components, and are available at highly competitive prices.

the finishing touch of a systematic grouping of the terminals, which are also plainly marked.

Have a look at the accompanying photo. Don't you agree with me that Graham Farish have created a design that deserves the thanks of all practical radio men?

"Create"—yes, that's the word. I wish there were more creation and less copying. However, we must be thankful that there are at least some firms, such as Graham Farish, with us to bring individuality and originality of thought into radio.

As for the general technical merits of the Graham Farish "Snap" seven-pin valve holder, these, too, are of a high order.

It takes a valve firmly but smoothly and with good contact at each pin.

I like the terminal screws. They are milled and slotted. A good point, that. How often can a valve holder nut be really easily gripped with pliers? It's an obvious screwdriver job, and Graham Farish, true to form, haven't overlooked it.

TELSEN IRON-CORED COILS

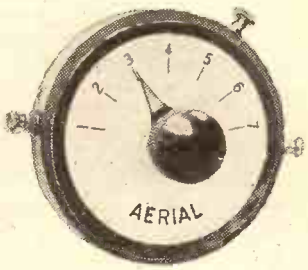
I have had a great deal to say about Telsen coils in the past, but not a word more than has been deserved.

The home-constructor movement should extend a vote of thanks to Telsen for setting such a high standard in coil design.

It would have been so easy for them, trading at lower prices and in greater quantities, to have made their coils just adequately good. And I can imagine the labour and arduous "costings" which it must have taken for them to achieve the high efficiency they did.

A long-sighted policy and obviously one which in due course brought and is still bringing, its reward.

A particularly simple unit made by the Exact Manufacturing Co., and known as the "Croft" tuner. It covers medium and long waves, and is provided with a one-hole fixing for easy panel mounting.



And now they have extended their coil range by the manufacture of an iron-core type.

It is an extremely neat and well-made component, and, as with all Telsen products, it can be judged on its intrinsic merits, irrespective of price (which is highly competitive).

It is provided with an effective screen, and it should be noted that it is because shielding can be applied with less loss to a coil of iron-core construction, rather than its small size as such, that renders it a very attractive proposition.

This is, of course, why it is able to give such good results. The Telsen iron-core coil is exceptionally efficient, and must be ranked among the best of its class—which, I can add, are a select few in number.

THE CROFT AERIAL TUNER

Constructors desirous of building a straightforward broadcast set of not-too-pretentious a character would be well advised to bear the "Croft" tuner in mind.

This is made by the Exact Manufacturing Co. It is a compact component, and amply covers both medium and long waves by the rotation of a tap-selectivity switch.

It is also particularly easy to build and wire into a set, for it is of a one-hole panel-mounting nature and has only three terminals.

In operation it is definitely in advance of the usual simple tuner.

THE LISTENER'S NOTEBOOK

Frank comments on recent programmes and on microphone personalities of the moment.

THE Brighter Sunday Movement is no longer *in* the air. It is well and truly launched *on* it. With that silent gap between the hours of 6 p.m. and 8 p.m. now well filled we have a continuous programme of varied items from 12.30 p.m. to 10.30 p.m. This is an autumn change that meets with general approval. Of course, it is at the expense of listening to the Continent, but, as I understand we are to be regaled with occasional Continental broadcasts, the Continent thus receives a little compensation.

* * *

Though I should be the last to belittle the performance of Jack Payne and his orchestra, I can't help expressing my lack of appreciation of his more pretentious numbers.

Take, for instance, that big number, written by Ray Noble, round his signature tune, "Say it with Music." I would much prefer three shorter numbers instead, for three, if not four, could be given in the time taken to give this one.

* * *

I always like to hear Derek Oldham sing, but, much as I enjoyed his little songs, I think his recital might have included one or two of the songs particularly associated with him.

* * *

A unique broadcast was "The Organ," consisting of improvisations by J. I. Taylor and commentary by Filson Young. I learnt a good deal from this Sunday evening item which should make future organ recitals more interesting still.

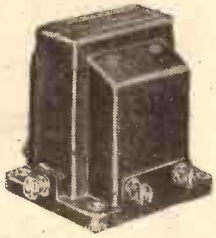
Filson Young began and continued for some time rather shakily. He didn't appear to be reading from a manuscript. The frequent stumbling, hesitation and repetition reminded one strangely of the pitfalls of impromptu speech.

(Continued on page 130.)

Telsen

L.F. TRANSFORMERS

cover every requirement

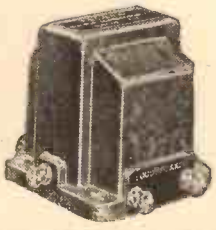


TELSEN AUDIOFORMER

Solves the problem of tone compensation which has been created by to-day's demand for super selectivity. Restores all the high notes which have been lost by the cutting of the sidebands, yet does so without any loss of amplification or reduction in bass response. Absolutely self-contained **11/6**

TELSEN MULTI-RATIO OUTPUT TRANSFORMER

For use with moving coil speakers having a low impedance speech coil winding, and suitable for anode currents of up to 40 m.a. Three ratios —9-1, 15-1, 22.5-1—allow for correct matching of speakers of widely varying characteristics **9/6**



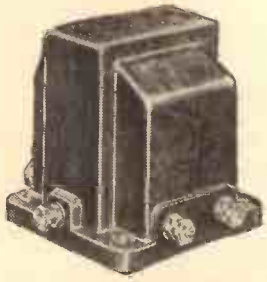
TELSEN OUTPUT TRANSFORMER (Ratio 1-1)

For connecting the speaker to the output stage, using a triode valve. Avoids saturation by isolating the D.C. from the speaker windings. Also keeps H.T. voltage from the speaker and its lead, which is specially important where a D.C. eliminator is used. For anode currents up to 40 m.a. ... **9/6**

TELSEN MAINS TRANSFORMERS

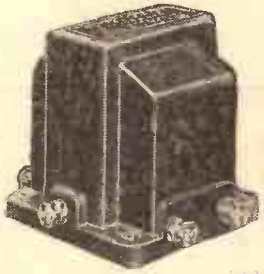
Built to the highest electrical and mechanical standards ensuring steady and constant voltage under all conditions. For receivers employing two A.C. valves, or for three-valvers with two A.C. valves and one battery type valve taking .25 to .5 amps. In attractive stove-aluminium finish, with bakelite cover to terminal panel.

W.360	200/250 Volt 40/100 Cycles H.T. 275-0-275	**32/6**
W.291	100/110 Volt 40/100 Cycles	**32/6**
W.300	200/250 Volt 40/100 Cycles	**32/6**
W.301	200/250 Volt 25/40 Cycles	**45/-**



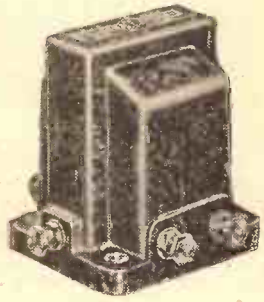
TELSEN RADIOGRAND (Ratio 7-1) L.F. TRANSFORMER

Gives extra high amplification on receivers employing only one stage of L.F. amplification. Not recommended for use with two L.F. stages, as overloading is likely to occur ... **9/6**



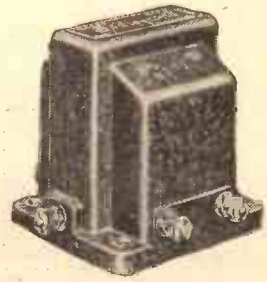
TELSEN RADIOGRAND (Ratio 1.75-1) L.F. TRANSFORMER

For use in high-class receivers employing two stages of L.F. amplification. When used following an L.F. stage employing choke or resistance coupling, it gives ample volume with remarkable reproduction ... **9/6**



TELSEN "ACE" L.F. TRANSFORMER

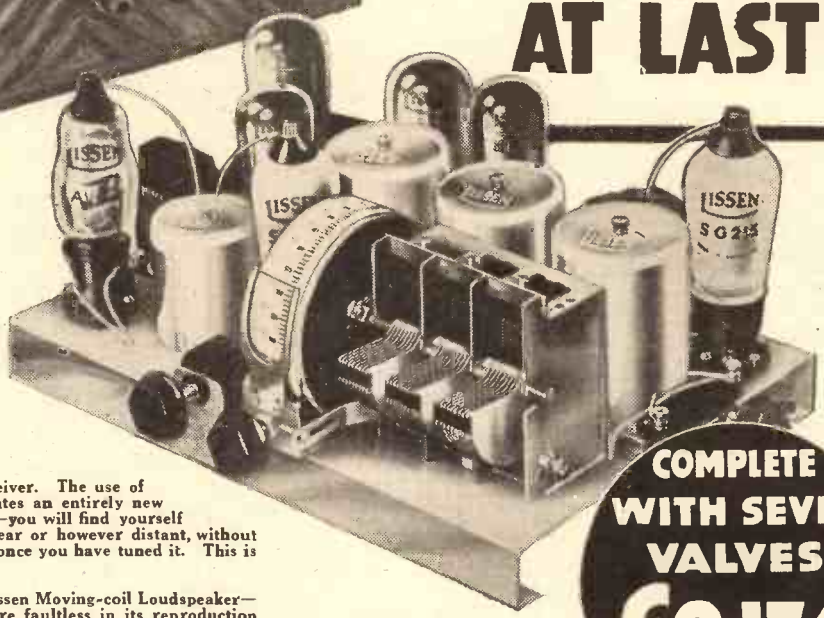
Telsen "ACE" Transformers are eminently suitable for Receivers where highest efficiency is required at low cost and where space is limited. They are designed in accordance with the most recent research, constructed on the soundest engineering principles, and tested rigorously under broadcast conditions for immaculate performance and enduring efficiency. Their characteristic curve bears comparison with many costly transformers and provides unquestionable evidence of their ability to satisfy the home constructor's most exacting requirements. Ratio 3-1. Ratio 5-1 ... **4/9**



TELSEN RADIOGRAND (Ratio 5-1) L.F. TRANSFORMER

Signifies to both expert designer and enthusiastic constructor all that is finest in Radio Craftsmanship. Its characteristic curve reveals a performance equal to that of the highest priced transformers. Ratio 3-1. Ratio 5-1 ... **6/9**

HOME CONSTRUCTORS MOST AMBITIOUS DREAM REALISED AT LAST!



COMPLETE WITH SEVEN VALVES £8·17·6

Never before has there been any receiver for Home Constructors on such an ambitious scale as this new Lissen "Skyscraper" Seven Valve Superhet. It embodies every up-to-the-minute advance and refinement of the most luxurious factory-built superhets—it gives the constructor the opportunity to build a £20 receiver for less than half that price.

The circuit of the Lissen "Skyscraper" Seven Valve Superhet incorporates a 6-stage bandpass filter giving exact 9-kilocycle channels and therefore providing a standard of selectivity never before achieved by a home constructor's kit set and very rarely found except in laboratory apparatus. Amplified Automatic Volume Control is provided, a special valve for this purpose having been produced by Lissen for use in this receiver. The use of this Amplified Automatic Volume Control constitutes an entirely new experience in listening; no "fading," no "blasting"—you will find yourself enjoying every word of every programme, however near or however distant, without the slightest temptation to interfere with the receiver once you have tuned it. This is radio listening as it should be enjoyed!

Lissen Class "B" Output through a new full-power Lissen Moving-coil Loudspeaker—glorious rich tone and majestic volume, actually more faultless in its reproduction than anything you ever heard from even the most powerful mains receiver, yet working economically in this Lissen "Skyscraper" from H.T. batteries.
Tuning is something new in single-knob control—in fact, not only single-knob control but *single station tuning*. You never hear two stations together, you never need to *think* about separation. The 9-kilocycle tuning peak of the circuit ensures "one station at a time" all round the dial, and the Amplified Automatic Volume Control adjusts the receiver automatically to provide the same volume from each transmission. This simplicity is the true luxury of listening—and this is the Luxury Receiver for Home Constructors.

Lissen have published for this great new "Skyscraper" Seven Valve Superhet a most luxurious Chart which gives more detailed instructions and more lavish illustrations than have ever before been put into a constructional chart. It makes success certain for everybody who decides to build this set; it shows everybody, even without previous constructional experience, how they can have a luxury receiver and save pounds by building it themselves. A copy of this Chart will be sent FREE in return for coupon on the left or your radio dealer can supply you. Get your FREE CHART now!

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"SKYSCRAPER" 7
SEVEN VALVE SUPERHET

CLEANING UP "CLASS B"

An interesting development of Class B amplification, as presented by a new valve which has just been put on the market, is discussed, from the constructor's point of view.

By FREDERICK LEWIS.

MANY users of Class B amplification have complained of harsh reproduction of the high notes, and have in some instances asserted that the system is "no good."

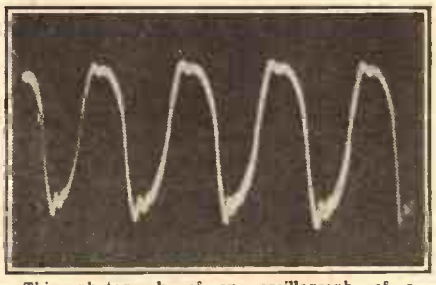
This, of course, is very far from being the case from a theoretical point of view, or in practice where proper precautions are taken. In the instances of the complainants' sets it is probably true—due to improper matching of the various sections of the Class B stage, including the speaker.

In positive drive (Class B) or push-push circuits the electrical constants must be more carefully arranged than in normal circuits, or perhaps I should say, if they are not carefully matched, the fact will be more readily demonstrated by distortion from the loud-speaker.

Price and Perfection.

It is claimed that this is partly due to the tendency of some Class B valves to cause "rattle" or papery reproduction of the high notes when used with medium-priced transformers. With theoretically perfect transformers and perfect valves, perfect reproduction should ensue; but we must necessarily look the facts in the face and realise that to be of general use Class B must not be too expensive. As perfection means expense we must do what we can to get as near perfection as possible with admittedly somewhat imperfect parts.

WITH BIAS



This photograph of an oscillograph of a Marconi B.21 valve shows the clean curves resulting from this type of valve.

This is no stigma on either transformer or valve manufacturer; both have done excellently in bringing Class B amplification within the means of all of us. The compromise between price and perfection is an excellent one—but it is nevertheless a compromise.

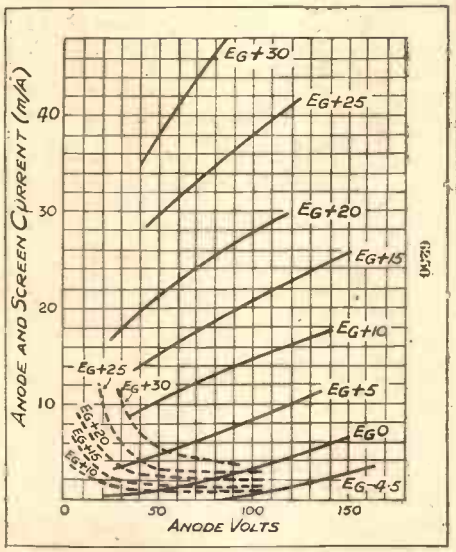
Having reached it, many ways have been thought out to remove, as far as possible, the signs of imperfection which I have mentioned, and one of the most ingenious ways is that incorporated by Marconi and Osram in the design of their Class B valve, the B.21.

They have taken the view that unless the transformers are of expensive design or the Class B valves were of a comparatively low-impedance characteristic the quality of the reproduction would be found to suffer.

Low-Impedance Drivers.

The trouble in the transformer section, unless the transformers be of unusually large proportions, and therefore very expensive, seems to be a certain amount of leakage inductance, which is higher than desirable

THE CHARACTERISTICS



Here is the graph which shows the principal characteristics of the new valve.

and causes much of the typical distortion associated with Class B amplification.

In the case of the valve, Osram point out that the distortion can be minimised by using a low-impedance driver valve, with its necessarily high value of anode current (undesirable from an economy point of view), or by lowering the impedance of the Class B valve.

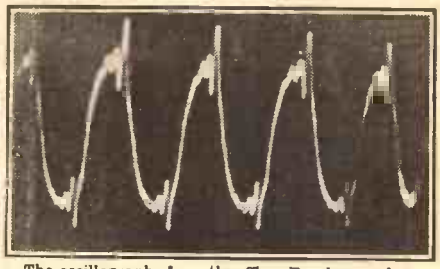
Improving the Quality.

In the case of the B.21 the latter has been carried into effect as being the most inexpensive way of improving quality, the reason given for the improvement, which certainly seems to be substantiated on test, being that the low impedance of the B.21 and its lower amplification factor reduce the tendency of the valve to oscillate, whatever the nature of the components associated with it.

It is claimed that the high-impedance, high-mag. Class B valve, which requires no bias, is prone to give rise to oscillations which are superimposed on the wave form of the audio "signal," resulting in harsh-tone quality. The application of the well-known condensers or condenser and resistance across the output serves to damp the oscillations, but it does not completely remove them until the value of the condenser becomes undesirably high.

The B.21 requires a negative bias of some 4·5 volts at 120 volts H.T., which bias

WITHOUT BIAS



The oscillograph of another Class B valve employing zero grid bias which presents a comparatively distorted curve due to superimposed valve oscillations.

can be taken from the battery supplying the driver valve and, it is claimed, enables the valve to operate economically on a much wider range of H.T. voltages.

Details of the Valve.

Here are the valve's main characteristics: Fil. volts 2·0, with 0·2 amp. consumption. The quiescent anode current at 120 volts is 1·65 milliamps, and the estimated average operating current at that voltage is 6·0 milliamps. The plate-to-plate load should be 12,000 ohms with an L.21 as driver, or 8,000 ohms with the L.P.$_2$. The bias is 4·5 volts, and the output power under the above conditions is 900 milliwatts with the L.21 and 1·4 watts with the L.P.$_2$.

The maximum output wattage of which the B.21 is capable is obtained with 150 volts H.T., —6 volts bias, and an L.P.$_2$ driver, when a figure of 2,300 milliwatts is reached. The average anode current is then 10 milliamps and the quiescent current is 2·2 milliamps.

A special driver valve has just been released in the L.21, which has an impedance load of 42,000 ohms at 120 volts H.T. and 4·5 volts bias. The anode current taken is 1·7 milliamps.

THE B.21

A photograph of the B.21 valve, the advantages of which are fully explained in this article.

(*Continued on page* 132.)

That MINIMUM CAPACITY

Some surprising facts about variable condensers, and the wave ranges they can cover, are contained in this article, in which is pointed out, among other vital considerations, the importance of avoiding wiring and other stray capacities.

By M. G. SCROGGIE, B.Sc., A.M.I.E.E.

IN the first place, and so that we understand one another, let us scrap the usual ways of specifying variable condensers. It is silly to call a condenser 0·0005 mfd. One might just as well say that a boy is 0·001 miles high and weighs 0·05 tons, or that a clock ticks once every 0·00000000317 years. Wouldn't it be fun working them out every time?

So here we are going to talk micro-microfarads, or mmfd.; and our awkward decimal condenser becomes 500 mmfd.

Misleading Statements.

Then there are numerous ways which manufacturers have of stating the capacity of their variable condensers. Some of them are insufficient, and all of them (so far as I am aware) are wrong. Wrong, that is to say, for the purpose of telling the prospective purchaser as concisely as possible what he wants to know about them.

Most often we are just told that the capacity is, say, 500 mmfd.

The purpose of a variable condenser is to tune over a band of wavelengths. So any information about the capacity of the condenser should be given in the form which indicates most clearly whether it is capable of covering the desired wavelengths.

It is quite possible for a 350-mmfd. condenser to cover quite as wide a range of wavelengths as a 500; so that particular piece of information is not enough. What we want is the *variation* of capacity obtainable, and the *minimum* capacity. If a trimmer is fitted it is useful to know the variability of that, too.

An Interesting Example.

The best way of showing the importance of the minimum is to take an example. Suppose we want to cover everything from 200-550 metres with one sweep of the condenser. That is a ratio of 2·75, or $\frac{550}{200}$.

The *capacity* ratio that must be used is got by squaring it, giving 7·5 approx. The minimum capacity of the whole circuit is, of course, made up of a number of items—the minimum capacity of the tuning condenser itself; the self-capacity of the tuning coil, with any associated wavechange switch; the stray capacity of the wiring, and that of the valve and its holder.

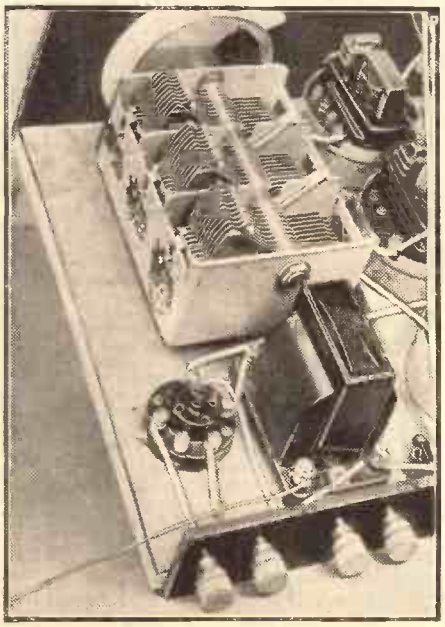
The condenser may be, perhaps, 20, the coil 10, the wiring 10, and the valve 10: total 50 mmfd. Therefore the maximum must be 7½ times this—375 mmfd; and the variable part of the condenser, the difference between these two, 325. The maximum capacity of the condenser alone is, of course, 345 mmfd. That is the figure that most manufacturers would quote in connection with it.

Reduced Range.

Now, suppose the condenser has a trimmer. With it fully screwed in the minimum capacity may be raised by 30 mmfd. to a total of 50. Adding in the other stray items, the grand total is 80. Maximum, therefore, 7½ times this, which equals 600, of which the condenser alone contributes 570; 520 being the variable portion.

So you see that, if the minimum capacity is large, because of a trimmer screwed well home, or because of long H.F. leads encased in screening, or for any other reason, in order to tune over the same range of wavelengths the maximum capacity must go up in the same *proportion* (not just by the same *amount*). It would have been no use trying to put things right in the last example by increasing the maximum by the same amount as the minimum—30 mmfd. It had to be increased by no less than 225 mmfd.; which, you observe, is 7½ times as much.

WATCH THOSE TRIMMERS



The object of trimmers on gang condensers is to balance *minimum* capacities, so see that you keep them all set at as small a capacity as possible.

So it is very clear that a comparatively small cut in the minimum capacity makes it possible to use a much smaller condenser. In the above example the 345-mmfd. condenser with 20 minimum is just as good as a 570-mmfd. condenser with 50 minimum. So when buying a condenser don't be put off with the usual inadequate information.

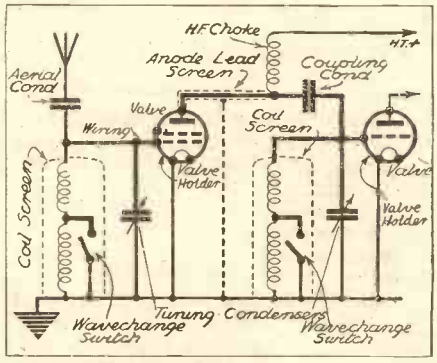
There are some other points to be gathered from this example. It is obviously little good taking the trouble to get a condenser with a low minimum if it is to be connected in a circuit with a very high minimum. The circuit has to be considered as a whole.

How Valves Vary.

The Fig. shows the items to take care of. The valves are as we get them and can't be altered; the capacity from grid or anode to the remaining electrodes may be anything from about 5 to 15 mmfd., according to make and type. The high-magnification ones are the worst in this respect.

The valve holders contribute only 2 or 3 mmfd. unless they are bad ones. A screened anode lead may add as much as 20 mmfd., or even more if it is long—an item not to be forgotten; but fortunately where there is an anode lead there is no aerial to be taken into account.

WHERE CAPACITY COUNTS



Unnecessary capacity at any of the points marked in this diagram may result in a restriction of the wave range which the receiver is able to cover.

There would be no great point in paring down an anode circuit if it just had to be trimmed up again to match the aerial circuit. To prevent an unreasonable difference between the two, see that the aerial doesn't weigh down its tuning circuit too heavily. The usual precautions are a relatively small condenser in series—100 mmfd. is really too large—or a tapping fairly low down the coil; this is the better plan.

Talking about coils, a close-fitting can add much capacity, as well as other bad effects. The coil itself has a certain amount of self-capacity; it may be as little as 4 or 5 mmfd. or more than 10 mmfd.

Wavechange Switches.

The wavechange switch is earthed when on medium waves, so affects only the long waves; and as the long waveband ratio is much less than the medium it is unlikely to give trouble. All the wiring marked in heavy lines should be short and not brought alongside screens or other wires.

Turning back again to the anode side, the coupling condenser is "live" both

(*Continued on page* 18.)

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ROLA CLASS 'B' UNIT AND MOVING-COIL SPEAKER

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ENORMOUS OUTPUT from your present Battery Set.

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A complete Class "B" Amplifying Unit complete with Valve is incorporated into a matched ROLA Permanent Magnet Moving-Coil Speaker to give enormous output equal to the best mains set. Simply connect the complete assembly direct to your present battery-operated set.

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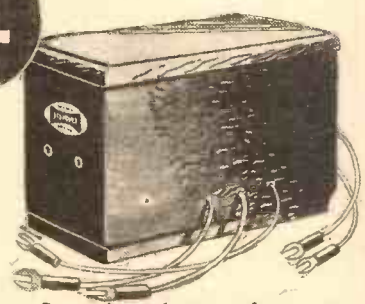

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This completely assembled Unit with Class "B" Valve enables you to convert your present battery set to Class "B" immediately. Increases power seven times with very little difference in present H.T. Consumption. Connected in a few seconds.

Send 5/- for 7 Days Trial. If satisfied, pay balance in 11 monthly payments of 6/- (Cash in 7 days) 63/-. Carriage Paid.

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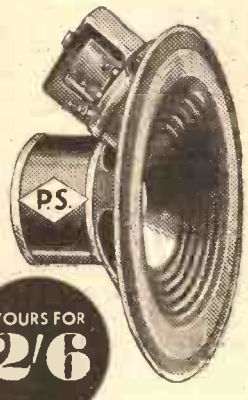

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With heavy Cobalt Magnet, moulded diaphragm and tapped input transformer for Power or Pentode.

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Astonishly sensitive—handles 5-watts undistorted.

SEND FOR IT ON 7 DAYS' TRIAL

Perfect matching between Set and Speaker is afforded by the Switched Controlled Matched Variable Radio Input Transformer fitted to this W.B. P.M.4A Moving-Coil Speaker. Every type of output can be matched, including the Q.P.P. Class "B" and Pentode.

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"PLACING" YOUR LOUDSPEAKER

To obtain high-quality reproduction it is not sufficient merely to ensure that one's receiver does not distort. The acoustics of the listener's room have a direct bearing on quality, and should be taken into account when installing a receiver. Whatever type of reproducer you employ you will derive benefit from this article.

By BERNARD BARNARD.

THE study of acoustics plays a very important part in the modern business of broadcasting. It is not sufficient that the transmitting microphone receives sound waves from the artiste or instrument that is broadcasting; the sound must be carefully balanced and "prepared" in order that the sound produced by a good receiver bears close resemblance to the original.

"Cooked" Music.

The chief reason for this is that the microphone, unlike the human ear, has no imagination, and cannot, therefore, fill in or build up weak sounds that should be strong, and cannot reject unpleasant resonances or reverberations.

The microphone and its associated apparatus also has characteristics of its own which must be considered, so that, for this reason also, it is necessary to "cook" the music or speech to a certain extent.

These technical points are carefully attended to by the broadcasting engineers before the sound gets "on the air," and the listener can be assured of pleasing and realistic reproduction from his set without taking any special precautions at the receiving end.

Under normal conditions, a good receiver can be installed anywhere in a room of average dimensions without the reproduction being adversely affected, and it is therefore very unusual to find much attention being paid to the installation of a set from the *acoustic* point of view.

It is, however, always possible to effect improvement, if not in the actual reproduction, then in the *comfort* of the listener, by careful positioning of the loudspeaker, and care and time spent on this matter will be amply repaid.

The Weak Link.

Before dealing with the acoustical troubles of sitting-rooms and the like, however, it will be as well to focus our attention on one link in the receiving chain which often "clanks" badly, and thus ruins otherwise excellent reproduction.

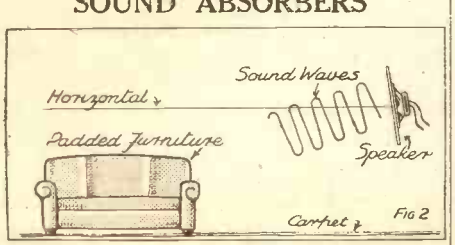
I refer to the loudspeaker cabinets.

I suppose the majority of receivers in use to-day are of the "built-in" type, the loudspeaker and receiver chassis being accommodated in the one cabinet.

From the point of view of compactness and utility, this arrangement is beyond criticism, but it undoubtedly has given rise to very many acoustic snags.

Apart from the more common difficulty of microphonic noises, the most usual trouble is severe cabinet resonance, which in most cases causes an excessive bass response. This is produced by the cabinet itself vibrating at its own fundamental frequency, and producing sound waves which, added to the normal output of the speaker, grossly exaggerate that particular note to which the cabinet, as a whole, responds.

SOUND ABSORBERS



If care is not taken in mounting the loudspeaker it will radiate most of its sound in the direction of padded furniture, where absorption will occur.

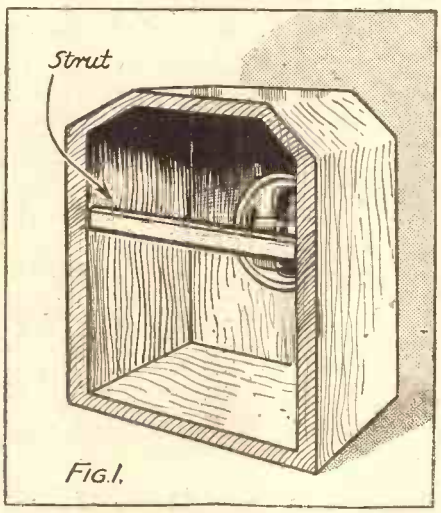
A Deadening Effect.

Trouble of this description can sometimes be cured by the simple expedient of fastening a wooden strut inside the cabinet. The strut should be made of a fairly thick piece of wood, and should be screwed to the cabinet sides in such a manner that it exerts considerable strain on them. This will usually have the effect of increasing the natural frequency of the cabinet, and also make it less well defined.

As a general rule, it may be taken that the thicker the wood used in the construction of the cabinet the less likely is it to give resonance troubles.

Another cabinet trouble which has less obvious symptoms is the production of a "boxy," lifeless tone. This is generally caused by the use of an insufficiently perforated back.

DAMPING CABINET RESONANCE



Cabinet resonance can cause distinct aural distress, but may often be cured by the simple expedient of a strut inside the cabinet.

From Front and Rear.

A moving-coil loudspeaker produces just as much sound energy from the rear of the cone as from the front, and if this energy is not allowed to escape it will obviously sound muffled and "dead." It will mix with the sound that is emitted from the loudspeaker fret, and the effect will be most unpleasant.

You should, therefore, make sure that the back of your cabinet has as many holes drilled in it as is possible, to allow this sound to escape. In fact, if conditions permit, it is a very good plan to leave the back of the receiver entirely open, so as to dispense with the possibility of trouble in this direction altogether.

With regard to resonances of a more physical kind, these usually take the form of "buzzes" and rattles on certain notes. Such noises can almost always be traced to loose screws or wood splinters, or other visible defects which can be traced by careful examination of the receiver and cabinet.

Whilst dealing with cabinets, we must not forget to mention that, acoustically speaking, the furniture upon which the receiver stands is part of the cabinet, and must be considered as such.

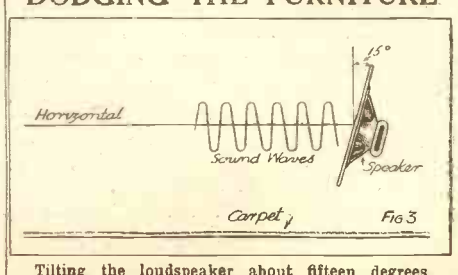
Avoid Direct Contact.

Avoid standing the loudspeaker on such articles of furniture as glassware cabinets or closed bookcases.

If it is necessary to stand the receiver on such a cabinet, trouble may be avoided

(*Continued on page* 120.)

DODGING THE FURNITURE

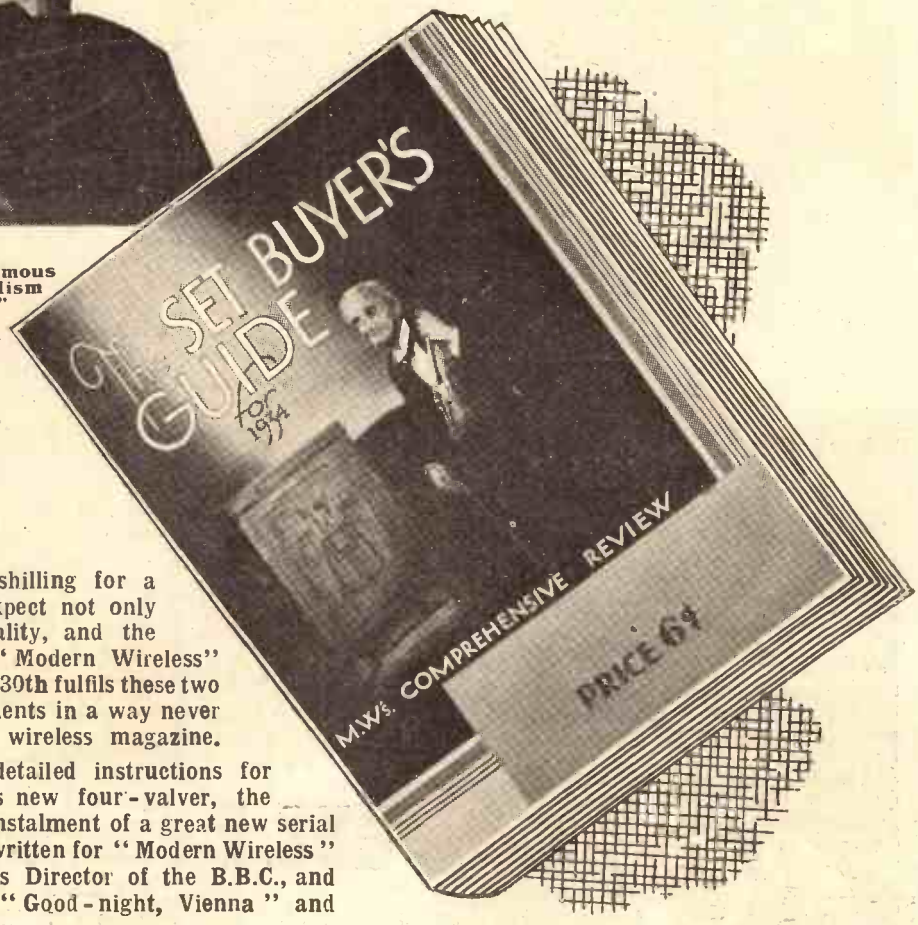


Tilting the loudspeaker about fifteen degrees upward allows sound to reach listeners which would otherwise be absorbed by the room contents.

MODERN

TWO FREE

Mr. G. P. Kendall, B.Sc., the famous set designer, returns to radio journalism in the issue of "Modern Wireless" on sale September 30th, with exclusive details of how to build his magnificent new four-valve receiver, the "K 4"—the last word in four-valvers.



* * *

WHEN you pay a shilling for a magazine you expect not only quantity, but quality, and the special issue of "Modern Wireless" on sale September 30th fulfils these two essential requirements in a way never surpassed before by any 1s. wireless magazine.

Not only will you find detailed instructions for building Mr. G. P. Kendall's new four-valver, the "K 4," but also the opening instalment of a great new serial story which has been specially written for "Modern Wireless" by Val Gielgud, the Productions Director of the B.B.C., and Holt Marvell, the author of "Good-night, Vienna" and many other broadcast successes.

This serial strikes a new note in radio journalism, for the story—entitled "Death at Broadcasting House"—deals with one of the most ingenious murder plots ever described in fiction.

On no account must you fail to read the long opening instalment of "Death at Broadcasting House," which, with many other special features, makes the October number of "Modern Wireless" the finest issue of the magazine ever put on sale.

* * * * *

As well as the 1s. Constructional Blueprint Chart of Mr. G. P. Kendall's set, the "K 4," which is presented free to readers, you will also find in "Modern Wireless" a free 6d. book, "The Set Buyer's Guide for 1934." Beautifully produced in photogravure, this book offers you a comprehensive review of all that is best in wireless set design.

This book will be of particular interest and value to new readers and to the non-technical friends of readers who would like to read in simple language about a selection of sets before they decide to buy one. Concise information is given about every receiver, together with price, operating details, etc.

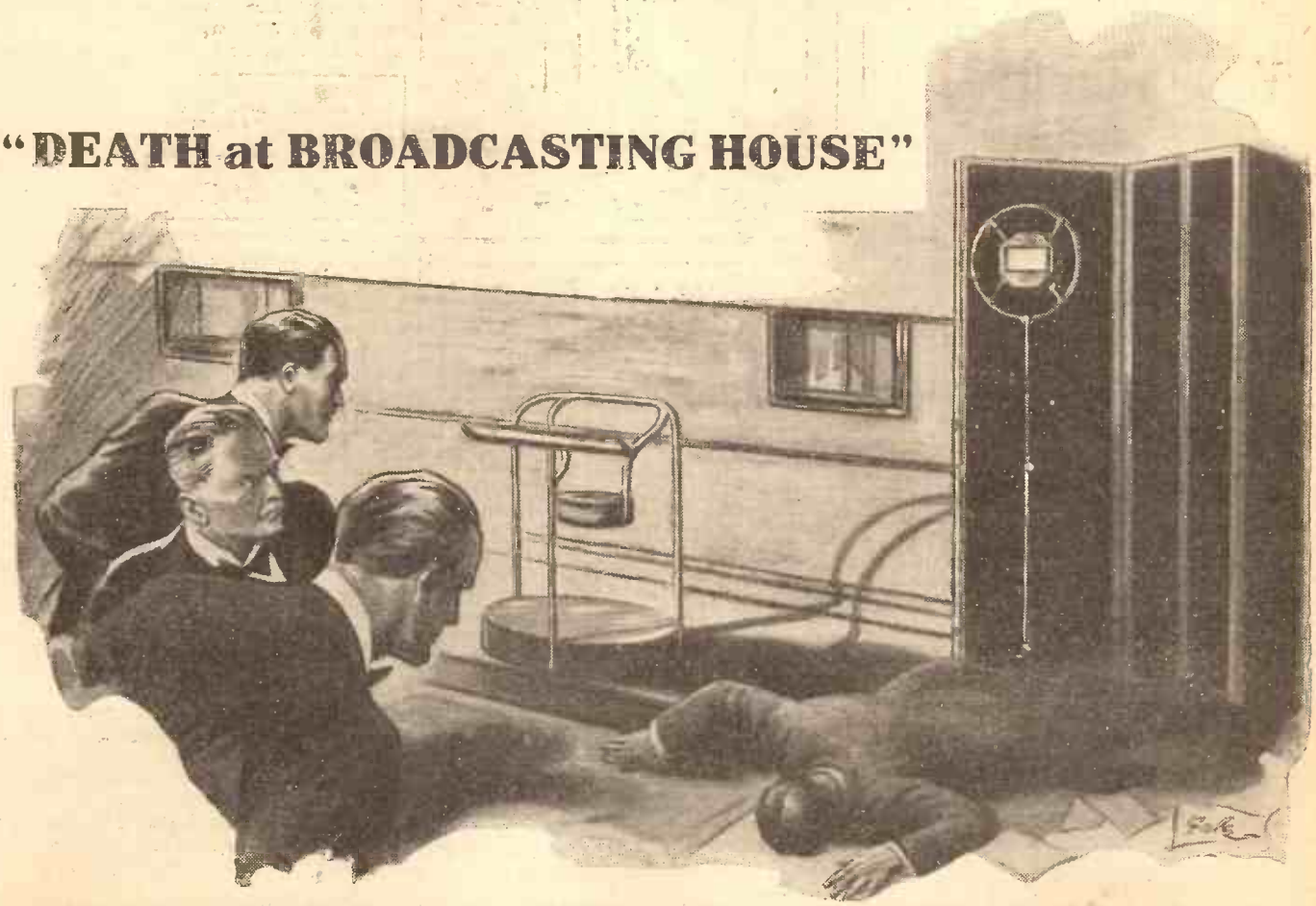
As there is bound to be a huge demand for this issue of "Modern Wireless," you are urged to secure an early copy. Place your order immediately with your nearest bookstall, for if you miss the October issue of "Modern Wireless" you will be missing a copy of the finest 1s. radio magazine ever published.

WIRELESS

GIFTS FOR READERS

A Shilling Blueprint Constructor's Chart of the "K4," and a magnificent Photogravure Book "The Set Buyer's Guide for 1934," are presented free with the October issue of "Modern Wireless"—which will be on sale, price 1/-, at all bookstalls and newsagents, on September 30th. Order your copy now and so avoid the disappointment of missing your copy of this unprecedented gift issue of Britain's Leading Monthly Radio Magazine.

"DEATH at BROADCASTING HOUSE"



A murder in a studio at Broadcasting House! Who killed . . . ? That is the question everybody will be asking when they have read the opening instalment of Val Gielgud and Holt Marvell's magnificent new thrilling story, "Death at Broadcasting House."

The serial rights of this new thriller have been exclusively reserved for "Modern Wireless," and if you wish to enjoy one of the finest murder stories ever written you will make a point of securing, without delay, your copy of the October issue of "Modern Wireless," on sale throughout the country at all newsagents and bookstalls on September 30th, price one shilling.

DISTANT ON-OFF SWITCHING

The ability to control a receiver from a distance appeals to everyone as almost an essential adjunct to listening convenience. The construction of a remote-control device is a very simple matter and, if the instructions given below are followed, can be carried out for an expenditure of only half-a-crown.

THERE are many remote control systems in vogue to-day, some simple, some complicated, but practically all having the disadvantage of entailing a considerable initial outlay. The little gadget I am about to describe has been working satisfactorily in my home for four years, and cost, including the wire for the extensions, less than 2s. 6d.

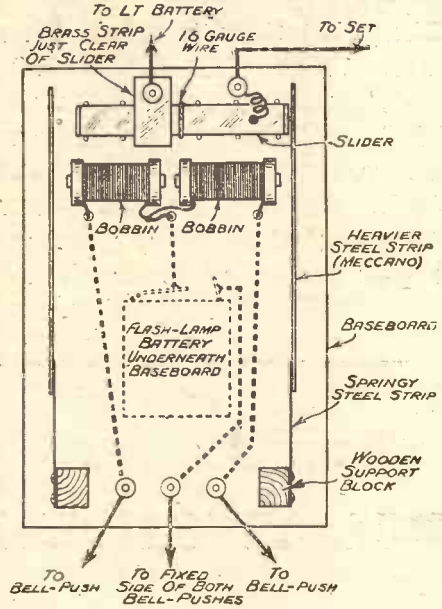
All that is required is an old electric bell, which practically everyone will have about. This is entirely dismantled, and the two bobbins are then mounted, end to end, *i.e.*, with the magnets protruding at each side, on a wooden base, say 6 ins. by 4 ins.

Double-Action Movement.

Two arms, which must be reasonably weighty, and which, in my case, were made from two lengths of Meccano strip, are then fixed at the end of the base by means of little wooden blocks. These arms run up at right angles to and about $\frac{3}{16}$ of an inch away from the magnets. These, of course, attract the steel arms, which must be quite free to move, and if not possessing sufficient pliability can be soldered to two strips cut from a tin lid (as in my case).

The magnets on the baseboard will both have a short length of wire at each end; these are connected up in the following way: The "inside" end of each coil is connected together and taken to a terminal, the other two remaining ends being taken to two separate terminals. These terminals can be conveniently mounted at the opposite end of the baseboard between the two blocks supporting the arms.

FOR CONSTRUCTORS' CONVENIENCE



And now for the contact breaker. This is a short length of brass strip, the lighter the better, bent at right angles at each end, its overall length being about $\frac{1}{8}$ in. longer than the overall length of the two electro-magnets.

About half-way along is soldered across it a short length of 16 S.W.G. round wire. This makes contact—by sliding underneath—with a brass strip, arranged, by means of a washer, so that it is about $\frac{1}{8}$ in. above and parallel to the base, to which it is secured by means of a terminal.

A length of fine wire, coiled so as to allow perfect freedom, is soldered to the slider and to another terminal. Gimp pins offer the best means of guiding the slider, and should be tapped in, about three each side and one about $\frac{3}{16}$th in. from each end to prevent it going too far over.

How It Works.

From the sketch the action is quite obvious. The L.T. battery positive lead is taken to the terminal connected to the slider and the lead from the set to the other terminal. When current is fed through the right-hand bobbin, the arm is attracted, pushes the slider across and so completes the filament circuit. The contact is broken by energising the other magnet.

Ordinary double bell-wire with a single strand of 22 D.C.C. will do for carrying the current, and two small bell pushes are mounted, in some unobtrusive place, close to the loudspeaker extension point.

The basis of the device is a discarded electric bell, which is first of all completely dismantled. The magnet bobbins are mounted end to end on a wooden base. Energising the right-hand bobbin attracts the arm which pushes the slider into the "on" position. To switch "off" the left-hand bobbin is energised and attracts its arm, so pushing the slider away from the "on" position.

---

by interposing a sheet of rubber or thick cloth between the set and the top of the cabinet; this will insulate the furniture from the loudspeaker vibrations.

It is not possible to lay down definite rules for finding the best position for a receiver. The acoustics of living-rooms vary enormously, and, apart from this, the point is largely governed by the reproduction that the set gives and the amount of volume that the listener normally requires.

Some Useful Hints.

There are, however, some hints which can be given, and these, used in conjunction with some careful experimenting, will enable the amateur to determine the most satisfactory way of arranging the installation.

The first of these hints is a fairly safe one, and seems to hold good for any ordinary domestic conditions; the loudspeaker should be installed well away from the floor, and, if possible, should be slightly inclined towards the ceiling.

The reason for this is twofold: in the first place, it is undesirable that any considerable amount of sound energy should reach the floor, as it will be speedily absorbed by carpets or rugs or any heavily padded furniture such as armchairs or sofas.

The other reason is that certain audible frequencies are emitted from the loudspeaker in a fairly well defined beam which leaves the cone at approximately 15 deg. *below* the horizontal; such frequencies are

"PLACING" YOUR LOUDSPEAKER

(*Continued from page* 116.)

partially lost if the speaker is mounted in the normal manner and close to the floor.

Incidentally, tilting a speaker in this way will often reveal a mains hum (on mains sets, of course) which was previously unsuspected; the sound waves that constitute the audible hum are lost by absorption when the speaker is mounted horizontally, but are able to reach the listener's ears when the baffle is inclined.

However disconcerting such a result may appear, it of course proves that the bass notes are not being properly *heard* in the first position, and that general improvement will be obtained with the speaker inclined and the hum eradicated at its source.

Improved by Distance.

The next point that will be found valuable in the quest of better listening is that the most pleasing reproduction will be obtained when the speaker is as far away as possible from the listener.

This, of course, only applies to normal-sized and normally-furnished rooms.

In this case the explanation is to be found in the fact that a certain amount of echo is obtained if the sound from the speaker does not reach the ears by too direct a path; this gives additional "life" to the reproduction, and will also be found to prevent tiredness after a long spell of listening. Many complaints of headache from listening are due to the speaker being too close to the ears, which forces the listener to sit in a "concentrated" beam of sound.

When you are experimenting in this matter, it is very important that the receiver is tuned to a fairly *constant* type of programme; that is to say, either to speech or music that does not contain many marked changes of volume or character so that the different results obtained from different positions of the loudspeaker can be fairly accurately compared.

Constant Volume.

It is also of the greatest importance that the volume control is set at a level that gives the amount of sound that approximates to comfortable listening strength; this setting of the control should be left unchanged throughout the experiments.

Finally, it is worth while mentioning that the best position for the set will in almost every case have to be a compromise; you may find that a position that is ideal for organ music may give less pleasing results when speech is received or vice versa. In any event, some all-round improvement is sure to be obtained from careful work on the lines that I have indicated, and you will find that an apparently slight improvement will be of the greatest benefit when a long programme is to be enjoyed.

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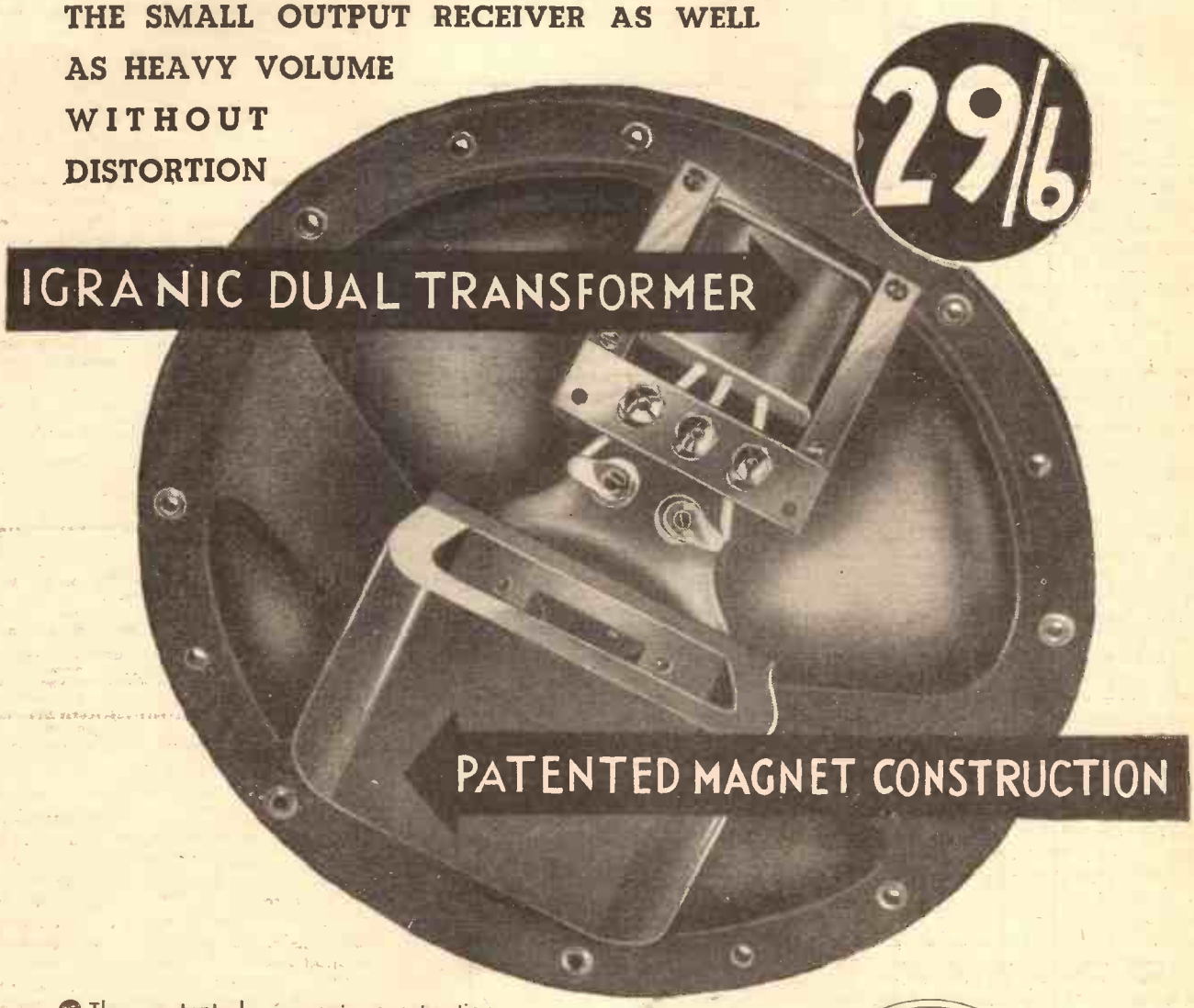

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CVS—91

RADIOTORIAL

The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos.

Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article.

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

All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

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

QUESTIONS AND ANSWERS

"WHAT IS "BREAK-THROUGH"?

D. S. (Farnborough).—"On several occasions lately I have come across the expression 'break-through'; but, so far, I have not seen it explained in any way. What is break-through?"

The term is generally used to indicate a particular form of interference which is troublesome in the districts immediately surrounding a broadcasting station. The interference in question generally takes the form of hearing an unwanted medium-wave local-station programme when tuned to the bottom (or near the bottom) of the long-wave dial.

In some districts special precautions have to be taken to prevent this on simple sets but it should not be troublesome in your locality.

FULL-WAVE OR HALF-WAVE RECTIFIER VALVE?

M. Y. (Norwich).—"The A.C. mains unit which I have been offered to work in conjunction with my set (detector and pentode) is without a valve, and I do not know what type to try in it.

"There are two big condensers, the valve holder, potential divider (20,000 ohms), smoothing choke and mains transformer. The latter is marked '150' across one pair of terminals, '4' across another pair, and its three other terminals are given as 0, 200/225 and 225/250.

"The two terminals of the '4' winding go to the valve holder and one of the '150' goes to another valve holder terminal, but the other '150' terminal goes to H.T.—, etc.

"What sort of rectifier valve do I need for that arrangement?"

The connections described are for a half-wave rectifier, and any of the 4-volt half-wave rectifier types should be satisfactory for a two-valve set such as yours.

DO YOU KNOW—

the Answers to the following Questions?

There is no "catch" in them; they are just interesting points that crop up in discussions on radio topics. If you like to try to answer them, you can compare your own solutions with those that appear on a following page of this number of "P.W."

1. **At approximately what speed do wireless waves travel from transmitting to receiving aerials?**

* * *

2. **If careful adjustment of grid bias cannot cure the occasional both-ways "kicking" of a milliammeter inserted in the plate circuit of an ordinary power valve to test for distortion, what is likely to be the matter?**

* * *

3. **Does an ordinary S.G. valve give any advantages for H.F. amplification when compared with a multi-mu S.G. valve?**

AN S.G. IMPROVEMENT THAT RUNS DOWN THE H.T. BATTERY.

A. R. (Dartford).—"The set is not the latest type, but is excellent on distance and tone (S.G., detector and pentode).

"On a friend's recommendation I recently hotted up the long-distance range by putting in a volume control, the new wiring being quite simple, as follows.

"Slider terminal to 'anode' terminal of S.G. valve holder; one end terminal of volume control to H.T.+; other end terminal to L.T. negative wiring.

"This has been very successful, except that I find the H.T. battery runs down very much quicker than before. Is this right when using a volume control, because if so I do not think it is worth the extra expense?"

When a volume-control resistance is used as an S.G. potentiometer, as described, it is joined across the H.T. battery permanently, and therefore takes some current, even when the set is not working.

This is wasteful and unnecessary. And, fortunately, it is easily preventable.

One way out of the difficulty is to remember always to remove the H.T. negative plug from the H.T. battery every time the set is switched off.

Another method is to connect an ordinary on-off switch in the lead from the end of the potentiometer ("volume-control" resistance) to the L.T. negative wiring, and to switch this off every time you put the set off.

The best plan generally is to use an extra point on the set's on-off switch, and thus automatically to switch on and off the S.G. potentiometer high-tension circuit when the main set is put in or out of action.

Thus, if you have a two-point on-off switch in use at the moment, substitute a three-point switch for it, wire up its filament leads, battery, etc., as before, and also use the extra point to make and break the potentiometer-to-low-tension wiring.

The fact that connection may now be made to a different part of the L.T. wiring is unimportant.

THE RELATIVE IMPORTANCE OF H.F. CHOKES.

S. E. K. (Stafford).—"There is one point I should like to raise, as, although I have seen it mentioned in 'P.W.' as being rather important, I cannot trace the article now in my back numbers (which I can never find possible to destroy, in spite of the space they take up as the months go by).

"It is about using two H.F. chokes, one in the detector's plate circuit and the other in the S.G.'s (multi-mu).

"I know that for best efficiency both chokes should be first-class components, but, like many others of your readers, I have to consider the cash angle very carefully and use up as many of my old components as I can.

"Of the two chokes which are on hand, one is unscreened, and I believe it is called by the makers an 'S.G.' choke, whilst the other choke is screened.

"The latter cost me 3s. 6d., but the unscreened one was 5s., if I remember right, and was bought at the beginning of last winter, at the same time as the other.

"My inclination is to use the unscreened one in the S.G. anode circuit (as I said, I believe it is called an 'S.G.' type), but I am not certain if it would not be better to use the screened one there because the fact of screening seems to show that the other one is definitely for H.F. work. And the H.F. stage is a little more crowded as regards the spacing of components than the detector section.

"Please advise as to which is the more important position, and, if possible, whether it is better to put the screened or the unscreened choke first."

In general it is far more important to use a very good choke in the screened-grid valve's anode circuit than in the anode circuit of the detector.

The fact of screening is nothing to go by; but the fact that one choke cost a good deal more than the other is important, and we expect that the unscreened choke is a far better component than the other, which cost less. So we should certainly expect it to be more suitable for use in the screened grid's anode circuit than the cheaper one, and we should wire up with this in mind.

To make doubly sure, however, why not wire both the chokes with *flex* leads at first, and extend the leads sufficiently to enable them to be changed over? If you are careful about the run and spacing of these temporary leads it should be possible to tell which arrangement—screened or unscreened choke first—gives the better results, and you could then wire up permanently accordingly.

We expect you will find that the cheaper (screened, in your case) choke will be perfectly satisfactory in the detector's plate circuit, but will rob the set of some of its sensitivity when in parallel with the tuning coil, which is what the connections amount to in the ordinary set when an H.F. choke is used in the anode circuit of a multi-mu S.G. valve.

"P.W." PANELS, No. 138. MUNICH

The Munich station is one of Germany's high-power (60 kw.) Regionals. It is now coming over extremely well on 533 metres, the dial reading being between Vienna's and Budapest's.

* * *

Munich starts the day's programme at about 6.30 a.m., and usually works with only short intervals till midnight. In German the name is pronounced "Munchen."

* * *

Orchestral concerts are one of the main features of the attractive programmes, which are relayed by three other German stations, Augsberg, Kaiserslantern and Nurnberg.

SHORT-WAVE REACTION CONTROL BY MEANS OF A VARIABLE RESISTANCE.

"W2XAD" (Sleaford).—"Having decided to bring out my short-waver again after a two years rest, I struck a snag owing to missing components, which I had taken from it after it had been put aside.

"It is quite a simple set, but was particularly good in its day on account of perfectly controlled reaction, which was done by a variable resistance instead of the usual variable condenser.

"Unfortunately, I do not remember the wiring for this now, but most of the set is intact. It is detector and low frequency (L.F. transformer), with the usual two short-wave coils, aerial being led through a neutralising condenser to a tap on the grid coil.

"All the second valve's wiring is O.K., and so is that up to the grid of the detector, but it is the plate circuit of this that has been altered, and I think the missing components are the variable resistance for controlling reaction and an H.F. choke.

"Please say where these should go, the present wiring being as follows:

"H.T.+1 to primary of transformer, the other terminal of which has no connection at present. Plate of detector to one side of reaction coil, and one (cut) lead to——?

(*Continued on page* 124.)

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 122.)

"Other side of reaction coil has no connection at present, but I remember this was joined to the variable resistance (which was a wire-wound). There is also a missing connection from a ·001-mfd. fixed condenser standing near the detector valve holder, its other side being taken to the common L.T.—, H.T.— lead, etc.

"Please say whether this needs H.F. choke as well as the variable resistance, and where they should be joined up. Also, how many ohms for the variable resistance?"

All you need to complete the set is a 50,000-ohms variable resistance and a short-wave H.F. choke.

The wiring will be the following: One side of the choke to the vacant terminal on L.F. transformer. Other side of choke to plate terminal of the detector valve holder.

One side of the variable resistance will go to the vacant reaction-coil terminal, and the other side of the resistance must be joined to the vacant ·001-mfd. terminal.

INSERTING A FUSE TO PROTECT THE VALVES.

D. E. (Taunton).—"As the set will be used out in the country by my old people, who know nothing whatever about wireless except how to put the switch on or off, I want to include a fuse to protect the valves from too much H.T. voltage.

"According to measurements in the battery leads, the H.T. battery will have to give about 12 milliamps and the L.T. about a quarter of an amp. So should I get a low-value fuse, as near 12 milliamps as possible, and put this in the lead to the H.T. negative terminal, to get the best protection?"

You will give the valves protection by providing any fuse which blows when called upon to carry more current than the normal filament current—in your case, a quarter of an amp. (250 milliamps). And we do not think a very low-value fuse is necessary or desirable, because it would be liable to burn out too easily, thus putting the set right out of action, because its owners would be incapable of fitting a new fuse.

It sometimes happens that the normal anode current value is greatly exceeded for a moment (whilst a condenser is charging or some similar momentary battery-drain is taking place), and it will be very inconvenient in the circumstances if this blows the protective fuse.

By fitting a higher-value fuse—say, one which blows at 120 milliamps—you would allow for such temporary surges of current, and yet the fuse would blow before the filaments were called upon to handle excessive current if by some means the H.T. gets connected across the L.T. wiring.

So we recommend that you use a fuse of somewhere near the value we suggest.

IS YOUR SET BEHAVING ITSELF?

Perhaps your switching doesn't work properly? Or some mysterious noise has appeared and is spoiling your radio reception? Or one of the batteries seems to run down much faster than formerly? Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers its unrivalled service. Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4. A postcard will do. On receipt of this an Application Form will be sent to you post free immediately. This application will place you under no obligation whatever, but, having the form, you will know exactly what information we require to have before us in order to solve your problems.

LONDON READERS, PLEASE NOTE: Inquiries should NOT be made by 'phone or in person at Fleetway House or Tallis House.

WHAT STATION WAS THAT?

T. M. (Dundee).—"What is the name of the German station that works on the wavelength just below Langenberg's?

"I often listen to the latter station, because I have a friend in Germany and am interested in the language. The Langenberg station comes over very clearly, but the other German, three degrees lower on the dial, is not quite so loud, though the language is clearly recognisable.

"I am unable to find it from a list of wavelengths and stations. The nearest German is the Konigsberg programme from Danzig, but I do not think this is the one I hear."

We have no doubt that the station you hear is Beromunster, which is often mistaken for a German because that is the language used, though the Beromunster station is situated in Switzerland. Its wavelength is 459 metres, and the power (sixty kilowatts) is the same as that of Langenberg.

The town of Beromunster is the actual site of this German-speaking Swiss regional station, but its official name is "Schweizerischer Landessender."

WHEN A VALVE LOSES EMISSION.

T. D. T. (Durham).—"There is one point about the replacing of valves which I do not remember having seen covered in 'P.W.,' but which might affect the pockets of a good many readers besides myself. Perhaps you could 'give a ruling,' for it has come up several times in my experience and must be fairly common.

"The point is this: When one valve of a set loses its emission, causing reception to become weak or 'fuzzy,' the question of replacing the other valves in the set also comes up.

"If all the valves were bought together, as with a new set, it seems a reasonable argument that now one has gone the owner had better get *all* new valves. On the other hand, if the test fails to show anything yet wrong

(*Continued on page* 126.)

RADIOTORIAL QUESTIONS AND ANSWERS

(*Continued from page* 124.)

with the other valves, why not go on using them as long as possible?

"Please say which is the right course to take."

Although it is often said that because one of the valves has lost emission the others are bound to do so soon, there is seldom justification for this in fact. Valve life is not uniform, and the time which the valve has been in use is only one of several factors affecting loss of emission.

Much will depend upon the voltages which have been applied and upon various circuit conditions. So it is not safe to assume that because one valve has gone all the others are "on their last legs."

The correct and safe procedure is to check the valves periodically, to make sure that the emission is O.K. (This is especially necessary where first-rate quality is of importance.) If a regular check is impracticable a watch should be kept for the symptoms denoting loss of emission—failing quality, loss of power and weakening of reaction are the commonest—and when any of these occurs the valves should all be tested and any faulty ones replaced. Those which are not faulty can be used till symptoms denote that another test must be made.

THE RESISTANCE OF A LAMP USED FOR CHARGING.

W. R. C. C. (Derby).—"Can you tell the *resistance* of an electric lamp when all you know about it is from the marking of volts and watts on the bulb itself?

"The reason I ask is that I am thinking of taking on a charging board for accumulators, and various lamps are used to give different resistances so as to pass more or less current. But, although I can work Ohm's Law, I do not see how it can be used to find the resistance R when only volts and watts are given."

To find the resistance you must use Ohm's Law in conjunction with the equation WATTS = VOLTS × AMPS.

You already know the wattage of the lamp, so if either volts or amps. are known, the other factor can easily be found.

For example, if you have a lamp marked 60 watts/240 volts you can determine the current passed through it by dividing 60 by 240, which equals ·25 amp. Both the current and voltage are then known, and it will be possible to apply Ohm's Law in the ordinary way.

In this instance we have 240 volts and a current of ·25 amp., and as amps. divided into volts will give the resistance we find that the latter is $\frac{240}{\cdot 25} = 960$ ohms.

Other values can, of course, be worked out in the same way.

WHEN REMOVAL OF THE SCREEN INCREASES THE STRENGTH.

C. N. (Borough Green).—"Quite by accident I found that removing the screen of one of the coil units in my superhet increased the strength of reception by a considerable amount. And the only other difference is that the condenser needs adjusting just a little lower than before.

"What is the cause of this?"

THE ANSWERS

TO THE QUESTIONS GIVEN ON PAGE 122 ARE GIVEN BELOW.

1. At the speed of light—approximately 186,000 miles per second.

* * *

2. It is probable that the set is being overloaded when a powerful transmission is tuned full in.

* * *

3. Yes. The ordinary S.G. valve gives slightly greater amplification than the average multi-mu type. The difference is not, however, very great and not enough to offset the volume-control advantages of the multi-mu.

DID YOU KNOW THEM ALL?

It is not possible to say definitely from the details you give, as there are several things that might account for increased strength in such circumstances.

One possibility is that in the absence of the screening you are getting some helpful feed-back effect, which could not take place when a metal screen surrounded the coil unit.

Another possibility is that the screen was introducing losses into the circuit, which is, therefore, much livelier without the screen in position. (But this, of course, should not happen with a properly designed coil unit in good condition.)

DO THE MAGNETS OF A LOUDSPEAKER WEAR OUT?

"PERMANENT" (St. Leonards-on-Sea).—"Is it likely to be the loudspeaker magnets wearing out that is causing loss of strength and quality? I have heard that the permanent-magnet moving coils are not so good as those run from the electric light mains, but knowing nothing of wireless I can't be sure this is true.

"Surely it is not because I got a permanent magnet instead of a mains type that the set has gone right off within twelve months of buying the loudspeaker."

It is most unlikely to be the loudspeaker magnets, for a well-made magnetic system of this type is not likely to deteriorate for many years. And certainly not noticeably so, as in your case, because careful measurements after years of use have shown that a good permanent-magnet loudspeaker loses remarkably little of its pristine magnetic energy under ordinary conditions.

On the other hand, there are many likely causes of such trouble as you describe in the outfit, apart from the loudspeaker—loss of emission of one or more of the valves, battery deterioration and so forth.

You can test whether the set part or the loudspeaker is at fault by substitution. That is, by trying another loudspeaker (known to be O.K.) on your set, or by testing your loudspeaker on another set, preferably similar in number of valves, etc., to your own.

This will show at once whereabouts the fault lies, and anyone skilled in wireless would be able to carry the method farther, and to decide in just what part of the outfit the trouble is situated. But you will have to get someone of experience to help you, as it is very easy for the novice in these matters to go astray.

THAT MINIMUM CAPACITY

(*Continued from page* 114.)

sides, and if screwed down flat on a screen is apt to contribute a surprising number of mmfds. A parallel-feed H.F. choke may be as low as 1 mmfd., but there are types as high as 12 and more; a single-slot winding is hardly good enough at this point.

Balancing Up.

When ganging circuits, the minimum capacity of each has to be brought up to the same standard with the trimmers. Suppose that all the bits and pieces that have just been mentioned total up to 40 in one and 55 in another.

Obviously they can be matched by adding 15 to the first and nil to the second, or adding 35 and 20 respectively. If the latter is done there is no doubt that the lowest wavelengths will pass mysteriously out of reach.

If so, try unscrewing *all* the trimmers of the gang by an equal amount of capacity. The object should be to add nothing to the circuit that has most stray capacity, but to bring all the others into line with it.

Not Really Difficult.

You may say, "This talk about keeping down the stray capacity is all very well, but how am I to know capacity when I meet it? It won't be wearing a blue geranium in its buttonhole." True, it is not marked with values, and the manufacturers of components rarely help one; but the experienced radio man can estimate stray capacity fairly well just by looking at it.

The capacity of any part is reduced by increasing the distance from it to neighbouring metallic parts that are earthed, or at any rate connected by large condensers to earth. It is also reduced by decreasing its size. And it is reduced still more if insulating material, such as bakelite, paper, rubber, etc., between it and earthed parts, is replaced by air.

As an example, take a piece of wire joining the tuning circuit to the grid of a valve. According to what has just been said, it should be quite clear that the worst thing to do is to use a long insulated wire running close against the metal chassis.

Bare Wire Best.

Of course, if the wire is more than an inch or so from everywhere, there is no appreciable merit in having it bare. Insulation would form such a small part of the total "dielectric" that it wouldn't noticeably influence the capacity. A short direct connection, in free air, is the ideal.

Now, if your set "doesn't go down," how about running over the layout to cut down some of the sources of minimum capacity?

THE "P.W." H.T. ECONOMISER.

To the Editor. POPULAR WIRELESS.

Dear Sir,—I wish to congratulate the designer of your unique H.T. Economiser, which is most effective and efficient. Would advise all battery users to invest in one who are out for quality and economy.

Again thanking you for the season's remarkable invention.

Yours faithfully,
"1912 EXPERIMENTER."

59, Norboro Road, Doncaster.

ABOUT YOUR GRAMOPHONE

(*Continued from page* 88.)

device, it should be gently drawn through the finger and thumb so that all traces of abrasive matter are removed. Such tiny scraps are liable to scratch the record and cause noisy reproduction.

Sometimes it is difficult to get good results with non-metallic needles when using old or steel-worn records. This is not the fault of the needle, however, and it should be given a fair chance. Old and worn records can be revived for use with fibre needles, but for the newcomer it is suggested that first tests be made on new or lightly worn records only.

Whether steel needles or fibre needles are used, care should be taken to see that the pick-up is always lowered on to the record very gently—a steel needle will do great damage if it is carelessly treated, whilst the point of a fibre will easily break. Keep all types of needles free from damp.

Air-Tight Boxes.

A steel needle will soon lose its high polish and sharp point, whilst its non-metallic brother will absorb moisture and become soft if it is not stored in an air-tight box. Do not use non-metallic needles after they have been repointed so often that less than $\frac{3}{8}$ inch projects from the pick-up, as the reproduction then tends to become harsh.

See that used steel needles are disposed of as soon as possible and not left to fall into the gramophone motor—a good plan is to bury them in the garden where the damp will soon rust them away.

THE LISTENER'S NOTEBOOK

(*Continued from page* 110.)

The B.B.C. is wise to insist, when possible, on the use of a manuscript, particularly when speakers can give the impression that they are talking and not reading from it.

* * *

Once more I can congratulate the B.B.C. on its method of presenting variety. This time in "One Good Turn." In this type of entertainment presentation is everything, for, as critical listeners know, it can make or mar. The atmosphere of a road house is known to everyone, and it was easy to imagine oneself there, listening to the pompous Bobbie Comber or the asinine observations of Claude Hulbert.

* * *

We were thus put in the mood whereby everything made a direct appeal. But for this background a good deal of the patter might not have passed muster. And added to this was the fact that this background was never allowed to eclipse the programme proper.

It was strange to hear Al Bowlly away from the Monseigneur. His particular brand of crooning is quite distinctive and grows on one. I liked him better than I usually do from the Monseigneur.

I didn't think he quite fitted in with Anona Winn in the duets, but, there being no one to my knowledge who croons as he does, the ideal partner would be hard to find.

* * *

The high-light of the week—of many weeks, in fact—was "The Fantastic Battle." Three people had a hand in this—C. R. Burns (original writer), Leslie Bailey (adaptor) and Robin Whitworth (producer).

These might be called a trio of geniuses as far as radio drama is concerned. Everything in the plot was so easily visualised, in spite of the many variations of time and place. This is where the trio mainly displayed their genius.

* * *

Having listened to a large number of radio plays now, I am convinced that those written expressly for the microphone have scored the bigger success.

The great plays in our literature haven't always been so great over the air. Radio and stage drama must thus be differentiated, as I previously suggested radio and stage actors must.

* * *

The cast of "The Fantastic Battle" was up to the same high level as those of recent plays, for which I have had nothing but praise. Harold Scott as the special reporter shared the chief honours with Fisher White in the rôle of president. Nor must I forget to mention Gabrielle Casartelli's excellent little sketch of a telephone operator. This was first rate.

* * *

"The Follies of the Air" relied for its atmosphere on a compère and a studio audience. This expedient finds considerable favour with the B.B.C., though I think it less effective than that used in "One Good Turn." "The Follies of the Air," like the curate's egg, was good in parts, and those parts were those in which Lupino Lane figured. William Stephens had a good song to sing in "No Thrill," as also had Margery Wyn in "The Picture Bride."

I also liked the Moderniques' version of a song called "I Heard," but I didn't like their "To-morrow," with the African rhythms in the background. Everything else was commonplace.

* * *

Lupino Lane had to carry most on his shoulders, and this he did very well. It was selfish on my part, I know, but I begrudged him the time he spent off-stage for a breather.

While I thought "The Musical Box" sketch was the best thing of the show, I wondered what future radio had to offer the Eight Step Sisters. A promoter who puts on an act that makes primarily a visual appeal must be a super-optimist if he hopes it to score as an act only to be listened to.

* * *

I noticed that Uncle André gave a non-committal reply when asked what he thought of the idea of the B.B.C. dancing troupe. It is significant, too, that he doesn't include a similar troupe in his broadcast shows, but, as he says, "That's no reason why the B.B.C. shouldn't. They'll learn from experience."

* * *

This interview with Uncle André in the wings of the Comedy Theatre was a good surprise item, and more enjoyable than the Balcony Scene from "Romeo and Juliet" that preceded it. Sylvia Sidney spoke her lines much too quickly, and was not at all convincing.

THE LINK BETWEEN

(*Continued from page* 86.)

Another Fine Effort.

While on the subject of really worth-while catalogues, I must not forget to pay tribute to the latest Bulgin effort. Far from being just a detailed list of the hundred and one different parts for which Bulgin are famous, it is a reference book of outstanding interest to every home constructor.

The 26-page appendix, which is in the form of a technical manual, is a veritable mine of information, and among many other topics it contains articles on such subjects as "Interference, Its Causes and Cures," "Class B Amplification," "Universal Remote Control," "Filter Output Circuits," "Tone Control," "Thermal Delay Switching," etc., etc.

Last season the Bulgin catalogue was one of the industry's most ambitious productions. This year it is even better, and I strongly recommend you to obtain one while the going is good. But will you kindly note a slight modification of the rules affecting postcard literature for this particular catalogue.

As the book is rather a "fat" one, will you, in this instance, kindly put your postcard (or slip of paper) in an envelope together with 2d. in stamps towards the cost of postage? This does not apply to any other applications you may care to make in the same envelope. **(No. 54.)**

H.P. Secrecy.

I gather from my morning paper (no names, no pack drill!) that we are swiftly returning to industrial prosperity. If they say so, I suppose we must be, yet I am afraid there is a certain amount of journalistic licence in the use of the word swiftly!

However, quite definitely there is an upward tendency, and I am wondering what percentage of increased trade returns are due to the extension of hire-purchase facilities. Personally, as I have mentioned before in my notes, I think it is a very sensible innovation, especially in connection with radio, for without a doubt, H.P. does definitely enable many people to participate in radio entertainment who might not otherwise be able conveniently to put down spot cash for a suitable instrument.

In this connection, the increasing popularity of the "easy terms" idea, prompts me to call attention to the attractive service offered by The New Times Sales Co. You can obtain almost anything radio on H.P. terms through this old-established organisation, and, moreover, they deal with you direct. In other words, the elimination of a third-party finance company does ensure strict privacy.

NOTES AND NEWS

(*Continued from page 82.*)

Perhaps the tracing of a mere twenty per cent of the missing people is not considered to be worth the "air time" expended on it! No, the reason given is invalid, callous, and demonstrates yet again, but rather more clearly than usual, the deplorable lack of psychological insight from which the B.B.C. suffers.

A Brace of Gems.

FROM a Kentish newspaper's report of an interview with a local radio amateur: "I also learnt that wireless travels on the same air waves as light . . ." No ether need apply!

Again: "Sound itself travels slowly, which explains why the words uttered by a speaker on the platform at the Albert Hall can be heard sooner by people in Australia than they can by a man seated at the back of the hall."

If I were an Australian I should be content if I could hear them at all at that distance. However, this "skip-distance" theory is a fine thing and explains a lot!

"The Modern Columbus."

ON October 13th the first broadcast by Mr. S. P. B. Mais, who is touring America, will be given. Whilst I, personally, should enjoy Mr. Mais better if he talked about the finest land on earth, Britain, I have little doubt that he will be as charming as ever when describing his American experiences. What really does bother me is the fear that we shall hear only every tenth word. The last broadcast from America was a very painful ordeal.

Wireless for Private Aircraft.

MR. W. LINDSAY EVERARD, M.P., who has his own private aerodrome at Ratcliffe, in his constituency of Melton, Leicester, is having his Dragon Moth aeroplane fitted with Marconi transmitting and receiving apparatus.

The transmitter is rated at 100 watts and the receiver is a three-valver. The H.T. current is derived from a wind-driven generator. This set can be used for telephony as well as for telegraphy, and will enable Mr. Lindsay to keep in touch with the ground from almost anywhere over the Continent.

The Lady Announcer.

YES, now I am sure that men's voices are far more suitable for the work of "announcing" before the microphone. The best voice of a woman announcer I have heard was that belonging to somebody who used to speak from Radio-Paris on Sundays; Mrs. Borrett's voice isn't a patch on hers. There has been a great deal of comment on the B.B.C.'s action in giving this £500 a year job to a married lady whose husband has the pension of a retired naval lieutenant-commander.

It seems strange, I admit; but those people who have written to the newspapers to say that their daughters have high-grade certificates for elocution should remember that the microphone demands something more than does the human ear—some peculiar quality which is not perceivable save through the "mike" and the receiver.

ARIEL.

THE MIRROR OF THE B.B.C.

(Continued from page 86.)

of established policy. I hope we hear more of Mr. Iremonger on the microphone as time goes on.

Political Broadcasting.

The B.B.C. is not much impressed by recent attacks on its policy of limiting political broadcasting to the "quota scheme" agreed by the main political parties. The B.B.C. is wisely keeping an eye on programme balance, and recognises that the average listener is not really interested in politics, anyway. Once the individual politician, however eminent, is admitted there will be no end to the clamour for equal rights for all. Politicians should realise that they have no natural right to the microphone. In their own interests also they should realise that most of them would only damage their careers by exposing their deficiencies as microphone performers.

London's Methods.

How different are the methods of London compared with the provinces in the quest for suitable talent for the microphone!

Broadcasting House, as we are often told, has special rooms set apart where filing cabinets are bulging to bursting point with papers containing the names and other details of thousands of people who have passed audition tests and can be called upon at a moment's notice to sing or play or act in the programmes.

Goodness knows how many thousands of others have been turned down in the ten years' existence of the B.B.C., but the number must be colossal, because for every hundred would-be broadcasters not more than one or two are chosen to give listeners the benefit of their abilities.

Scotland's Plight.

Yet here is Scotland simply crying out for artistes. If you know of a choir or a soloist, vocal or instrumental, who you think should appear before the microphone, write and tell us, says the B.B.C. in Scotland.

They are even prepared to lend the Scottish Studio Orchestra or the Scottish Wireless Singers, or both, and co-operate with local musical associations in their efforts to discover talent. We hope that such a bold attitude meets with the success it deserves.

Local musical associations should be terribly bucked that the B.B.C. thinks them to be so important. It is up to them to behave as true Scots and not be shy, but to grasp the powerful hand which is offered to pull them from obscurity to fame.

Mr. J. S. Clark.

Mr. J. S. Clark, who will inaugurate the new series of talks, entitled "Queer Happenings," in the Scottish Regional programmes on Tuesday, October 3rd, is an Englishman who has made Glasgow his home for many years.

Once a sailor "before the mast," then a trainer of animals in a circus, a lecturer and a member of the Glasgow Corporation since 1926, with a spell of representing Maryhill in Parliament, few men can say they have had such a wide and varied experience of life.

He is a Fellow of the Royal Society of Antiquarians for Scotland and a Trustee of the National Portrait Gallery. The Queer Happening which Mr. Clark will describe concerns a book that came back in a very, very curious manner.

The Edinburgh Show.

Scottish listeners are looking forward to the National Radio Exhibition, which takes place in Waverley Market, Edinburgh, from October 11th to 21st.

An interesting feature of the show (apart from the receiving sets, of course) will be an exhibition of musical instruments.

Later on we shall let you know what the B.B.C. is doing to assist in making the event more popular and successful than it has ever been.

CLEANING UP CLASS B

(Continued from page 113.)

and the power output is 40 milliwatts. It requires, with the B.21, a driver transformer ratio of 1·5 : 1 with 150 volts H.T. 1·25 : 1 at 120 volts, and at 100 volts it should be 1 : 1. The Class B wattage outputs under above conditions are 1,500, 900, and 500 milliwatts, the same H.T. being used for both valves.

The L.P.2 we know well, and it makes an excellent driver. Here we need transformer ratios of 1·25 : 1 with 150 volts and 1 : 1 with 120 or 100 volts. The bias figures at those voltages should be 7·5, 6·0 and 4·5, and the anode currents are 3·6, 2·5 and 2·7. The power outputs of the driver are 120, 70 and 50 milliwatts under the above conditions, giving a Class B wattage output of 2,300, 1,400, and 900 milliwatts.

TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio.

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

Condenser Impedance.

THE impedance of a condenser being inversely proportional to the frequency, it means that if the condenser has a certain impedance at a certain frequency it will have half the impedance at twice the frequency, one-third of the impedance at three times the frequency, and so on. Again, inasmuch as the impedance is inversely proportional to the capacity, this means that if a condenser of a certain capacity has a certain impedance, then a condenser twice the capacity will have half the impedance, and so on. If we have a condenser of a certain capacity and we use this at a certain frequency, and then we take a condenser of *twice* the capacity and use it at *twice* the frequency, the impedance will be half of half—that is, quarter of the original impedance.

The Effect of Frequency.

Considerations of this kind explain many of the properties of condensers in relation to alternating currents. It becomes clear, for instance, why a very small condenser may easily pass the *radio*-frequency currents which come in from the aerial, whilst a condenser which is to pass *audio*-frequency currents freely must be of much larger capacity.

It also explains why a condenser will discriminate between direct current and alternating current, because the direct current (being, in effect, alternating current of zero frequency) finds itself faced with an infinite impedance, and so none gets through. The alternating-current component, on the other hand, gets through, and so the condenser acts as a separator of the two.

Reaction and Selectivity.

I dare say you have noticed that if you are tuned to a particular station and you bring up the reaction, this often has the effect of cutting out a nearby station which is in the background—I mean cutting out as distinct from merely drowning it.

This effect, which is quite a well-known one, is due to an improvement in the selectivity of the receiver by increasing the reaction.

It is not, however, always convenient to bring up the volume of the desired station, because when you have so increased the reaction as to get the station fairly free from the background of another station it

(Continued on next page.)

TECHNICAL NOTES

(Continued from previous page.)

may be too loud. If this happens you can tone it down again by means of a volume control, one of the type which doesn't interfere with the tuning. If you are using a series condenser in the aerial this can be reduced in capacity, which will increase its impedance and reduce the signal input. If you are using a multi-mu valve you can try increasing the bias on it.

Tone Interference.

Another consequence of sharpening up the selectivity is the danger of interfering with the tone, especially the higher frequencies. but this again can be got over by means of a suitable tone control. If you are using a pentode output with a tone control to bring up the bass you can readjust this so as to lessen its effect on the bass and so relatively increase its effect in the higher register.

Obviously the amount of any of these controls which has to be used will depend on the amount of reaction employed and the resulting sharpening of the selectivity ; consequently, if you are going to vary the amount of reaction from time to time, you will need in the same way to adjust these compensating controls. The general effect of high selectivity, whether obtained by increasing reaction or by any other means, will be to diminish the high-note effect, and therefore anything which counteracts this will come in useful—such as a transformer with what is known as a "rising characteristic."

Permeability Tuning.

Permeability tuning is one of the latest ideas in radio, and although it cannot yet be said to have "arrived," there is a strong probability that it will attract a good deal of attention in the near future.

The idea is that by adjusting the core—that is to say, adjusting the effective permeability or, if you like, the inductance of the coil—it will be possible to tune without the use of variable condensers. I have already said something about iron-core coils, and I think I showed how it comes about that these coils make for smaller size and greater efficiency.

Keeping Resistance Down.

For one thing, the fact that the coil can be made smaller is in itself a reason for greater selectivity, because it means that less wire has to be used to obtain the same inductance, and therefore the ohmic resistance is kept down. One of the greatest enemies of selectivity is *damping*, and one of the most efficient damping agents in a wireless receiving set is ohmic resistance. Anything you can do to reduce ohmic resistance is all to the good so far as selectivity and efficiency are concerned.

Iron-Core Coils.

Of course, the mere idea of using an iron-core high-frequency coil is as old as the hills, but an ordinary solid iron core or even one of relatively thin laminations is out of the question because of eddy-current losses. It was only when the finely divided core came along that we were able to take advantage of the high permeability of the iron without suffering from the drawback of these eddy-current losses.

(Continued on next page.)

TECHNICAL NOTES

(Continued from previous page.)

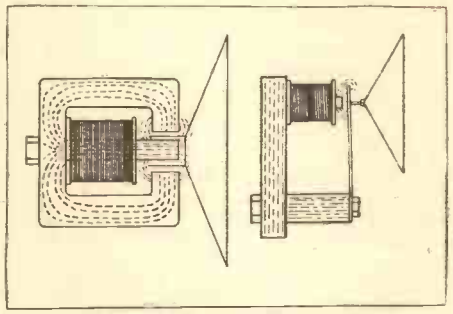
It will be very interesting to see whether permeability tuning "takes on." Personally I think it will, and I think that before very long our present large air-core coils and tuning condensers will be going out of date.

Using Speakers Simultaneously.

The moving-coil loudspeaker employs a special form of magnetic gap and a relatively strong field. This, together with the way in which the moving coil is drawn in and out of the gap, accounts for the large amplitude and the big volume which is obtainable from this type of speaker. At the same time the moving-coil speaker tends to emphasise the bass register.

The moving-iron type of speaker, on the other hand, although simpler in construction, tends to emphasise the upper frequencies and so some experimenters use a

THE TWO MAIN TYPES



This diagram illustrates the main differences in the magnetic systems of moving-coil and armature-type speakers.

combination of the two so as to get a more uniform response over the audio range. In the accompanying figure the general construction of the two types of speaker is shown and the path of the lines of force is roughly indicated.

Reaching Lower Wavelengths.

Often enough you will find that with a given coil and variable condenser in parallel you cannot tune down to a low enough wavelength. It is often stated that by using a tapping on the coil or by putting a semi-variable or pre-set condenser in series with the aerial you will be able to "enlarge" the tuning range. Some people seem to be a bit dubious about this, as it seems on the face of it impossible that either of these dodges should actually increase the range.

In point of fact, this is perfectly true, and what it does is not really to increase the range, or at any rate not to any appreciable extent, but rather to *shift* the range to cover a somewhat lower waveband. In other words, it is probable that if you cannot get low enough you are getting at the *upper* part of your range a wavelength higher than you require.

Shifting the Range.

By tapping the aerial on to a lower part of the coil, instead of connecting it direct to the grid end of the coil, or alternatively by putting a pre-set condenser in series with the aerial, you will be able to come down to a lower wavelength, whilst at the same time you will not seriously reduce the maximum

(Continued on next page.)

TECHNICAL NOTES

(Continued from previous page.)

wavelength which you can get. The result is that you shift your wavelength range into a different part of the scale, where you want it.

A pre-set condenser is simple enough to put into the aerial circuit; as regards the tapped coil, this is a dodge which I should always recommend. It is so very easy to arrange, and even if you do not happen to want the tappings at the moment it is always handy to have them available.

Interaction.

Talking about coils of the ordinary aircore variety, if you are using these with screens it will be necessary to use fairly small coils; but if you are working a simple set where screens are *not* used, then there is no reason to keep the coils so small, and it is better to use somewhat larger coils.

If you do, however, bear in mind that the larger the coil the more the field of the coil tends to spread, and consequently —since you are not using shields—you will need to keep the coil well clear of other components in the receiver with which it might interact.

Push-Pull.

When using a push-pull output stage you will find it a great advantage if you use a pair of matched valves.

These valves can be obtained from the makers specially matched, and it is much better to get them in that way rather than go to the trouble to try and pick out a pair for yourself.

As time goes on, however, they may not "age" in quite the same way, with the result that the matching will become less and less perfect. In addition to this, the push-pull circuit is sometimes liable to instability, but you can get over both of these troubles by putting in a decoupling resistance—of 100,000 ohms—in the grid lead from each end of the tapped transformer.

That is to say, instead of the two outside terminals of the secondary of the transformer going direct to the grids of the two push-pull valves, each goes to its appropriate grid through a resistance of the value mentioned.

Magnification and Overloading.

To use push-pull output properly you should have at least one low-frequency amplifying valve (preferably more). One of the advantages of this arrangement, in fact, is that you can avoid overloading and get excellent results without using any very high value of H.T. voltage.

The push-pull arrangement, however, does not really give any greater magnification than a single transformer-coupled valve, so that you must not expect appreciably greater volume from the loudspeaker than you would from a single valve unless, as I say, you use a greater input—which would give you greater volume in either case.

If, however, you *are* able to make use of a larger input, then you have the advantage that a push-pull arrangement is capable of handling something like twice the volume of the single transformer-coupled stage without distortion.

ILLUMINATING REFINEMENTS

(Continued from page 108.)

The required resistance of the shunt is then given by the equation:

$$\frac{Cs}{Cp} = \frac{Rp}{Rs} \text{ or } \frac{Cp.Rp}{Cs} = Rs.$$

Where Cs is the current to be passed by the shunt, i.e. the total current less the current passed by the lamp:

Cp is the current passed by the lamp.

Rp is the resistance of the lamp.

Rs is the desired resistance.

Having in this way fixed on the value of the shunt (it need be only fairly accurate), it should be wired in the negative H.T. lead in parallel with the lamp.

All Changes Indicated.

When the set is switched on the lamp will glow at normal brilliance and continue to do so until some considerable change takes place in the average current passing through the anode circuit.

Such a change will only occur when overloading takes place or when the emission of the output power valve starts to fall off.

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Under these circumstances the brilliancy of the glow will either be diminished or will increase so that the listener will have visible indication as soon as trouble of this nature occurs.

When the output stage is being overloaded the lamp will flicker with each loud signal, whereas, if the emission of the valves drop, the glow will be reduced. When the emission falls below a certain point the lamp will be completely "starved" and will not light at all.

Not Always Necessary.

By the way, where the total anode current approximates to that which the bulb requires it is not absolutely necessary to go to the trouble of making up a shunt resistance; the lamp can be simply inserted in the negative H.T. lead.

There is the objection, however, that the set will not work whenever the bulb fails; and as the life of a pocket-lamp bulb is always somewhat uncertain, this may lead to a number of unnecessary breakdowns.

It is far better to shunt the bulb with a fairly high resistance—about 500 ohms—so that the H.T. circuit is not interrupted if the bulb filament "blows."

If may be found that this arrangement produces instability on some sets; where this occurs a 2-mfd. condenser wired across the lamp will successfully cure the trouble.

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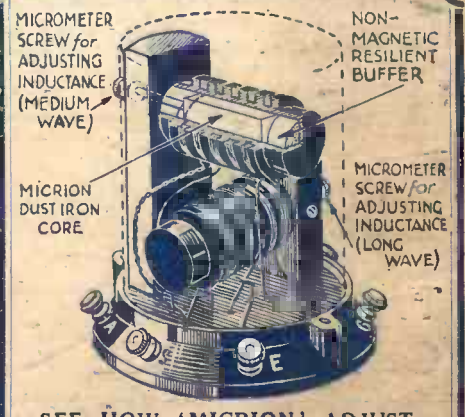

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