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Popular Wireless

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No. 567. Vol. XXIII.

April 15th, 1933.



BUILDING THE "P.W." AUTOGRAM

THE FIRST AUTOMATIC
RADIOGRAM for CONSTRUCTORS

THE P.W. "REGULITE" TWO

THE LIGHTS SHOW
YOU WHICH STATION!

Also
Inside:

WHAT
DO THEY DO?

By The
Viscountess Snowden

□ □ □

ECKERSLEY
EXPLAINS

□ □ □

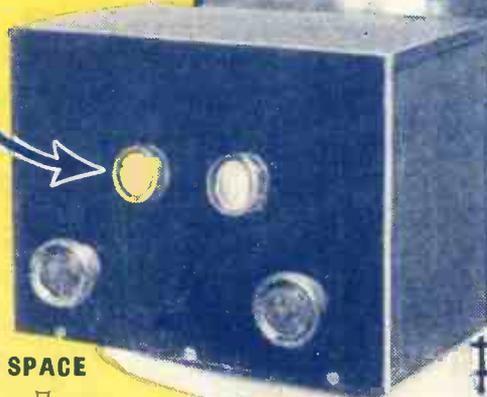
SPANNING
INTERSTELLAR SPACE

□ □ □

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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.

The Paper that Made Wireless Popular

**FRENCH RADIO
 MICROPHONE PLAYS
 MY MISTAKE
 NOT GOOD ENOUGH**

RADIO NOTES & NEWS

**INDIAN PIRATES
 THE LADIES
 IN THE TRAP
 AIR NAVIGATION**

Prospero and Ariel.

THE two stone blurbs which have now been discovered over the front entrance of Broadcasting House have, by general agreement, been christened Prospero (the one with the heaver!) and Ariel. As for Ariel (the one holding a rolling-pin with six holes bored in it!)—it's a libel.

As to Prospero, I have seen better sculpture I liked in a snow-man. I am, however, relieved to read in the Press that the perpetrator, Mr. Eric Gill, admits that the group is not "art."

Art and Radio Combined.

BEFORE I leave the subject of Art, I would mention that one of the exhibits at this year's Salon des Arts Ménagères is the "Tadiphone," which is a combined framed picture and radio receiver. The set is so arranged that there is room for it between the picture and the wall if the former is so hung that it leans forward.

The only frontal evidence of the set is the presence of three unobtrusive knobs on the frame of the picture.

New French Regulations.

AND before I leave France let me record that the French Ministry of the Merchant Marine has issued some supplementary regulations which stipulate, among other things, that all passenger ships of over 10,000 tons must be provided with two separate wireless telegraph receiving and transmitting installations situated in different parts of the ship.

There are also rules for wiring, type of fuses and so on. All this is, I suppose, the result of the fires in the French liners.

Future of Radio Drama.

I DISAGREE with those who maintain that there is no successful future for the radio play. What is already a success can be a success again and again, and if the success of the radio play is to be judged by its popularity, then the radio play is a decided success, as I believe a referendum would demonstrate.

Some of the plays which have been presented have not been above criticism, but that they have generally been so well received is a tribute to the writers and particularly the producers.

Imagination's the Thing.

I WOULD suggest that those who see no future for radio plays under-rate the imagination of the average listener. If, as the highbrows tell us, music can suggest scenes and situations to the imaginative hearer, surely the spoken word, ably assisted by "effects," can do the same, but do it more efficiently.

Both the writers and producers are experimenting, and the results so far achieved give promise that the blind "talkie" will win through. Don't forget

"Q.P.-B."

**The First "CLASS B" Set
 WITH ORDINARY VALVES!**

Full Constructional Details in
**"POPULAR WIRELESS"
 NEXT WEEK.**

the moral of Well's play, "The Country of the Blind," in which he demonstrates how well *sound* can replace *sight*.

The Magnificent Egoist.

AN inhabitant of Brighton has expressed himself in no uncertain manner. Realising that radio reception costs money, he cast around for a remedy and eventually decided that he must adopt the principle of "the greatest and cheapest good for the lucky number."

In pursuance of this policy he connected his loudspeaker to the wires of a Brighton radio relay system, with the result that, (a) he got his radio, (b) 270 subscribers to the relay system got nothing but silence, and (c) he found himself within an inch of the "jug," but was let off, on humanitarian grounds, on payment of £2 costs.

Montgomeryshire Shows Willing.

THE statistics of the increase in the number of licence-holders from month to month is very interesting when analysed. For instance, as between

December 31st, 1932, and January 31st, 1933, Lancashire tops the list with 15,503, Yorkshire is second with 13,158, and London third with 9,523.

The drops occurred in Dorsetshire (907), Hertfordshire (1,467), Worcestershire (1,114) and Pembrokeshire (266). But Montgomeryshire weighed in with an increase of THREE. The runner-up was Hampshire, with 3,895.

I Stand Corrected.

WHEN I read my note in "P.W." for March 25th about how many gramophone records one person can make per hour, I observed with a sudden chilling of the blood that the compositor had omitted the decimal point from my figures. I knew what to expect and I have not been disappointed.

"Old Brummie" (Birmingham) informs me that my calculation is hopelessly wrong. Now, the answer at which I arrived was 3.24 records per hour per person, but my friendly human slide-rule makes it 3.3671! I suggest that we are near enough to each other to "kiss and make it up." After all, 0.12 of a record would be of little use to Kit Stone!

Broadcasting in Chile.

FROM Chile it is reported that an attempt is being made to introduce national broadcasting by the proprietors of stations C.E. 94 in Santiago and C.E. 126 in Valparaiso. These stations offer the best musical talent obtainable in Chile, between 9.0 p.m. and 11.30 p.m. daily. The American method of "renting transmission time" is to be followed. The Santiago station, which works at 4 kw. is on 945 kc.; Valparaiso (½ kw.) being on 1,290 kc.

"Betcha"—as they say in the best American circles—you can't pick them up!

Scarcely "Cricket."

BUT largely "policy"! I refer to the fact that whereas the B.B.C.'s net revenue for 1932 showed an increase of £203,388 over that for 1931, the expenditure during 1932 on programmes only exceeded that of 1931 by £5,489. It's not good enough, considering that all the money is subscribed by listeners and that the

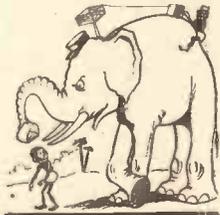
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ARIEL CONTINUES HIS RUNNING COMMENTARY ON RADIO

Post Office gets paid for its expenses of collection and the Treasury gets a handsome "rake-off" as well.

Radio Regulation in India.

A BILL has been introduced in the legislative assembly to regulate the possession of radio apparatus, the object being the prevention of "piracy."



I expect that eventually the Indian Post Office will have to equip a special elephant for detecting "pirates"!

Before leaving India we may note that the Indian State Broadcasting Service has opened a short-wave station at Cossipur.

What About Stravinsky?

AND Honegger! Why, in a recent case in which someone was sued for instalment arrears on a wireless receiver, it is alleged that Judge Crawford said: "Why do people in your position try to buy these expensive radio sets when they can get all the news and information in the very admirable newspapers which can be bought for a penny?"

One can assume from this that the learned judge has never heard of Honegger, Foundations of Music, the Life of the Wireworm, Stravinsky, Poland's expenditure on armaments, Mr. Usher's House (which fell!) and Gillie Potter.

Russia—and All That.

I HEAR that Russia, having signed an agreement, in common with all other European broadcasting countries, to limit its transmitting power to 100 kw. has "kicked over the traces" and proposes to poke out some 500 kw. from Moscow.

My reply is that the more a Government departs from its international obligations the more it recedes from civilisation and approaches savagery.

Cosmic Ray Broadcast.

IN February, the New York Electrical Society arranged and Dr. W. F. G. Swann carried out, a broadcast which ought to appeal to astronomers. Some of the little-known "cosmic rays" were trapped after they had penetrated a 360-tons steel vault 40 feet underneath a 36-storey building! The rays were caused to ionise the air particles and generate a minute electric current, which was then amplified and broadcast over a network of seventy radio stations. The noise was somewhat romantically



described as the birth cries of atoms born in interstellar spaces probably a million years ago.

described as the birth cries of atoms born in interstellar spaces probably a million years ago.

Ladies on the Air.

MY accomplished colleague, the writer of "The Listener's Notebook," has been ingratiating himself with our lady readers by professing admiration for the female voice as heard via microphone and radio. On that issue I differ from him profoundly.

Leaving aside professional speakers such as Miss M. Bondfield, actresses, "Our Mabel," the Misses Waters, and so forth, I assert that the woman's voice has no special quality which renders it eminently suitable for the "mike." Quite the opposite!

We have had poetry readers who sounded like Mary Ann talking to the milkman's boy over the back gate, and "good cause"

W. C. L. can get the London National on a 14 in. by 12 in. frame aerial. That's the stuff of which the R.A.F. is made!

Rapid Replies.

SEVEN letters from various parts of Africa, all saying that only short-wavers are of any use out there, that the Americans sell them and the British do not. Why doesn't F. R. O. (S. Rhodesia) make up a "P.W." set?



C. W. (Bath).—I say, is your name Allbones? Can't quite make it out, but as you are a lady I have given you the benefit of the doubt and called it Woburn. Sorry I don't know of a women's wireless club. Why be so anti-social, fair reader?

T. W. O. H. (Grantham).—There is no rat-killing ray apparatus. Bait the trap with Stilton and bump them off like an English gentleman.

S. F. (Wells).—Invisible light is a reality. It is present beyond each end of the band of visible waves—ultra-violet and infra-red.

The World and Blattner.

IT is announced that the Marconi Company has acquired the world rights for making and selling the Blattnerphone, with the exception of a few countries—European, I believe. This means that lots of listeners, "from China to Peru," are going to hear canned radio.

But the Blattnerphone has other uses, and already it is being tried out in aircraft. When test flights are made the aviators have to record a number of readings—altitude, temperature, pressure, etc. Sometimes these vary so rapidly that the men cannot write down the readings of the instruments. Hence the Blattnerphone! The observers will merely speak, and the results can be reproduced on terra firma at leisure.

Flying Laboratory.

A LABORATORY aeroplane appropriately named "Général Ferré," and the property of the French Government radio service, is scheduled to fly to French Equatorial Africa on an experimental flight, the object of which is to determine whether it is possible to use very short waves for aerial navigation. I do not know the date of departure, but perhaps some of our skilled ether (small-tooth) combers will hear the performance and report thereon.



SHORT WAVES

Farmers are asked to reply to a questionnaire on the kind of wireless talk they prefer. It is believed that many of them would appreciate a broadcast grumble. —"Punch."

A woman reader of the "Daily Telegraph" describes the B.B.C. Orchestra as a cuckoo in the nest. We are afraid it is too late for her to claim that she was the first to hear it this year.

A MATTER OF OPINION.

It has been said on many occasions that headphones are not a success where there is a large family. But have you ever tried to listen to a loudspeaker when a family of twelve are taking soup?

"Come and see our new portable inside" is the announcement outside a wireless shop in Clapham. Students of physiology, please note.

"Anti-noise campaigners busy," runs a headline. We think they must have been at our loudspeaker. We can't get a sound out of it.

appeals from ladies whose voices sounded like frozen marrows being mangled by broken bottles.

"Radio Frank."

ACCORDING to advices from the U.S.A. the new President Roosevelt is likely to appear in American history as "Radio Frank," along with "Honest Abe" and "Old Hickory." Roosevelt, it seems, has made a great success on the radio.

Hoover was a discreet President and is a clever engineer: but he is a very poor broadcaster. But Roosevelt has "got over." Well, he is boss of the White House now, but all the radio speeches in the world will not cure unemployment.

Power of the Press.

W. C. L. (Aboukir, Egypt), pays a tribute to what must seem to him to be the well-nigh miraculous power of the Press generally and of "P.W." in particular. Some time ago I reproduced his complaint that he had to pay fivepence for "P.W."—and lo! the very next week the price was reduced to threepence three-farthings. I expect that his native news-agent thought that I am a relation of Isis and Osiris. With a "Cosmic" Four,

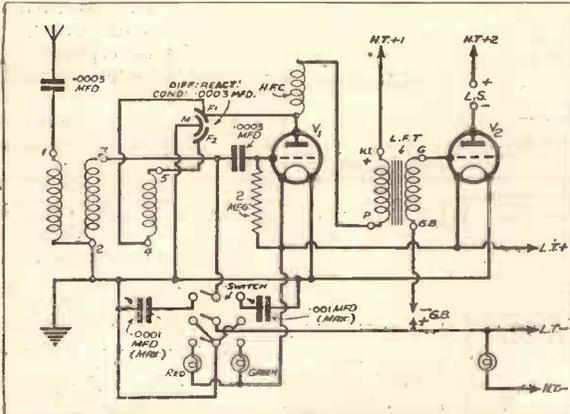


THIS is one of the most attractive little home radio outfits ever described. It has been designed for "domestic" reception of either one of two "local" medium-wave programmes.

Once the few controls are initially set (an easy task) all that has to be done is to turn the on-off switch either to the left or right in accordance with the programme desired.

To the right the lower wave station is heard, and the red lamp glows to provide visual indication of the fact. Turning the switch to the left lights the green lamp and shows you that you are on the higher wave programme.

REGIONAL OR NATIONAL AT WILL



There are two panel lamps, one glowing red and the other green, according to the position of the switch, thus indicating which programme the set is tuned to.

The "Regulite" will operate a loud-speaker comfortably and it is an extremely economical instrument both to build and maintain.

The cabinet and coil are home made, but are so simple that neither demands any real experience nor skill.

Coil Details.

The coil details are clearly shown in one of the diagrams. Number 32-gauge silk-covered wire is used throughout, and both windings should run in the same direction.

There are only two of these windings, the one comprising 32 turns and the other 111 turns. The latter has a tap at 20 turns from the start.

Two small holes should be bored in the former near the start and finish end of the

THE P.W. "REGULITE" TWO

THE IDEAL SET FOR LOCAL RECEPTION.

By the P.W. Research Dept.

windings in order that the wire can be threaded through and thus secured.

Keep the turns as even as you can, but don't worry if you cannot achieve the neatness of machine winding.

The tapping can be accomplished merely by taking a fairly long loop out, twisting it and baring the end, for connection.

Mounting the Components.

After having cut the wood to the dimensions given, fix the panel to the small baseboard, and, looking at what will be the complete affair from the front, the left-hand side to the back piece and the top to the right-hand side piece.

The aerial and earth and loudspeaker terminals and .0003-mfd. condenser can now be fixed on to the back piece and the .0001-mfd. preset screwed to the left-hand side piece.

The remainder of the components are mounted on the panel and baseboard as shown. The coil is secured by fitting a piece of wood into the bottom of the former. A piece of half-inch material will serve. It is cut fairly closely to the dimensions of the interior of the former and fixed to this by a screw.

The former is then held to the baseboard by a screw passing up from underneath through the baseboard into the wood, thus securing the coil.

The battery leads, the aerial and earth terminal leads, and the lead from the switch to the .0001-mfd. preset

condenser are fashioned from flexible wire, and for all the others the usual stiff variety can be employed.

The L.T. minus lead also serves for H.T. minus and, therefore, a branch should be fitted to it.

This "branch" which is merely another piece of wire joined to the lead so that two connections can be made to it, should terminate in a wander-fuse, i.e. a wander plug having an H.T. fuse incorporated in it.

The fuse is not absolutely essential, but is a worth-while safeguard.

The battery leads pass through a hole in the back of the cabinet.

The back (and left-hand side which is closely secured to it) can now be permanently fitted into position.

After the initial adjustments have been made the other piece (top and right-hand side) could be secured in place. But a better plan is to fit a hinge at the baseboard and a hook catch at the other end.

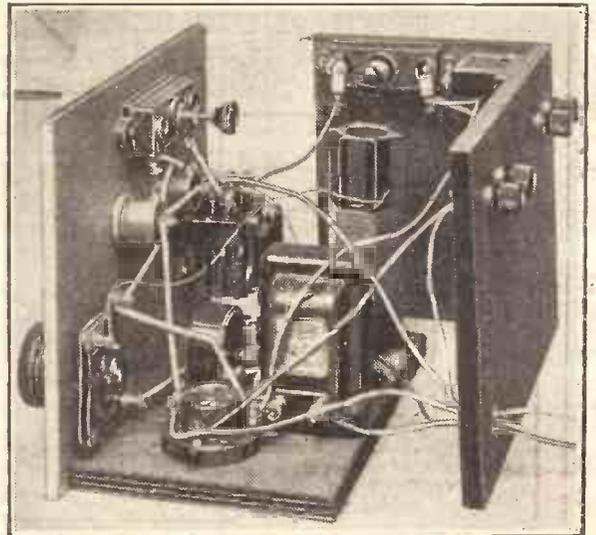
THE CORRECT VALVES

	Det.	Output (Battery)	Output (Mains Unit)
Mullard	P.M.1.H.L.	P.M.2A.	P.M.202
Cosor	210H.L.	220F.A.	230X.P.
Marconi	H.L.2.	L.P.2	P.2
Osram	H.L.2	L.P.2	P.2
Mazda	H.L.2	P.223	P.220A
Tungstam	H.210	P.223	S.P.230
Eta	B.V.1815	B.W.604	B.W.602
Micromesh	H.L.B.1	P.B.1	P.B.1
Clarion	H.2.	P.2.	P.2

The adjustments are very simple. You switch over to the left (this should light the green lamp if all is well with the lamp circuit) and adjust the .001-mfd. preset until the higher wave programme is heard. Then switch over to the right (red light) and adjust the .0001-mfd. for the lower wave programme.

(Continued on next page.)

AUTOMATIC INDICATING LIGHTS



Simplicity both in construction and operation are outstanding features of this attractive little set. The home-made coil is tuned to the wavelengths of the two "locals" by means of the preset condensers, and either programme is instantly available at the touch of the switch.



WHAT DO THEY DO?

by THE VISCOUNTESS SNOWDEN J.P.

THE Editor of POPULAR WIRELESS tells me that he is continually being asked what the Governors of the B.B.C. do. It is an innocent and inoffensive question and I think it should be answered.

It is a little puzzling to understand why there should be any Governors in view of the large staff of officials presumably competent to do the work of the broadcasting service and intelligent enough to carry responsibility.

The spirit of mischief which sometimes takes possession of me recalls to my mind the fact that this was the view of the little group of broadcasting pioneers, who were not at all pleased to be bought out by the Government!



LORD GAINFORD

The Government very wisely left those pioneers and their newly-appointed Governors in full control of the general conduct of the business, reserving only certain rights of ultimate control and veto. Again and again it has been pointed out to members of the House of Commons that the B.B.C. is free to conduct its internal affairs in its own way, and that the details of its business are not the proper stuff for Parliamentary questions.

But this gives point to the query as to why it was thought necessary to appoint Governors, and what was expected of them when appointed?

I think it will be admitted that a Government which buys out a private business and then makes a monopoly of it is under a very special obligation to see that this monopoly is conducted with the maximum of efficiency and the perfection of honesty.

The policy it should exact should be one which will satisfy as much as possible those people who pay for their licences, and offend as little as may be foreign



Dr. MONTAGUE RENDALL

Governments, whose equal title to the ether must be respected.

Government Departments are notoriously overworked. Moreover, there is no Government Department into the structure of which broadcasting comfortably fits. The B.B.C. has been placed under the Post Office because of its technical features; but the whole of its programme work relates it more fitly to the Department of Education.

A Ministry of Fine Arts, were we sufficiently regardful of Art to possess such an institution, might more suitably draw within its orbit the programme side of broadcasting.

A special Board of Control was appointed composed of people whose public service

GOVERNORS OF THE B.B.C.

are sometimes accused of taking their money for nothing. In this article we have the truth about them

BY AN EX-GOVERNOR

was known and whose integrity was respected. This Board of five shapes the policy of the new enterprise, conducts its activities in harmony with that policy and presents to Parliament each year a Report and Balance Sheet. This is its work in broad outline.

The first Board of Governors was appointed for five years but, with one exception, sat for six. The additional year was to give an opportunity of carrying to its completion the new Empire Broadcasting Service.

The new Governors have been appointed for four years, which carries them to the end of the Charter. It is not generally known that the B.B.C. Charter specifically provides for the reappointment of Governors. In this fact lies the inducement to an enthusiastic and conscientious Governor to devote his whole being to the work.

The salaries of the five Governors are curiously unequal. The Chairman's £3,000 a year is by no means over-generous when compared with ordinary commercial emoluments and in view of the work he has to do. The Vice-Chairman's £1,000, when compared with the £700 each of the other three Governors seems unnecessary, in view of the fact that any one of them, with equal efficiency, could deputise for the Chairman in his absence.

Seven hundred a year is very generous remuneration of a Governor who limits his activity to the bi-monthly statutory meetings of the Board. It is not enough if he

occupies himself as fully as the amount and the importance of the work demands. I would ask my readers in this connection to turn up the article I wrote in a recent issue of POPULAR WIRELESS (March 25th, 1933), when I outlined the work of an ideal Governor and suggested it was a whole-time job.



Mr. HAROLD G. BROWN

It is thought by some that the Chairman of the B.B.C. details his colleagues to special departments of the work. This is not so. In the days of Lord Clarendon's chairmanship I suggested this, but it did not meet with favour from my colleagues. None the less, members slip into their natural spheres after a time, and speedily exhibit the qualities of specialists.

On the old Board sat Sir Gordon Nairne, the banker. His special knowledge of finance and business organisation was of great service to his colleagues. He is a man of the finest integrity, and though he was very reserved at the Board table he did splendid work in all those matters which touched upon money. The development along sound lines of the Board's Pension Scheme was largely his doing.

He gave way to Mr. Harold Brown, who, in addition to financial knowledge, has great legal experience most valuable to a big Corporation. His special knowledge is sought when the purchase of land and other properties is undertaken. The B.B.C. has its own legal adviser, but somebody on the Board with a knowledge of the law is a real necessity.

Lord Gainford was one of the pioneers of broadcasting, and was informed on the technical side. His experience in political movements, and particularly as Postmaster-General, made him valuable as an adviser on controversial programme matters.

During Mr. Whitley's long absence in India, Lord Gainford presided over the Board meetings with great acceptability both to his colleagues and to the general staff.

Dr. Rendall, once Headmaster of Winchester School, was the accepted authority on educational matters. His large acquaintance with art and his fine taste made his



Sir P. GORDON NAIRNE

(Continued on page 189.)



MORE power; less average H. T. current consumption! That is what "Class B" amplification offers the battery-set owner. And here is a compact, easy-to-build adaptor that will enable any listener who has a one-L.F.-stage battery set to try "Class B" without any but the most trifling alterations to his set connections.

The method of applying the adaptor is simplicity itself. In "Class B" two L.F. valves are required; the first is known as the "driver," and the second is the special double "B" valve. The "driver" is usually a small-power valve and it delivers power to the "B" circuit.

Obviously, then, if we tack a "B" valve on to the output power valve of an ordinary set we get the elements of "Class B" amplification. The only snag lies in cases where the set already has two L.F. stages, and the addition of the "B" valve would constitute a third. In such instances one of the two stages would have to be cut out.

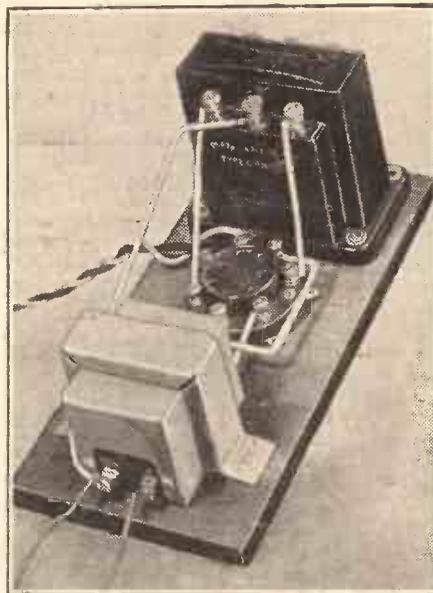
Simple Connections.

But the majority of battery-set users employ one L.F. stage, preceded maybe by a detector and one, or two, H.F., or by the detector alone. This part of the set does not concern us. What we are interested in is the fact that by simple connections we can use the power valve in the output stage of the set as the driver in our "Class B" system.

And this can be done very simply, as will be seen. In the main there are three forms of output circuits generally used in battery sets. The first is the direct plate-to-speaker feed from the power valve; the second is a shunt feed through a filter-choke scheme or a 1:1 ratio transformer (incorporated in the set); and the third is either of the above methods used with a pentode valve.

These will be considered in order. Our purpose, of course, is to design a small unit,

**THE LATEST VALVE
in
THE NEWEST METHOD**



Note the special "Class B" valve holder with its numbered sockets, which are marked in the sketch below.

containing the necessary parts for the output section of a "Class B" amplifier, in such a way that with the minimum of connection it can be tacked on to the output of the power valve in the set to form a complete "Class B" stage.

Now, given that the set's power valve is suitable as the driver valve, all we need is the means of coupling that valve to the "Class B" valve, and a means of feeding the output of the latter into our existing loudspeaker.

Let us work backwards. We have a loudspeaker which is either a high-resistance type, or a moving coil with incorporated transformer.

Attaching to Set.

Thus we need the "B" output matching transformer on our adaptor (the usual Q.P.P. type is O.K. here). In front of that we naturally have to put our double "B" valve, and in front of that we need our driver transformer to couple the "B" valve to the set's output valve. *And that is all.*

Now for the means of connection. The "B" valve needs a filament supply, via two flex leads from the "B" valve holder. It also needs H.T.

This can be obtained from the set's supply, so we connect the H.T. terminal of the output transformer on the adaptor to the H.T. terminal of the driver transformer, and run a flex lead from there for attachment to the set.

There remains only a connection to the "P" terminal of the driver transformer, and another flex lead provides that. So we have an adaptor with four flex leads from it, and with two terminals (on the output transformer) which will be used for the loudspeaker connections. As the "B" valve needs no bias we do not have to worry about that.

Now let us take case 1 of the three instances mentioned previously, that of a set with direct feed from output valve anode to loudspeaker.

Easy to Use.

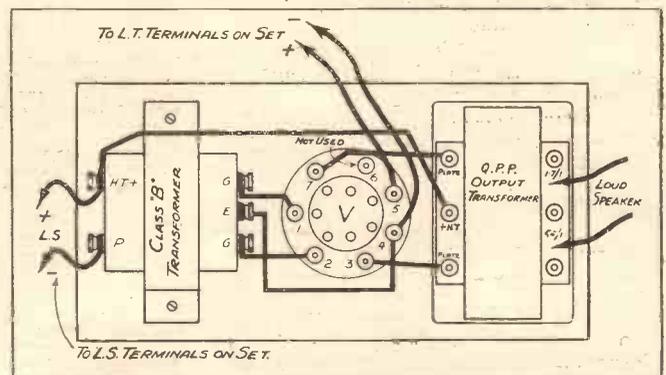
This set will have two loudspeaker terminals, one (L.S.-) going to the valve's anode and the other (L.S.+) to H.T.+ . Such a set is easy to use with the adaptor, for all we have to do is to take our speaker off the set's terminals and connect it to the two terminals marked 1:7:1 on the adaptor transformer, next we take the two flex leads from "P" and H.T. on the drive transformer and connect them to L.S.- and L.S.+ respectively on the set.

Finally, we take the two filament flex leads on the adaptor and connect them to (Continued on page 188.)

THE PARTS REQUIRED

Component.	Make used by Designer.	Suitable Alternatives.
1 "Class B" input transformer	Benjamin	R.J., Multitone, Varley, Lissen, Sound Sales, Lotus, Ferranti
1 Q.P.P. output transformer	Ferranti OPM12 (c)	
1 "Class B" valveholder	W.B.	Benjamin, Wearite, Ferranti
1 Baseboard, 8 in. x 4 in.		
1 yd. of insulating sleeving	Goltone	Wearite
1 yd. 18-gauge tinned copper wire	Goltone	Wearite
Flex, screws, etc.		
1 "Class B" valve	Cossor 240B.	

ALL READY TO ADD TO YOUR SET



Extreme simplicity is one of the outstanding features of this, the first "Class B" Adaptor for the home-constructor. It was in "P.W." that details for constructing the world's first short-wave adaptor appeared, so this latest device follows a precedent that proved of world-wide popularity.



The "P.W." AUTOGRAM

FULL CONSTRUCTIONAL DETAILS OF THE FIRST AUTOMATIC RADIOGRAM FOR THE SET-BUILDER

Easy to Build—Selective and Sensitive—All-Mains Driven—Silent in Operation—Self-changing Record Unit.

Designed and Described by K. D. ROGERS, Chief of the "P.W." Research Dept.

THOUGH the parts used in the "P.W." Autogram (first introduced last week) are fairly numerous, there is nothing tricky about the way in which they are employed, or in their arrangement on the baseboard.

With the exception of some of the small condensers and resistances slung on the wiring, and the controls that go on the cabinet itself (including, of course, the mains resistances for set and gramophone), all the components can be laid out and screwed down right away, before wiring is commenced.

Simplifying the Wiring.

This makes the construction much easier than when parts have to be left off until certain sections of the wiring have been done, for apart from the advisability of doing the heater connections of the valve holders first, no particular order of wiring need be followed.

These heater connections, by the way, are best carried out with rubber-covered flex, for the usual insulating sleeving may not be able to withstand the pressure (possibly 250 volts) between the wire (connected to the mains) and the earthed foil on which the sleeving will rest. This sleeving is excellent elsewhere, but it should always be so used that it never comes into contact with an earthed metallic object if the wire inside the sleeving is carrying high voltage.

As is shown in the diagrams, copper foil covers the whole of the baseboard and is of great assistance in simplifying the wiring. Many earth return points can be taken to this foil instead of requiring lengthy and complicating wiring, for it cannot be denied that very often such earth connections complicate the construction of a receiver very considerably.

The theoretical diagram, published last week, gives the essential circuits employed in the Autogram, showing how the variable-mu resistance network is arranged, and how the heater and anode circuit smoothing are carried out.

Carefully Chosen Components.

Decoupling is employed in the anode and screened-grid circuits of the variable-mu valve, and also in the screen circuit of the pentode. It is not required in the detector anode owing to the presence there of a separate smoothing choke, which, besides removing any anode current ripple, also acts with its associated condenser as an L.F. decoupler.

The components for the Autogram have been very carefully chosen, and should be

followed implicitly, for not only are the makes of many components important, but the types as well, owing to the fact that resistance values have to be arranged carefully.

This is particularly the case throughout the variable-mu resistance scheme, the resistance decoupling the screened-grid valve anode, and the choke in the detector anode circuit.

In the first case—the resistance network—the values have been chosen to provide approximately the right voltages when 200-volts H.T. are applied to the top of the

This not only decouples but acts as a voltage-dropping resistance. The anode of the S.G. valve should not have more than 200 volts "on" it, and the value of this resistance must be chosen to suit the voltage of the mains on which the set will be used.

We may as well say here that the set is really only suitable for use on mains of 200-250 volts, for though it would work on the 150-volt variety, of which there are still a few about, the lack of voltage would greatly reduce the overall efficiency of the set.

But to return to the resistance. The Ferranti smoothing choke will drop about 22 volts, taking the overall average anode consumption of the set as round about 50 milliamps, so that we have available on 250-volt mains a voltage of just under 230 for the S.G. valve. This is too much, so we insert a resistance of 3,500 ohms as voltage dropper and decoupler in one, remembering that the usual anode current at 180-200 volts (and maximum sensitivity) of this valve is 8 milliamps. For 230-volts input, 1,250 ohms are required.

- ★.....★
- AUTOGRAM VALVES AND ACCESSORIES.**
 VALVES.—1 V.D.S., 1 D.H. and 1 D.P.T. Osram, or Marconi.
 LOUDSPEAKER.—Magnavox D.C.142, 5,000-ohms field coil, or D.C. mains energised type of Celestion, Epoch, Amplion, Rola.
 AERIAL AND EARTH EQUIPMENT.—Electron "Superial," Goltone "Akrite," Graham Farish "Filt" earthing device.
 ONE AUTOMATIC RECORD-CHANGER, Garrard "Universal" type.
- ★.....★

10,000-ohm resistance. That will occur when round about 220-volt H.T. mains are used. If the mains are in excess of this or below it, the screened grid will get slightly more or slightly less than the average voltage required. This deviation is not important as the valve is a variable-mu type, and valves differ somewhat individually.

The Series Resistance.

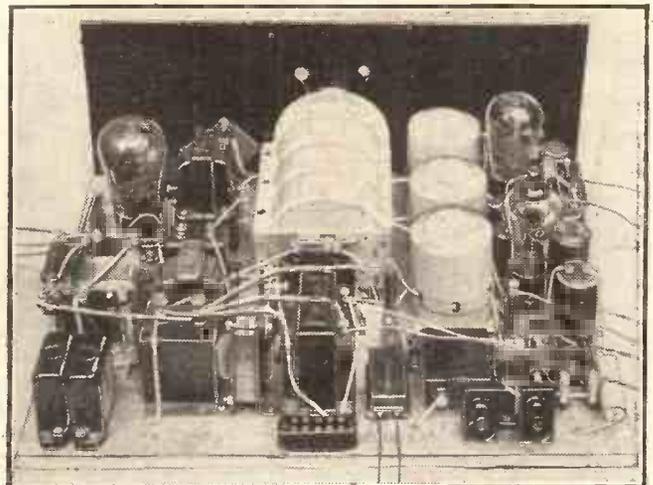
Now for the resistance in series with the anode of the S.G. valve (situated in a vertical holder near the Ferranti choke).

For Low-voltage Mains.

If the mains voltage is 200 we cannot hope to get the full anode voltage on any of the valves, for we must smooth the mains, and so must put up with a little loss. This will not noticeably affect the working of the set as regards S.G. and detector efficiency, for the former is quite O.K. at 180 volts, and the latter at 150 or less. Where we are inevitably affected is in the output stage, which has a maximum working

(Continued on next page.)

READY TO PUT INTO THE CABINET



A general view of the receiver portion of the Autogram. The flex leads running towards the lower edge of picture go to the mains switch, which is situated on the left-hand side of the cabinet (looking from the back), together with the tone control, whose three leads can be seen on the left of the photo. Note the mains input distributor in the foreground, from which power is supplied to the loudspeaker field winding and the automatic record-changer. The two leads of the loudspeaker "speech" transformer go to the two fixed condensers in the left foreground.

THE "P.W." AUTOGRAM

(Continued from previous page.)

and that the set has been constructed, proceed to describe the connecting up and the preliminary tests.

We will assume also that the speaker is in position in the bottom compartment, but that after the Garrard record-changer has been dropped into position it has been removed for the purpose of the radio test of the set. This is essential, for the trimming of the gang condenser has to be carried out by means of a screwdriver from above.

Avoiding Shocks.

The particular type of make of gang condenser was specially chosen because of the ease with which the trimmers can be adjusted, and the safety with which the operation can be carried out. Only one precaution is necessary, and that is that the screwdriver employed shall have a wooden or bakelite handle and that the metal shaft shall not be touched by the operator.

In the event of his touching the shaft he will receive no shock *unless* the positive main of his D.C. supply happens to be the earthed one, and he happens to touch, or be standing on, some earthed object at the same time. But it is better to be safe than sorry, and no one likes even the most harmless shock. "Earthed" objects in the set do not count because the condenser is itself one of them and they are all isolated from "real" earth by a 2-mfd. condenser.

To get back to the test details. The set is situated in the cabinet, with a V.D.S. valve in V_1 , a D.H. in V_2 , and a D.P.T. in

V_3 . The heater resistance is preferably screwed on the base of the loudspeaker section, and is connected to the set by flex leads (see diagram).

Preparing to Switch On.

These are taken to two terminals on the resistance, one to terminal "0" and the other to the terminal on the resistance marked with the voltage of the mains, or the nearest voltage *above* it. It does not

diagram are for the benefit of those technically minded readers who want to be able to trace the circuit rapidly.

The speaker field terminals are connected by flex to the terminals 1 and 2 of the mains distributor block, while the gramophone connection is left off for the time being. The pick-up connection also cannot yet be made.

Check everything over carefully with the wiring diagram and then connect aerial and earth, and the loudspeaker "speech" leads. These go from the two output condensers to two of the loudspeaker terminals.

Here there is a choice, as we have a number of taps on the output choke. Probably you will find best either one lead to "Black" (on speaker) and other lead to "Red" with V_3 anode tap on "6" of the output choke, or else you will prefer "Black" or

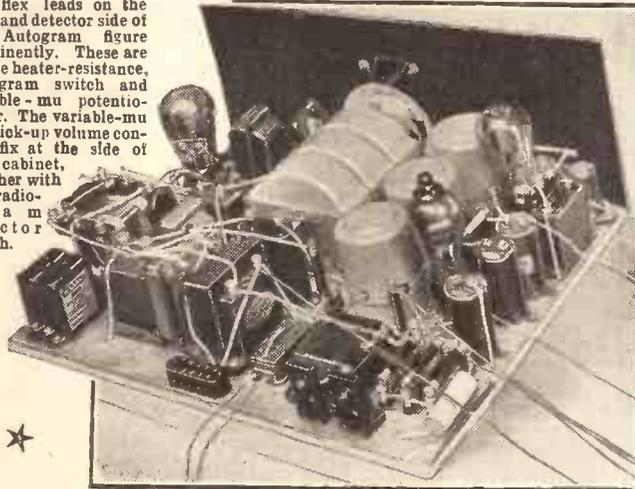
"Green" on speaker with anode tap on 5 or 4.

These variations should be tried when the set has been ganged up, and though the above description is for the "Magnavox" speaker, the tapped output choke allows other makes to be used if desired. Whatever the speaker, however, it is safe to start

(Continued on page 188.)

VARIABLE-MU RADIO CONTROL

The flex leads on the H.F. and detector side of the Autogram figure prominently. These are for the heater-resistance, radiogram switch and variable- μ potentiometer. The variable- μ and pick-up volume controls fix at the side of the cabinet, together with the radiogram selector switch.

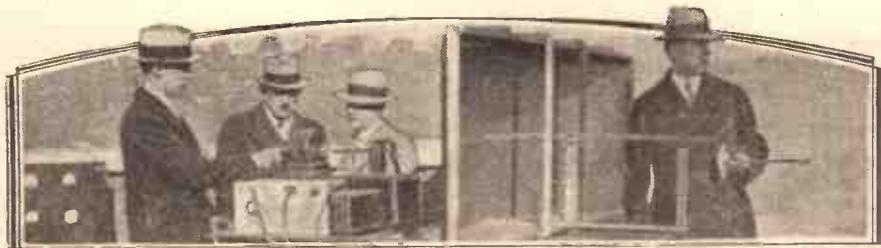


matter which flex lead of the two goes to which terminal on the resistance.

The mains adaptor plug, which goes into the lighting or power socket of the supply (not mentioned in the list of components) is connected by a length of flex to the on-off switch, and this is connected to the fuseholder. (See diagram.) Don't worry which is plus or minus, the signs on the

BUILD THE AUTOGRAM WITH THESE COMPONENTS

Component.	Make used by the Designer.	Alternative makes of suitable specification.	Component.	Make used by the Designer.	Alternative makes of suitable specification.
1 Panel, 18 in. x 7 in.	Peto-Scott	Goltone, Lissen, Becol	1 500-ohm resistance with vertical holder	Graham Farish "Ohmite"	—
1 Baseboard, 18 in. x 14 in.	Peto-Scott	—	1 400 do. (see text)	Graham Farish "Ohmite"	—
1 Cabinet (see text)	—	—	1 50 do.	Graham Farish "Ohmite"	—
1 Three-gang .0005-mfd. condenser	Polar Star	—	1 Set Ferrocart coils on chassis	Colvern F1, F2 and F3	—
1 .0003-mfd. reaction condenser	Graham Farish	Polar, Ready Radio, Bulgin	2 H.F. chokes	Telsen	—
1 4-mfd. fixed condenser	T.C.C. type 80	Dubilier type LEC	1 On-off switch	Binocular	—
3 2-mfd. do.	T.C.C. type 50	Telsen, Igranic, Lissen, Dubilier	2 Escutcheon plates	Bulgin S.104	—
2 2-mfd. do.	Telsen W.226	T.C.C., Igranic, etc.	1 Radiogram switch	Bulgin E.2	—
2 2-mfd. do.	Igranic	Dubilier, etc.	3 Five-pin valve holders	Bulgin S.86	—
1 2-mfd. do.	Ferranti C2	Igranic, Dubilier LSA, etc.	1 H.T. smoothing choke	Lissen LN.593	W.B., Benjamin, Telsen
3 1-mfd. do.	Dubilier 9200	—	1 H.T. smoothing do.	Lissen LN.5299	—
1 .25-mfd. do.	T.C.C. type OF	—	1 L.T. smoothing do.	Ferranti B.10	—
1 .002-mfd. do.	Dubilier type 620	T.C.C. type 34	1 Pentode output choke	R.I. .25 amp.	—
1 .002-mfd. do.	Dubilier 665	—	1 L.F. transformer	1 Hy.	—
1 .006-mfd. do.	Dubilier 670	Graham Farish, T.C.C., Telsen	1 mains type double fuse holder	Tnewell	—
1 .0001-mfd. do.	Dubilier 670	—	1 5-way insulated mains connector	Lissen	—
1 .0002-mfd. do.	Dubilier 670	—	1 pair Terminal blocks	"Hypernik"	—
1 .0002-mfd. do.	Dubilier 670	—	2 Terminals	Belling-Lee 1033	—
1 5,000-ohm potentiometer	Varley	Lewcos, Wearite	5 yds. insulating sleeving and 8 yds. 18-gauge tinned copper wire	Wilburn	—
1 50,000-ohm do.	Varley	Lewcos, Wearite, Igranic, Watmel	2 3-amp. fuses	Goltone	—
1 50,000 ohm do. and Tone Compensator	Lissen LN 5189	—	1 piece of .004-in. copper foil, 18 in. x 14 in.	Belling-Lee type R	Igranic, Goltone, Clix, Eelex
1 1-meg. grid leak with wire ends	Goltone	Dubilier 1 watt, Tnewell	1 Disc drive for variable condenser	Goltone	Wearite
1 1-meg. fixed resistance	Dubilier 1 watt	—	1 yd. copper braided insulating single sleeving	—	—
1 10,000-ohm fixed do. with horizontal holder	Graham Farish "Ohmite"	—	1 Anode connector	Belling-Lee	—
1 8,500 do.	Graham Farish "Ohmite"	—	2 Knobs for panel matching	Bulgin type K8	—
1 5,000 do.	Graham Farish "Ohmite"	—	1 Mains resistance	Bulgin MR.5	—
1 600 do.	Graham Farish "Ohmite"	—	Wire, flex, screws, etc.	—	—
1 250 do.	Graham Farish "Ohmite"	—			
1 1,000-ohm resistance with terminals	Graham Farish "Ohmite"	—			
1 15,000 do.	Graham Farish "Ohmite"	—			



SPANNING INTERSTELLAR SPACE

The idea of radio communication with other planets forms an intriguing fantasy. Will it ever become a practical possibility? No one can tell, but in this article our contributor, Mr. G. H. Daly, ably discusses the pros and cons.

THE Bishop of Birmingham is of the opinion that we shall one day be able to communicate by wireless or some variant of wireless, with other inhabited planets in the universe.

There is still a tendency among modern thinkers towards a belief in life on other worlds, and, indeed, when we consider the millions and billions of stars which do exist, it seems at least feasible that there may be other stars like our sun, with planets more or less the same as our own, and having a planetary family whirling round them.

A certain section of opinion believes that wireless signals cannot leave the earth or penetrate as far as Mars, but if wireless is impossible, there are still light waves; we know these can get through the layers in the earth's atmosphere.

Rumours Without Foundation.

But despite various rumours which have arisen from time to time that flashes from Mars have been seen, investigation has shown these to be without foundation. Even the celebrated canals do not materialise as such on the most exact photograph.

Mars is a much older planet, from a habitable point of view, than the earth. Martians, if they existed, would be, logically, almost millions of years ahead of us. Yet

we see no giant Martian space ships flying about the heavens.

And it is almost inconceivable that a people millions of years in advance of ourselves will not have conquered space.

Dismissing Mars, there is only Venus left amongst all our planets where life could possibly exist. It is believed that Venus always turns the same face to the sun, and if this is so, then one side is boiling hot while the other side is as cold as space itself.

Low Form of Life.

It is possible, however, that a narrow belt might exist between the two which would approximate to the climatic conditions of our own earth; there is plenty of air. But although it does not do to be dogmatic, there is very little possibility of life except in a very low and unintelligent form.

If, then, there is other life in the universe, it must be amongst the more distant stars, possibly in that vast area which we call the Milky Way.

But to communicate with them by wireless—that is a different matter.

We are not sure yet that it is possible to transmit by wireless as far as the other planets in the solar system. There are at least two layers—the Heaviside and the Appleton—which appear to do their best to

confine wireless waves to the earth's atmosphere.

Wireless echoes—i.e. wireless waves which it is believed passed through the upper layers and travelled millions of miles into space—are now believed to do no such thing.

That, at least, is the latest theory, although Stormer, of the original wireless echo fame, still holds that the waves pass out to space and are reflected back from there.

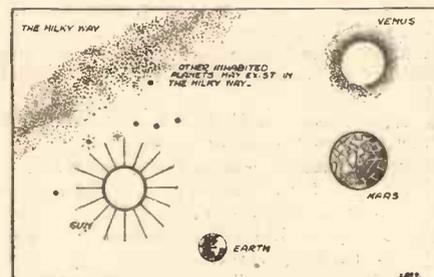
Outside the Solar System.

Yet, even if Stormer is correct, and the waves do get into space, they will never be of much use for speaking to inhabited worlds which may exist outside our solar system.

Even the nearest stars of the Milky Way are 25,000 light years away from us—that is to say, light or wireless waves would take 25,000 years, even travelling at their great speed of 186,000 miles per second, to reach the Milky Way.

So that if anyone lives in that part of the

RADIO'S LONG JOURNEY



Although the existence of life in that vast area, the Milky Way, is not outside the realms of possibility, the question of wireless inter-communication is entirely another matter. Our distance from the nearest star in the Milky Way is such that a wireless wave would take 25,000 years to reach it.

universe we shall never know anything of them if we are to depend on our wireless waves, which merely crawl where astronomical distances are concerned.

If we are to establish communication across the universe then we must discover something infinitely more swift than our wireless waves.



Weekly Jottings of Interest to Buyers.

HOW often do you have to have your accumulator charged? Once a week? Then you will be especially interested in a new development by the Edison Swan Electric Company, Ltd., which may enable you almost to halve the frequency of your visits to the charging station.

The production of a cell that will hold its charge for a longer period has been the aim of accumulator experts for years past, but the problem is not by any means an easy one, and the rate of progress has necessarily been slow,

The introduction of the new Ediswan "Extralife" accumulator is very definitely a step in the right direction, and it is a development that will be welcomed by all who are dependent upon batteries for their radio entertainment.

Ediswan "Extralife" accumulators incorporate a new principle known as "balanced capacity," which has the effect not only of conserving the charge, but also of prolonging the life of the cell under adverse conditions.

It is noteworthy that the prices of these new "Extralife" cells are the same as those of ordinary accumulators.

Wearite and "Class B."

I spent a few interesting hours the other day in the Tottenham factory of Messrs. Wright & Weaire, Ltd., and I was glad to observe that they are doing a valve holder for the new "Class B" valve.

From my inquiries round the trade, I gather that the new seven-socket holder is something of a rarity at the present moment; but the position is likely to be eased in the near future, for I am assured that the Wearite version will be available

generally by the time these notes appear in print.

Incidentally, in my tour round the Wearite factory I saw something which intrigued me beyond words. I am not at liberty to divulge the secret at the moment, but I am able to state authoritatively that the first announcement of this new and interesting development will appear in "P.W."

The Speaker Position.

Several of the prominent loudspeaker manufacturers have asked me to call attention to the fact that they are doing special models for the new "Class B" output scheme.

I am afraid that space will not permit of a mention of each individual model, but will readers kindly note that suitable speakers are available from R. & A. Celestion, Amplion, Blue Spot and the British Rola Company?

I do not believe that these are the only ones available, but these are the only firms from whom I have had an official intimation. I shall be glad to hear

(Continued on page 192.)

ECKERSLEY EXPLAINS-



Have you ever wondered what sort of loudspeaker is used by radio's leading technicians? On this page you are let into a secret, for "P. P. E."—originator of the Regional idea of Twin-Wave Broadcasting and "P.W.'s" Chief Radio Consultant—tells you all about his own choice. And you will probably be surprised to learn that it is a "moving-iron"!

LET'S talk first of pentodes. I wonder whether you have noticed the curious muddy quality they are inclined to give, but how this disappears when the signal is made loud?

I do not in the least blame designers for using pentodes. They have all sorts of advantages. They are, for example, very sensitive. They give lots and lots of punch. Then, again, because they give this punch the distortions they introduce get "masked" when the signal is loud. The pentode is not quite "linear," that's why you get these distortions.

Volume and Quality.

I had a very interesting experience the other day *apropos*. I was testing a typical good set, two H.F., det., and pentode, and I was really impressed with performance when I tested in a big laboratory.

I took the frequency characteristics of both the "low" and the "high" side—and truly, considering the awful state of the ether, I was surprised, considering the set was reasonably selective, how good the top reproduction was; at any rate, on the curves. So I thought I'd take the set home and mess about, trying to pick up some "foreigners."

Now I live in a flat, and there are humane rules and regulations about wireless sets and gramophones—one must not play them too loud. So I changed from a big room in a laboratory to a small one with a good deal of damping and rules about noise.

I was immediately struck now, if one didn't play the thing loud and get away from it, the quality was muddy!

Try this! Get a pentode output set and turn it down in volume and listen closely. I am sure you will notice, as I did, that it's blurred over a bit.

Reaction for Good Bass.

It's curious about this quality business. I own a set designed and made for me by R.M. Radio, the same people who designed sets for all the leading lights of the B.B.C. and their leading light political friends. I have had the set for five years.

It is a detector and two note-mag. in push-pull—or, should I not say, paraphrase; I use a Lion Amplion loudspeaker especially titivated by expert titivators.

I know that the frequency characteristic of the set is not ideal if straight lines are ideals. I know also that the loudspeaker has a by no means perfect frequency

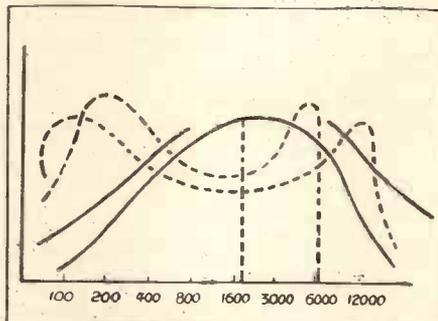
characteristic. So I push up retroaction to give me bass. And here is the point, the quality is far better than anything I ever hear, and I have a very open mind.

Making a Compromise.

I have also a theory to account for it all. Quite obviously the only real quality really worth listening to comes about when all the frequencies are present and reproduced in their original relationship.

You want every frequency from 30 cycles up to 12,000 equally reproduced, you want a fortissimo to pianissimo ratio of 60 to 80 decibels. The sound should come, when

THE FREQUENCY CHARACTERISTICS



"The dotted lines show the frequency characteristics of bad speakers, giving unsatisfying quality! The full lines give characteristics of typical moving-iron speakers."

reproducing orchestras, not from a point source but from a number of scattered points.

I have heard reproduction (in the Bell Laboratories in America) conforming to these conditions—and "Oh boy, it was grand!" I have never heard anything like it before or since, but that's another story, and I've told you about it before.

But we shall never get quality like that with ordinary gramophone records (which "cut" at 5,000 about) or from wireless which, except on a very local and very powerful station, imposes the selectivity cut at between 4,000 and 8,000 cycles per second.

Thus, we are driven to making a compromise—we must study how best to arrange our inevitable distortions. All "art" involves distortion.

But, as I said before, I have a theory to explain why I like the Lion Amplion

speaker, and why I dislike most moving-coil speakers.

The theory is that the frequency characteristic of the speaker should bend symmetrically about the frequency at which the ear is most sensitive (about 2,000 cycles per second). Look at the diagram. The full lines might show good speakers giving pleasing results, the dotted lines show the frequency characteristics of bad speakers giving unsatisfying quality. The full lines give characteristics of typical moving-iron speakers of the Lion type, the others are typical (poor) moving-coil types.

Difficult to Manufacture.

This is not to say that all moving-coils are bad, nor do I think that all moving-irons are good. Far from it. To-day I am torn between the old Lion Amplion and a moving-coil.

Unfortunately, the really good moving-iron speaker is "out of print," and, one understands, is difficult to manufacture in quantities to give consistent performance. I know of no other moving-iron speaker so good as my own moving-iron speaker. I shall stick to the one I have got, and when designing new sets I shall be forced to the moving-coil.

I may have a bee in my bonnet, but from the first days back in 1921 I have stuck to one idea and one ideal—good quality. I know it is a costly ideal. I know tastes differ. I know we must use pentodes in commerce. I know that my speaker may be unusual (except that relations, friends and colleagues have them and swear by them).

In Good Company.

But through it one fact stands out, that the finest judges are with me—those whose lives are spent in understanding the art of reproduction know that there is something in what I am trying to say.

The B.B.C., on the other hand, has fallen for the very best moving-coil types, but perhaps their attitude is dictated by considerations of reliability.

There is a long and fruitful field of research to be undertaken in the real research spirit. Anybody can take the line, reproduce all frequencies equally and get on with it; the question is—will the quantities involved ever become manageable enough to allow us even to attempt such a development?

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

FUTURE OF BROADCAST EDUCATION

New Symphonies—The Vaudeville Appointment—A Wallace Play.

MR. E. R. APPLETON, the West Regional Director of the B.B.C., wants to come to London to take over the whole of the educational work so far as the young are concerned. This means the Children's Hour, the schools transmissions, religion, and a certain number of other departments.

Mr. Appleton's Silent Fellowship and his "Joan and Betty" series have created for him a strong personal following among listeners, but I prophesy confidently that he will not get away with his last move.

Fees for Promenade Artistes.

In the past the B.B.C. has managed to secure artistes for the Promenade Season at reduced fees. This year, however, the artistes are restive, and it is being considered whether the fees should not be brought in line with those ordinarily paid. My impression is that a concession will be made.

Haydn Symphonies.

Mr. Sandberger has submitted to the B.B.C. his copied scores of two of the recently discovered Haydn Symphonies and members of the staff at Broadcasting House have pronounced them worthy of performance, one being of special interest.

There is a snag, however, in the fact that Mr. Sandberger is keeping the rights to himself and some think he should throw them open. I anticipate an amicable adjustment.

A Brewery Band.

The proposal to broadcast a brewery band has caused a considerable stir at Broadcasting House. Apparently the Music Department of the B.B.C. has had excellent reports of the standard of performance of the Friary Brewery Brass Band and contemplates a trial broadcast.

But administrative officials have serious qualms about the effect on Nonconformist opinion of a courtesy acknowledgment of a brewery on the microphone. The controversy develops.

Chief of Vaudeville.

From the listener's point of view the one appointment that matters in the staff reshuffle at Broadcasting House is that of Mr. Eric Maschwitz, otherwise "Holt Marvell," who takes over the vaudeville department on May 1st. The other changes have a purely internal significance, and will have no outward or visible sign on the Corporation.

There is naturally some heart-burning in certain quarters, and jubilation in others. On the whole, however, the staff are now settling down to the new order of things.

Mr. Maschwitz is already deep in his plans for brightening up the light side of the programmes and I can promise you a bevy of brilliant ideas as soon as he officially takes over. He has just that depth of

imagination and that touch of inspiration to be able to discern what listeners want and to dish it up to them in a novel and appetising form.

The Derby Relay.

I can safely forecast an extra good running commentary on the Derby this year, for the B.B.C. commentator is to be stationed in a much better position, commanding a view of the course superior to that of previous years.

It appears that hitherto the commentator has been in a small box adjoining the Press, with the result that he has found the good-humoured banter of his Fleet Street friends a little embarrassing, and listeners must have wondered at the mysterious laughter and queer background of noises. So in more ways than one it seems that the move is a good one, and if the commentary is as successful as that on the Grand National it will have been fully justified.

Organising.

It will probably be well into May before listeners hear anything of the organ that is being installed in the Concert Hall of Broadcasting House. From the outside it looks as though it were practically finished, for the great bronze grille now covers the thousands of pipes and the intricate-looking console is there in place.

"FROM THE TOWER BALLROOM, BLACKPOOL"



Reginald Dixon at the Wurlitzer organ of the Tower Ballroom, Blackpool. He recently gave a recital specially for listeners in Canada and the U.S.A., broadcast from the new Daventry Empire short-waver.

"Behind the works," however, things are very different. The expert engineers are working in an extremely confined space, and it is a marvel how they can fix and adjust the two thousand odd pipes under such cramped conditions.

Indeed, to the layman it seems impossible that so many "works" can possibly have been got into such a tiny loft as the B.B.C. provided for the organ builders.

"The Ringer."

In addition to Constance Cummings, the American film star who is to take the part of Cora Ann in the broadcast version of Edgar Wallace's great thriller, "The

(Continued on page 189.)

THE LISTENER'S NOTEBOOK

A critical review of recent broadcasting topics.

LAST week I registered a plea for more running commentaries, and this week, to use the words of Alexander (or is it Mose?), I would like to "elucidate myself."

Most people like to be in the know. It would be a bad day for the Press if they didn't. The popularity of the "Talkie" News Reel in almost every cinema offers further proof of the fact, if proof is needed.

Excellent as descriptive writing may be, or any picture of the event, neither Press nor picture can compare its achievement with that of broadcasting. And why? Because they are post-dated—they happen after the event.

That Ten Minute's Thrill.

The running commentary of the Grand National illustrates my point. Descriptive writings, etc., may contain all the colour and movement of the event they describe. But they cannot contain the thrill or the suspense.

One got such a kick out of that ten minutes' thrill at Aintree, that for the rest of the day, one felt one was walking on air. The same can be said of the Boat-race, or any big Soccer or Rugby commentary.

To be able to follow, without actually being present on the scene, the fortunes of a side, a crew, or a horse is an experience which broadcasting alone can give.

One realises this more, I think, if one compares a running commentary with another popular broadcasting feature—the eye-witness account. There is no thrill about this, or a vestige of suspense. It is only just interesting.

Mr. Abrahams' account of the 'Varsity sports, or Mr. Holt's version of the cross-country championship were no more thrilling than the newspaper reports the following morning. But interesting, yes!

There was detail in them, for one thing. Certainly Mr. Abrahams provided a wealth of detail about the 'Varsity sports which no newspaper would have had room for.

No Cold Water.

Mark you, I am not pouring cold water on eye-witness accounts. They are very acceptable fare, but they are not occasions for excitement in which they invite listeners to share.

In point of fact, I think a running commentary of an athletic sports meeting would be dull in the extreme, for as a rule such meetings are long drawn-out affairs. But there are scores of events in the course of a year which, although they are inaccessible to most human eyes, are, thanks to broadcasting, completely accessible to every human ear.

And the kick that we would get out of them, although we would be receiving them second-hand, would be ample reward for the B.B.C., if they were to undertake to supply them.

Two recent variety

performances in an evening, one from a studio, the other relayed from a theatre, just invited comparison. It was significant, too, that this should happen at a time when the B.B.C. had been expressing opinions on variety humour.

Would Have Wiped the Deck.

To my mind, there was no comparison between the two performances. The theatre had the studio beat all ends up. But if you compare the respective bills, as far as big names go, you'll agree the studio could have wiped the deck with the theatre.

Another interesting feature of both performances was that they both included a turn in which a broken-down car provided the fun. Yet who got the most fun out of it? Why, the theatre party, of course!

Although the relay was superior to the studio show, I am quite prepared to believe that, had the studio bill been put on at the theatre, and vice versa, the theatre would have won again, with a bigger margin.

For instance, the man who sang popular songs at Birkenhead with such success would have been

(Continued on page 189.)



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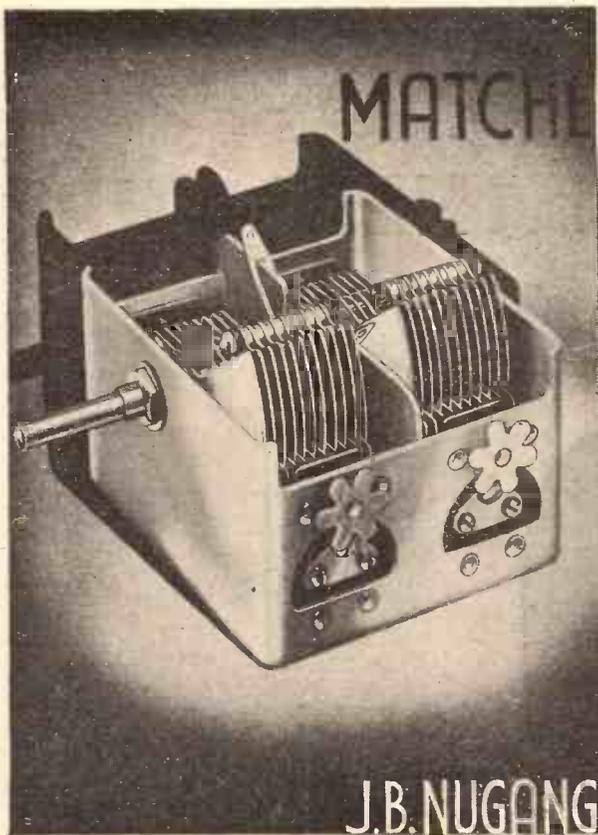
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RADIO SIMPLIFIED

A PRACTICAL OUTLINE FOR BEGINNERS

MOST modern sets employing two or more valves are decoupled in some way or another.

The extent of the decoupling depends very largely upon the type of circuit, but, in general, any design in which high amplification is a feature will require careful treatment in this respect.

What is decoupling, and why is it necessary?

Decoupling is a method of keeping high or low-frequency currents "in their place," and to prevent them from straying into those parts of the circuit where they may result in instability and distortion.

Useful Application.

One of the most useful applications of decoupling is in the battery circuits. Take, for example, the high-tension leads. Suppose we consider first of all, the H.T. supply to the detector valve.

The anode of the valve is maintained at a certain steady positive potential in relation to its filament (or cathode). In consequence a current flows from the high-tension supply through the valve and the components in its anode circuit.

This means that a perfectly steady current is flowing through the L.F. transformer primary winding or the R.C. coupling anode resistance.

But these L.F. coupling components have also to deal with low-frequency impulses (constantly varying currents and voltages), which after being magnified appear in the output circuit and operate the loud-speaker.

Now unless suitable precautionary measures are adopted there is every possibility of some of the low-frequency impulses passing along the H.T. + lead and into the H.T. battery or

the resistance and L.T. negative—which is, of course, the "earth line" of the set.

The condenser and resistance values are chosen so that the reactance of the condenser at the

15,000 ohms is the nearest commercial value for a decoupling resistance, and will give very fair decoupling when used with a 2-mfd. condenser.

A 4-mfd. condenser would be better, but the cost has to be considered, and in any case, if 2 mfd. is found to be adequate for a particular design, there is little to be gained by using a higher value.

DECOUPLING



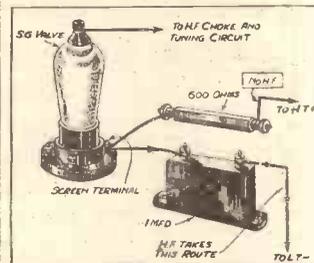
mains unit, which is common to the anode circuits of all the valves.

In this way impulses may be "fed back" into other parts of the amplifying chain and so cause trouble. The effect of this unwanted stray coupling is impossible to predict.

lowest frequency the amplifier will reproduce, is small compared with the decoupling resistance value.

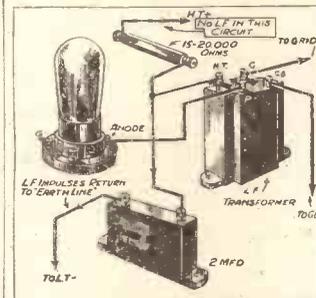
For instance, suppose we assume that the lowest frequency the amplifying stages can handle is 50 cycles.

HIGH-FREQUENCY



In this pictorial diagram the route taken by the H.F. back to the "earth" line is indicated by the arrows on the condenser leads.

LOW-FREQUENCY



No L.F. should be present in the H.T. + lead if the decoupling is efficient. Sometimes a larger bypassing capacity than that shown above is desirable.

Much depends upon the constants of the H.T. circuit, but

the fact remains that the presence of high or low-frequency current in the high-tension leads is highly undesirable.

Various instability troubles can be caused by lack of decoupling, and we shall see how stability may be ensured by taking proper precautions.

The scheme employed is this: A resistance is inserted in the H.T. + lead to the anode of the valve, and a large condenser is connected between the anode side of

At this frequency the reactance of a 2-mfd. condenser is approximately 1,600 ohms.

If we decide to use 2 mfd. for bypassing the L.F. impulses back to the "earth line" our decoupling resistance must have a value many times greater than 1,600 ohms.

If we choose a resistance of 16,000 ohms, the path into the H.T. circuit will be ten times as difficult as that via the decoupling condenser back to the "earth line."

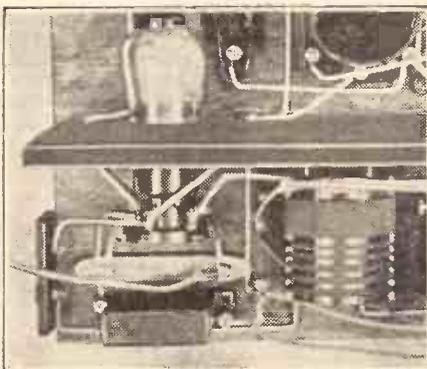
That a high resistance value is not required is evident from an inspection of the reactances of various sizes of condensers at different wavelengths

For example a .01 mfd. condenser has a reactance of 110 ohms at 2,000 metres and 16 ohms at 300 metres.

Similarly the figures for a .1-mfd. condenser are 11 ohms and 1.6 ohms respectively.

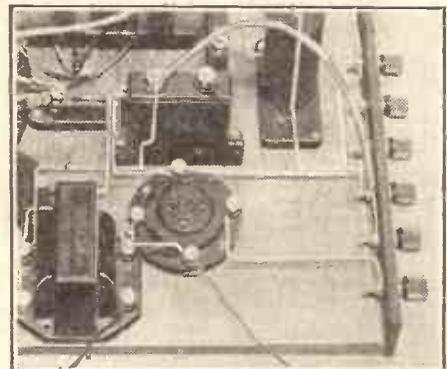
On increasing the capacity to 1 mfd., the reactances become as low as 1.1 ohms at 2,000 metres and .16 ohms at 300 metres.

SHORT LEADS FOR EFFICIENCY



S.G. "screen" decoupling in practice—the resistance and condenser are arranged so that they come close to the screening-grid terminal in order to keep the wiring as short as possible.

FOR STABILITY AND QUALITY



Here we see a portion of a set employing L.F. decoupling. The resistance is of a spaghetto, and is joined between the H.T. + terminal on the terminal strip and one side of the bypassing condenser.

Special Beginners' Supplement—Page 2

As soon as one begins to take a real interest in radio the necessity for measurement becomes evident. How many volts will be needed? How many ohms should the resistance be? How much current will flow? are questions that will constantly arise.

To answer them we have various laws, and formulas which can be worked out by simple arithmetic. But even in this matter of measurement wireless is different and more interesting than most sciences, for we find that the quantities involved are extraordinarily varied.

CONDENSERS IN SERIES.

FORMULA: $\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2}$ etc.

EXAMPLE: What is the capacity (C) of two 4 mfd. condensers, in series?

$\frac{1}{C} = \frac{1}{4} + \frac{1}{4} = \frac{2}{4}$

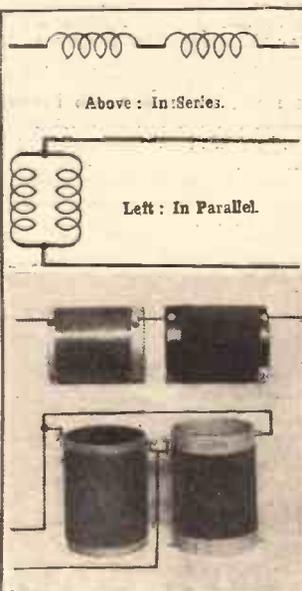
So $C = \frac{4}{2} = 2$ mfd.

When an architect or a surveyor is working he thinks in terms of miles, or yards, or inches. And as one mile is 63,360 times as long as one inch, he deals with quite a large scale of quantities. But mere thousands are nothing at all to the electrical engineer.

The Billion Scale.

For purposes of wireless we must work on the billion scale! At one moment we may be considering units in their millions, and the same calculation

COIL CONNECTIONS



Above: In Series.

Left: In Parallel.

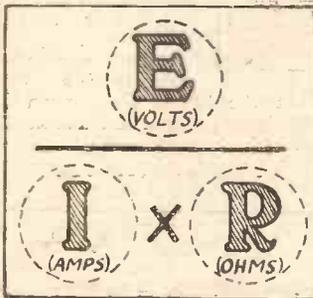
Corresponding to the theoretical signs at the top, the photograph shows the upper coils "in series," and the lower "in parallel."

RADIO ARITHMETIC

may involve only the one-millionth part of another unit. So that radio arithmetic is bound to be varied, and, alas! full of pitfalls for the unwary.

This apparent difficulty of the tremendous range of quantities is overcome in a very effective manner by the use of certain familiar prefixes. When speaking of current, for example, we talk of so many amps., or of milli-amps., or even of micro-amps. That little prefix milli reduces the amp. to $\frac{1}{1000}$ of its former size, whilst the little word micro infers a million-fold reduction. So 2 micro-amps are really $\frac{2}{1,000,000}$ of an ordinary amp. And similarly, 6 milli-amps are $\frac{6}{1,000}$.

OHM'S LAW



To find volts (E), amperes (I) or ohms (R) place your finger on the appropriate letter, and the sketch shows how the remaining quantities will give it. For example, if you cover (R) ohms you will see that the volts (E) must be divided by the current (I).

Obviously, these prefixes are of the first importance, so we will enumerate those which must be memorised.

Prefixes to Memorise.

To reduce the unit to a smaller dimension we have:

MILLI = $\frac{1}{1000}$

MICRO = $\frac{1}{1,000,000}$

Examples:

(a) $\frac{3}{1000}$ amps. = 3 milliamps. = .003 amp.

(b) $\frac{3}{1,000,000}$ volt = 3 micro-volts = .000003 volt.

(c) 300 milliamps = .3 amp. Now for the larger quantities.

To increase the unit to a greater dimension we have:

KILO = multiply by 1,000.

MEG (or -MEGA) = multiply by 1,000,000.

RESISTANCES IN SERIES.

FORMULA:

$R = R_1 + R_2 + R_3$, etc.

EXAMPLE: 100 ohms, 5 ohms and 52 ohms in series— $100 + 5 + 52 = 157$ ohms.

Examples:

5,000,000 ohms = 5 megohms.

500,000 ohms = .5 megohm.

1,147,000 cycles = 1,147 kilocycles.

Once these four prefixes have been committed to memory the range of a billion holds no terrors for the student. He swings up to the thousands or to the millions by "kilo-" and "meg-" (or mega-) respectively; and down to the thousandths by "milli-" or to the millionths by "micro-".

So familiar do these terms become that most people who use them frequently forget that they constitute a sort of mathematical conjuring outfit, by means of which we can easily enumerate and mentally visualise differences in quantities that would otherwise seem quite staggeringly small or bewilderingly big. And of course, a prefix can be repeated if necessary. Thus micro-microfarad means $\frac{1}{1,000,000}$ of $\frac{1}{1,000,000}$ of a farad!

To correspond with prefixes in words, we have the small index figures, added to a number, such as 10^2 , 10^3 , etc., which, of course, indicate how the ten is to multiply itself.

Thus $10^3 = 10 \times 10 \times 10 = 1,000$.

CONDENSERS IN PARALLEL.

FORMULA:

$C = C_1 + C_2 + C_3$, etc.

EXAMPLE: What is the capacity (C) of a 1-mfd. condenser in parallel with two 5-mfd. condensers?

$1 + 5 + 5 = 2$ -mfd.

And $10^6 = 10 \times 10 \times 10 \times 10 \times 10 \times 10 = 1,000,000$.

When the index figure is preceded by a negative sign it indicates that the number will be correspondingly smaller than 1. So $10^{-3} = 1 \div 10 \times 10 \times 10 = \frac{1}{1000}$.

Thus, corresponding to micro we have 10^{-6} .

Thus, corresponding to milli we have 10^{-3} .

Thus, corresponding to kilo we have 10^3 .

Thus, corresponding to mega (or meg) we have 10^6 .

A Rule of Three.

They are all continually used in the textbooks, and although they sometimes look formidable, it is surprising how greatly they simplify the arithmetic of radio.

We must now refer to the fundamental law of electrical measurement, laid down by Georg Ohm, and called after him

—Ohm's Law. He it was who pointed out the exact relationship that the current in any ordinary circuit bears to the resistance of the circuit, and to the electrical pressure across it. And if any two of these quantities are known, his law always enables the third quantity also to be found.

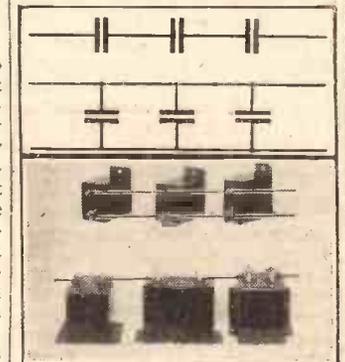
In words, the Law can be expressed as

Current = $\frac{\text{Pressure}}{\text{Resistance}}$

"Pressure" is generally termed Electro-Motive-Force, or abbreviated to E.M.F., so the law is then stated as

Current = $\frac{\text{E.M.F.}}{\text{Resistance}}$.

SERIES AND PARALLEL



The top and bottom illustrations show condensers joined in series, and the centre pictures the parallel connections.

For practical working, of course, we must express these ideas in the practical units used to measure them. The unit of current is the Ampere (abbreviated amp.). The unit of Electro-Motive-Force is the Volt. And the unit of Resistance is the Ohm.

Thus the Law becomes:

Amperes = $\frac{\text{Volts}}{\text{Ohms}}$

and obviously it can be stated as above or by transposing, in two other ways, viz.

Volts = Amperes \times Ohms.

Ohms = $\frac{\text{Volts}}{\text{Amperes}}$

It has been agreed that certain letters shall stand for the three "ingredients" of Ohm's Law, so we have R for resistance, I for current, and E for E.M.F. (Volt). Try to remember them.

RESISTANCES IN PARALLEL.

FORMULA:

$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$, etc.

EXAMPLE: What is the resistance (R) of 5 ohms joined in parallel with 4 ohms?

$\frac{1}{R} = \frac{1}{5} + \frac{1}{4}$

$R = \frac{1}{.2 + .25} = \frac{1}{.45}$

So $R = \frac{1}{.45} = 2.222$ ohms.

Special Beginners' Supplement—Page 3.

WHAT goes on inside an ordinary coil unit? What are all the numbered terminals for? Why does it sometimes work on long waves and at other times on the shorter ones? How, in fact, does the tuning coil function?

Everyone knows that coil units differ greatly in appearance, that some are "canned" (in a metal screen), some use clips, some have switch mechanism incorporated, some embody a condenser as well, some have tapping points, etc.

An Obsolete Method.

Those readers who remember the earlier tuning arrangements will recall that originally a simple coil or pair of coils was employed fixed by means of plug and socket into the coil holder.

For changing to long waves it was then necessary to remove the medium-wave coils from the set altogether, and to plug in long-wave coils instead. Thus, on the more ambitious sets, with several tuned stages, to change from one waveband to the other was quite a laborious process.

The modern coil unit is independent of all this.

In the one compact assembly it embodies the up-to-date equivalent of the ordinary and the long-wave coil, the necessary reaction coils for use with these, usually some form of selectivity-control such as variable tappings or condensers, and possibly other refinements, like switching, as well. Yet it is quite compact, is easily fitted, and very reliable.

Wave-change Switching.

Owing to the many variations and types it is not possible to detail the action of them all, but the principles governing design and construction are fundamentally the same.

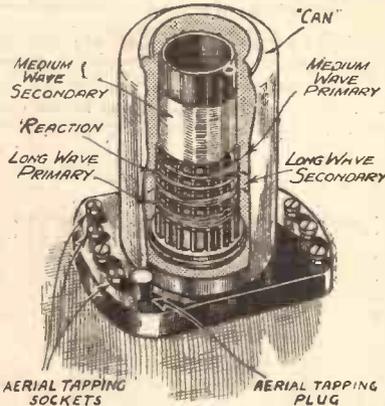
Most important, there are the unit's tuning-coil-windings, one section for medium (or ordinary) wavelengths, and the other for long waves above 1,000 metres.

The coil-unit must be so arranged that the connections from the associated tuning condenser can easily be placed across the medium-wave section, or across the long-wave winding at will, a 3-point switch

THE TUNING COIL HOW IT WORKS

being the usual means employed for this change over.

Sometimes the switch is external, on the panel, and sometimes it is part of the coil unit. But in either case it generally effects a



winding — or perhaps two — for reaction purposes.

"Reaction" must be spaced a certain critical distance from the tuning coil(s) and arranged so that current flowing through it is in the direction to

necting points, and accessibly arranged on an easily-fixed base.

We have not yet, however, considered the means of coupling the aerial itself to the tuning coil; and it is in this particular that coil units vary most.

Concerning Coupling.

One popular arrangement is for the aerial to be connected to a point on the medium-wave winding itself, so that part of this coil is in the aerial circuit as well as in the tuned circuit. (This is called auto-coupling.)

A variation of this idea is to provide, by means of several tapping points, a choice of "aerial turns," enabling varying degrees of selectivity to be achieved by increasing or reducing their number.

Or a variable condenser instead, may be provided to achieve the variation in selectivity.

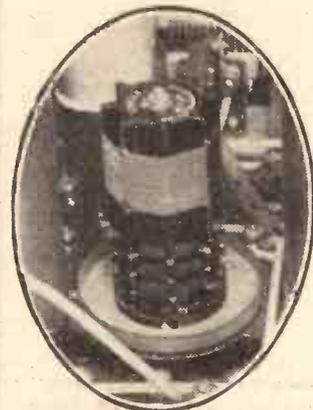
Another method is to dispense with auto-coupling altogether, and to use a separate aerial winding, properly spaced and proportioned to its adjacent tuning turns, and carefully positioned with regard to the reaction winding. And the various methods of connecting the aerial lead to this aerial winding gives the designer yet another problem in his attempt to achieve high magnification concurrently with ample selectivity.

For Other Purposes.

There are other complications which often arise, but we have already written enough to indicate why coil units differ greatly, and how extremely well designed and constructed they must be if all the necessary and none of the unnecessary interactions are to take place.

Coils are, of course, used for other purposes in a receiver apart from "tuning" the aerial circuit.

If the set employs one S.G. valve, a coil will be required to couple that valve to the detector, and here again there are a large variety of designs, although a fundamental similarity exists between them all. When more than one S.G. valve is in the set a coil has to be used to couple together the S.G. valves.



A typical Lewoos screened coil in position in a set.



This "Goltone" coil has a flat screen underneath its base.

make-or-break connection across the "long wave" section.

If this long-wave section is internally joined to the medium-wave winding to form one continuous coil with it, the make-or-break action of the switch can, in effect, alter the "size" of this dual coil. Because if the switch is in the "open" position (usually this is "push") any current flowing through the combined coil has to flow round every turn of it.

But if the switch is now moved into the "closed" position (usually this means "pulled out") the current will flow round the turns of the medium-wave winding, as before, but then will not need to follow the comparatively tortuous windings of a long-wave section, because the closed switch offers a direct pathway right across it. So only the medium-wave section is then operative.

Reaction Winding.

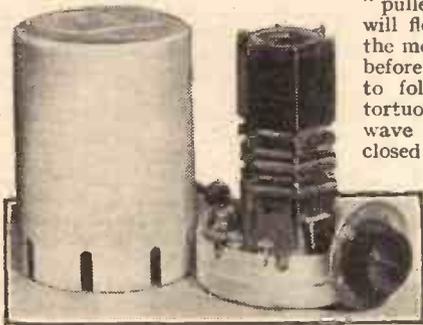
Close to the actual tuning windings there is generally another

create an "assisting" and not an "opposing" magnetic field. Moreover, its number of turns is critical—too many turns means too much reaction, and vice versa.

Careful Design.

Thus in addition to the two main windings properly spaced from and connected to each other, we have a separate reaction coil, placed to interact correctly, on both medium and long waves. And often part of this reaction coil must be switched out when the set is not working on the long waves.

It will be seen that even if this were all the coil unit would be quite an intricate little piece of apparatus, calling for careful design and manufacture. For it must be turned out as a robust, well-spaced, shielded unit, fitted with terminals for its various con-



A switch and facilities for ganging are features of this Telsen assembly.



The popular Lissen Dual-Range coil has a terminal screwed on the top of the coil to which an earth connection can be made.

Special Beginners' Supplement—Page 4.

INSTABILITY is really another way of saying that a receiver is uncontrollable. Perhaps the S.G. stage goes into oscillation directly the tuning condensers are brought into step. Possibly the L.F. stages howl; whistle or "motor-boat." If so, the set is not stable and will not give the results which it should.

A Practical Proposition.

Why should one receiver be perfectly stable and another just the reverse? There are several reasons. Suppose we commence with the H.F. side.

Unless there is a high-frequency amplifying stage, the question of unstable working in the post-detector portion of the set does not apply.

The modern H.F. amplifier invariably incorporates an S.G. valve, and this has solved one of the most difficult problems of a few years back, viz. that of "feed-back" through the inter-electrode capacity of the valve itself.

This used to make it practically impossible to attain a high

PLACED AT RIGHT ANGLES



If there are two transformer-coupled L.F. stages, it is often an advantage to place them so that their cores are at right angles, as depicted above.

degree of magnification without self-oscillation setting in when the tuning circuits were adjusted to the same wavelength.

The metallised S.G. valve has simplified the designer's task and rendered high amplification on the H.F. side a practical proposition.

But, apart from the valve itself, there are other factors that have to be considered.

Magnetic Coupling.

For example, tuning coils have magnetic fields which spread out and link with adjacent windings or leads. Suppose, for instance, there are two coil windings, one for the aerial

THE CAUSES OF INSTABILITY

tuning circuit and the other for the detector grid circuit. This is the normal scheme employed in S.G. receivers.

The aerial coil is joined in the grid circuit of the S.G. valve and the detector grid coil has the amplified impulses from the S.G. anode circuit flowing in its windings.

If the two magnetic fields due to these two coils are allowed to interlink, the care taken to eliminate "feed-back" in the valve itself will be nullified.

In such a circuit as this self-oscillation will occur, in all probability, as soon as one tuning circuit is brought into step with the other. The only way in which stability will be achieved, in this case, is by reducing the amplification, either by damping one or both of the tuning circuits or by not tuning them accurately to the desired wavelength.

Fortunately, things are not so bad as they may seem. If the magnetic coupling between the tuning circuits can be prevented, any trouble from this source will be eliminated.

In practice, the coils are

screened by placing metal covers or "cans" over them. Since the coil base is also provided with a metal shield the coil winding is completely surrounded by a screen, and therefore no magnetic coupling takes place. Coil screens call for careful and skilled design, otherwise

they may cause serious losses. But given adequate spacing between the coil and its screen, the total losses can be reduced to a negligible amount as compared with the undoubted advantages of proper shielding.

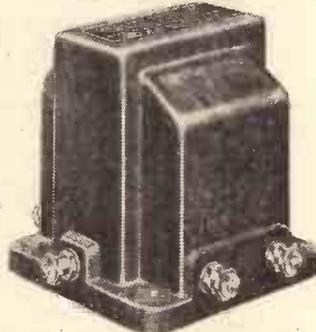
When screened coil units are employed, two or more coils can be placed close together, and this enables the receiver to be constructed on compact lines and facilitates "gang-ing."

Another factor that has an important bearing on stability is the disposition of the grid and anode wiring. If two or more leads forming the connecting wires for components in the grid and anode circuits of an S.G. valve are permitted to run near each other, some of the energy in the anode circuit may be "fed back" to the grid circuit. This is due to the fact that the adjacent leads act as small condensers, and is a common cause of instability. All grid and anode wiring must, therefore, be well separated, so as to reduce this effect to an absolute minimum.

There are occasions when it is not vital that screened coil units should be used. There are, for example, methods of winding coils so that their magnetic fields are to all intents non-existent within an inch or so from the coil.

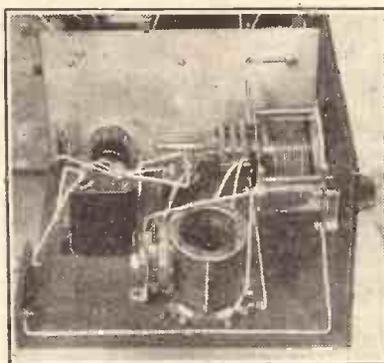
Toroidal and binocular coils possess this valuable feature, but

EARTHING THE CORE



When a transformer is provided with an earthing terminal on the case, this terminal should always be connected to the "earth line" of the set.

USING A VERTICAL SCREEN



Care should be taken to see that "back-coupling" between the aerial and S.G. anode circuit is reduced to a minimum. A vertical baseboard screen, combined with suitably arranged component positioning, is one method of achieving this.

the scheme entails a marked increase in the coil losses which rather outweighs the other advantages.

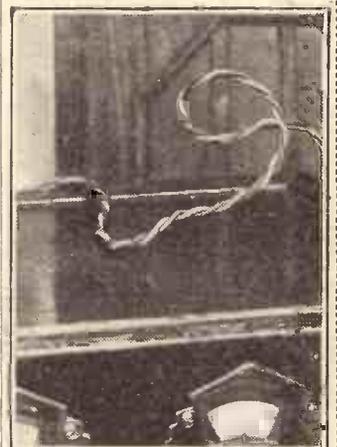
On the L.F. Side.

Turning now to the L.F. stages, here again high magnification increases the possibility of instability. It is partly for this reason that the popular resistance-capacity-transformer coupling combination is so often employed in two-stage amplifiers.

On the other hand, there is no reason why two low-frequency transformers should give trouble if the amplifier is properly designed. Decoupling is dealt with in this issue, and, as is stated in that article, lack of decoupling is a frequent cause of unstable working, not only on the low-frequency side of the set, but on the high-frequency portion as well.

First and foremost, therefore, the amplifier must be decoupled. Then there is the question of layout. Careful spacing of the various wires is essential, and the components must be arranged so as

SOMETIMES CAUSES TROUBLE



Instability is sometimes caused by the flexible leads from a loudspeaker or gramophone pick-up being allowed to trail over the top of the cabinet.

to minimise "coupling" between the stages.

In no circumstances should the output stage be "doubled back" so as to come near to the first amplifying stage or the detector anode circuit.

The loudspeaker leads must not be allowed to trail over the set, since the amplified impulses may quite easily "feed back" into one of the preceding stages and render the set unworkable.

Simple, straightforward wiring, adequately separated grid and anode circuits, proper decoupling and efficient screening are the secrets of success in receiver design.

NEXT WEEK: WHAT IS SELECTIVITY? and VOLUME CONTROL.



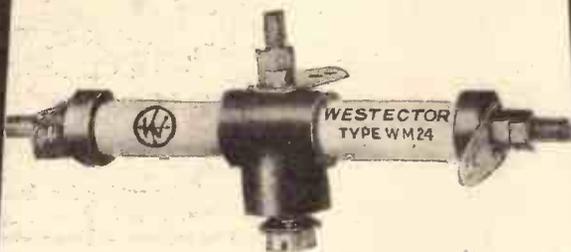
DETECTION

Today & Tomorrow!

The design of radio receivers has passed through many changes in the last few years, but one element has remained common to all—the detector; and this portion of a receiver is of first importance.

Normally, the present methods of detection give poor quality and selectivity, but certain modifications have allowed the use of a diode or duo-diode valve, which has met with considerable success. But valves require both heater and anode current, and have the further disadvantage that the anode circuit must be efficiently decoupled.

The advent of the new WESTECTOR, however, brings the ideal detector a step nearer. This development of the well-known Westinghouse Metal Rectifier enables the rectification of radio-frequency currents to be obtained by the use of a robust copper-oxide detector, which requires no anode or filament current, and which is no bigger than a grid leak. The WESTECTOR is a



great advance on previous linear detectors; and, as it retains the inherent qualities of long life and distortionless output associated with the Westinghouse Metal Rectifier, it is undoubtedly the detector of the future. The attached coupon will bring you full particulars.

THE WESTINGHOUSE

WESTECTOR

High-Frequency Metal Detector

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82, York Road, King's Cross, London, N.1.

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P.W. 154-



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PRICE 25/-



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The B.T.H. Pick-up has, since pick-ups were first used, always been acknowledged as the finest obtainable. The "Minor" model is a worthy representative of the latest B.T.H. range. It is fitted in a highly finished tone-arm moulding. A volume control of the correct value is incorporated in the tone-arm pillar. It is supplied complete with rest and fixing screws. For the connoisseur in radiogram reproduction, the "Senior" model is ideal. It is finished Florentine bronze and supplied complete with separate volume control.



PICK-UPS and TONE ARMS

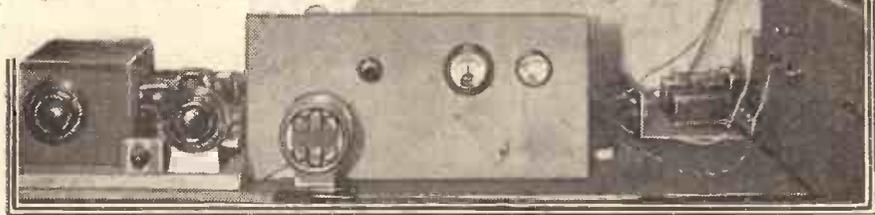


The Edison Swan Electric Co. Ltd.
155 Charing Cross Rd., London, W.C.2

GOOD RADIO DEALERS RECOMMEND EDISWAN

W.207

Short-Wave Notes *By* W.L.S.



THE recent spell of summer weather tempted me to take a day off and retire to the seaside. To ease my conscience, however, I had to combine business with pleasure, and I accordingly took with me a short-wave receiver that I have been testing at home for the past week or so.

Having tried it out at various times of day at three different South Coast resorts, I have come to the conclusion that the seaside-dweller who dabbles in short waves is indeed a lucky man.

In 1922 the radio enthusiasts (fairly rare in those days!) who lived at Hastings, Eastbourne or Brighton were to be pitied. They could not receive any of the existing transmissions particularly well, and the fleets of small trawlers who made the ether hideous with their primitive spark transmitters did anything but help matters.

Short Waves By The Sea.

Nowadays, even if the British medium-wave stations are not too good, the South Coast people have 5 X X and the usual hosts of foreigners at their disposal with the simplest of sets, and if they take to short-wave work they can do absolutely anything.

It is safe to say that every station I heard during my little tour was coming in 30 or 50 per cent better than I have ever heard him at home. And this with a small portable aerial, as against a good high outdoor rig!

Cornwall and Devon have the reputation of being very good for short waves; the coast of North Wales, as I found last year, is quite exceptional. I know that the East Yorkshire coast is good; and Clacton has a reputation of its own.

It would, therefore, seem to be the general rule that a situation on or near the coast is highly desirable for really good short-wave reception. Let's all make for the seaside!

Does Re-radiation Help?

Whatever we can say about short waves and the town-dweller, there is no doubt that the man in a favourable spot can derive just as much amusement and "programme-value" from them as he can from the broadcast bands. The only drawback that I can see is the small amount of extra skill needed to get a short-waver going "just right"—particularly when it is to work a speaker.

Now for the week's post-bag. J. Q. (Uxbridge) raises an interesting question that has been at the back of my mind for some little time.

He writes as follows: "I have had several arguments with a person who is not interested in short waves, who says that a station would naturally be heard

easily when many other receivers were trying for it." Well, J. Q., to put it bluntly, this is pure bunk.

It might be the case in very exceptional circumstances, but in most cases (knowing,

Each week our popular short-wave expert gives you the latest news about this fascinating wave-band. This week he deals with the advantages enjoyed by those whose aerials are located near the sea.

as I do, the capability of the average short-wave operator) I have no hesitation in saying that others trying for the same station as you were getting would merely make a confounded nuisance of themselves.

HAVE YOU HEARD HIM?



This is the French short-wave transmitting station, F8BJ, of Paris—a good example of modern amateur technique.

If you have two or three people *very* close to you who are actually listening to (not "trying for") the same station as yourself, their steady re-radiation might possibly help you along a little. But a friend who refuses to be impressed by your DX results and says that you only get them because of someone else is merely showing his abysmal ignorance (or is it jealousy?).

Another Listening Competition.

In the old days we used to get freak cases of medium-wave reception when several local people had settled down on one

distant station. On short waves, however, very few of them ever *do* settle down! And in any case it is rather doubtful whether you have any other short-wave sets within "re-radiating" range of you.

L. S. (St. Annes-on-Sea) is the latest qualification for the H.A.C. Club. He wants another listening competition on which to try his skill. Right, L. S. It's about time we arranged another; I will see what can be done.

Getting the Antipodes.

W. T. H. (Birmingham), on the other hand, wants to be enrolled as No. 1 Member of the "H.P.N." ("Heard Practically Nothing") Club. He has been persistently unlucky with his short-wave receivers, and I confess that the reason baffles me.

It seems to me, W. T. H., that you have some dud component that has been common to every set you have made. Otherwise they would not *all* show the funny symptoms you mention, particularly on the reaction control.

If you still have the back number of "P.W." in which I described my single-valver, try and follow that as exactly as you can, particularly with regard to the coil construction. I don't see that you *can* go wrong there. And try a new reaction condenser.

W. M. (Hanley) gives me some "red-hot" news about the New Zealand station ZL2Z X. Its times of transmission are 2.15-6.15 B.S.T. on Mondays, Wednesdays, Thursdays and Saturdays. W. M. tells me that it is only my notes that have made him interested in short waves. Thank you, W. M., but that's what they are for! And you don't know yet what you've let yourself in for.

Best Time for India.

F. W. H. (Birmingham) wants to know the best times to listen for India, New Zealand and Australia. Well, F. W. H., the best times are really when you hear them!

But I suggest that you try for Australia and N.Z. between 8 and 9 a.m., either below or about 30 metres—this applies also to amateur bands. Australia also comes in on 40 metres from 4 p.m. till 7 p.m., and sometimes on 20 metres from noon till 3 p.m.

India is unreliable. The only time I have heard Indian stations lately has been round about mid-day on 20 metres. I don't remember having heard one this year on 40, although the best time there would be about 7 p.m.

Two Sets On a World Tour.

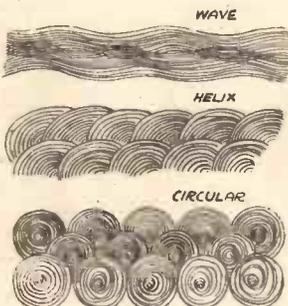
W. G. W. sends me an interesting account of reception of the Empire Station on a ship, the receiver being "My S.G. Four." He found the South African transmission coming in well, while he was crossing the Southern Indian Ocean, while the Australasian and Indian programmes were rather weak.

With the "S.G. Four" and the "S.T.400," friend W. G. W. doesn't find himself very far from home, although he is somewhere near Australia. He tells me he is coming home via Cape Horn, so it looks as if it will be a real world tour for these two sets.



"ENGINE TURNED"—BY HAND.

If copper or aluminium foil is used to line the baseboard or sides of the interior of a set, the discoloration due to exposure and oxidation can be obviated by first polishing the foil and then brushing a thin layer of amylacetate over the surface.



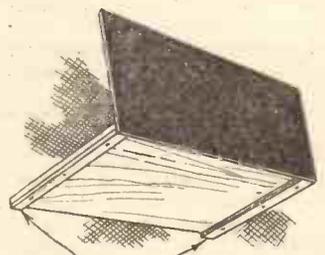
Pleasing designs can be made with a polishing cloth after treating the screen with metal polish.

A good substitute for "engine turned" designs can be made on screens etc. by polishing with metal polish first and then, wrapping the polishing cloth round the finger, describe a wave, helical or circular design with dry cloth. This produces a light design of pleasing effect, to the amateur who is as interested in the interior of the set as the exterior. The design just reveals the plainness of the metalwork.

SUB-BASEBOARD WIRING.

The following panel baseboard arrangement allows for quite an amount of under-baseboard wiring (fil and E connections).

In short, the baseboard is raised up by "runners" approx. 1/2 in. x 1/4 in., the length depends upon the depth of



Raising the baseboard on runners allows for quite an amount of under baseboard wiring.

baseboard, the runners are just "pinned" to the baseboard. By using this method a much neater set interior results.

DISTANT TUNING.

HOW irritating it can often be when it is desired to tune-in to a broadcast programme for reception on a loudspeaker that is some little distance away from the wireless receiver.

A remote control system can be employed, it is true, but this may be very elaborate and too costly. But why go to this trouble? The amateur constructor may overcome the difficulty very easily.

The set may be tuned with the aid of a pair of telephones inserted in series with the H.T. positive lead that goes to the plate of the detector valve—positive lead of the 'phones to the H.T. positive socket, negative lead to the set.

In the case of a commercial or "built-in" type of receiver where alterations to the wiring are not desired, the difficulty is overcome in the following manner:

The 'phones and a small fixed condenser may be attached direct to the output terminals of the set.

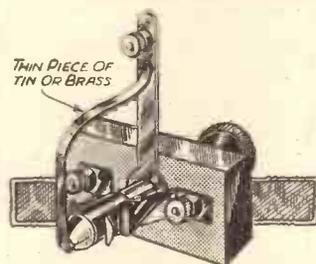
One lead should be connected to the positive output terminal, the other to one side of the fixed condenser, the other fixed condenser terminal should then be connected to the negative output terminal.

The capacity of the condenser is best found by experiment. For a set with moderate output .0003-mfd. or .0005-mfd. will probably be found to be suitable, while in the case of a "big output" receiver it may be found only necessary to connect one lead of the 'phones (to the positive terminal) the leads themselves providing the necessary capacity.

the flat end of the iron. Lowering it down on to the head of the screw you hold it there for a few minutes to cool. You will now have a good hold of the screw to turn and lift at the same time.

THAT THIRD CONTACT.

ON several occasions I have been troubled with bad contact of so-called three-point push-pull switches



The extra strip ensures a positive instead of a "rubbing" contact on the third point.

WE PAY FOR YOUR RADIO IDEAS!

Readers are invited to send a short description, with sketch, of any original and practical Radio idea. Each week £1 ls. 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, 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."

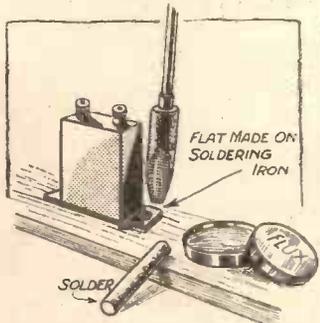
Will readers please note that the Editor cannot, under any circumstances, guarantee to return rejected Wrinkles, and that payment for published hints is not made until ten days after they appear.

The best Wrinkle last week was sent by Mr. Douglas C Dawson of 34, High Street, Laurencekirk, Kincardineshire, Scotland, to whom a guinea is being awarded.

REMOVING AWKWARD SCREWS.

SOMETIMES when reassembling a receiver you find the brass screw which holds a component down cannot be got out with a screwdriver as the thread in the baseboard is stripped, but the following method will enable any brass screw in any position to be removed.

After putting a little flux on the head



Obstinate screws soon give way to a hot iron and a "spot" of solder.

of the screw, use a small sixpenny soldering iron, the point filed flat.

When nicely heated, just touch the solder, allowing a drop to adhere to

which have only two actual "points," the other being a rubbing contact with the centre spindle.

This third point invariably does not make good contact always, owing to the spindle being slack in its bush.

I overcame this difficulty by soldering a thin piece of "tin" from a cocoa tin about 1/4 in. wide to the end of the metal plunger (see sketch) to the end of the third contact.

Flex is not satisfactory, as it easily twists off in time, whereas the tin strip remains firm, and if carefully soldered is a sure cure.

GRID-LEAK HOLDERS.

MANY readers, particularly older enthusiasts, will still have in their junk boxes a number of the metal clips which were formerly used to hold crystals in position.

These are strong and very pliant, and if cleaned bright and fixed in an upright position on a strip of ebonite, or an old or broken fixed condenser case, make excellent holders for grid leaks or anode resistances.

SWITCHING OUT A VALVE

A LOW capacity switch, for cutting out the middle valve of a det and 2 L.F. set, which at the same time breaks the filament circuit to that valve, can be made at little cost from the old pattern of swinging coil holder.

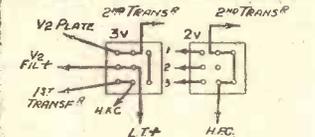
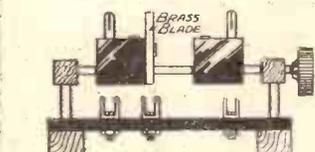
Remove the fixed holder from its base, and drill it to suit the spindle, placing the hole so that the former

fixing screws now act as pinching screws. Then mount the bearings on cross pieces of wood, held together by two ebonite strips bearing switch contacts (see below).

The coil holders are mounted on the spindle, as far apart as possible, with the pin contacts to the outside. One extra contact of strip brass is made, and screws to the inner end of one of the coil-holders, as the sockets are too close to the pins to replace one of the sockets by another pin.

The pins are then used as switch blades, and the connections are made as follows, numbering from the top of the diagram:

1. Left contact to plate of second valve, moving blade by flexible to second transformer, right contact to No. 3 right contact.



The second ebonite strip with its contacts is behind the one showing in the diagram.

2. Left contact to filament plus of second valve, moving blade by flexible to L.T. plus, no right contact.

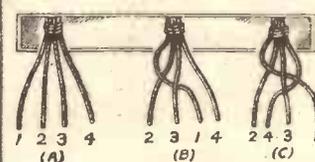
3. Left contact to "P" of first transformer, moving blade by flexible to H.P.C., right contact is already joined to No. 1 right.

When using two valves, the first transformer and second valve are quite isolated from the rest of the circuit, and it is not necessary to lift out the valve. The filament switch should be off when changing over.

FOUR WIRE CABLES.

A "wrinkle" recently recommended was to plait battery cables for the sake of neatness. The writer suggested the separating of the wires into three sections. Four wires can be plaited to look much neater in the following way:

Tie the wires temporarily near one



A new method of making four battery leads into one neat cable.

end and then spread them out as shown at (a).

Then take the left-hand wire (No. 1) and pass it over No. 2 and under No. 3, which will leave them as in the second sketch (b).

Next pass the right-hand wire (No. 4) under No. 1 and over No. 3, giving the result shown at (c).

The process is repeated as often as necessary, starting with the wires which now occupy the left and right-hand positions—i.e. No. 2 and No. 1 respectively.



FROM THE TECHNICAL EDITOR'S NOTE BOOK

TESTED AND FOUND?

SIMPLIFYING TUNING

ONE of the few points with which the commercial set scores over the home constructor design is in the fact that it is generally calibrated in wavelengths.

But I ought to say "was," because it is now possible for the constructor to incorporate such a feature in a set.

This can be done by using a Telsen Ganged Condenser in conjunction with Telsen Coils.

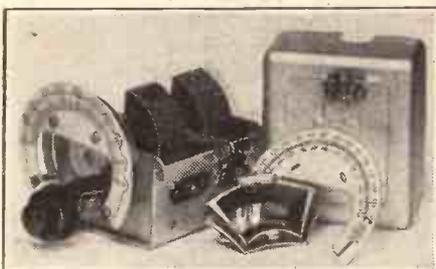
Actually, two scales are provided with it, one of which is marked with degrees in the usual way.

The wavelength scale is provided with small slots enabling it to be set accurately. This is, of course, necessary owing to the slight differences in wiring capacities that are liable to be encountered.

It might be thought that the calibration would at best be rather crude, but it is far from being that. Indeed, I must confess to some surprise at the closeness achieved.

I was examining a set using one of these Telsen ganged condensers together with Telsen coils quite recently, and found that on both medium and long waves you could rely on the markings all round the dial. This most easily applied, inexpensive apparatus for home assembly is, in my opinion, an achievement of outstanding merit.

And it is also a tribute to the precision with which Telsen manufacture both their condensers and their coils. In regard to the Telsen Ganged Condenser itself, I can easily be quite as eulogistic, for it is a magnificent piece of radio engineering,



The Telsen Twin Gang Condenser.

and in its every aspect it reveals first-class design and craftsmanship.

It is assembled with great rigidity, and its robust construction is combined with a clean and attractively smooth finish; these two qualities are not always found together.

The sections are accurately matched and the trimming, which is operated by easy-to-handle star wheels, is generous.

The disc drive has a firm, velvety action

and is provided with an exceptionally attractive escutcheon. There is also a conveniently placed panel light.

THE "REGULAR"

H.T. BATTERY

Some weeks ago I received a 120-volt "Regular" H.T. battery from Polchar's Wireless for test.

A cursory examination revealed that the battery is substantially and apparently soundly made. The voltage markings are clear and the sockets are deep and well placed.

But there is one thing that cannot be done, that is gauge the merits of a battery



A new H.T. Battery which we have recently tested.

merely by an inspection of its innards and the application of a meter.

A period test is essential. And even this must be comparable with the normal use of a battery, i.e. a regular series of discharges interspersed by periods of rest. A continuous discharge may lead one to false conclusions.

Therefore, in pursuance of our usual practice, the "Regular" was given a 3-hour daily discharge at a standard output rate.

At the time of writing this is still proceeding, but sufficient time has now elapsed to enable us to form the conclusion that it is a good battery, for its voltage drop has been extended and is even.

IMPROVING PANEL APPEARANCES

It often happens that when a receiver is built up from a set of parts the panel knobs do not match particularly well.

It is true that there is a tendency these days to make knobs moderately standardised in appearance, but there are differences in both shape and size, and nowhere do such differences become so noticeable as on a set panel.

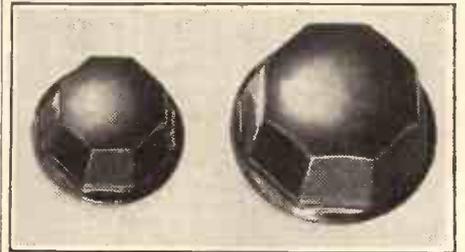
It may be argued that set designers ought to choose their components with knob forms in mind. They try to do so,

but the first requirement is that the components should be of high efficiency and work well together. Appearances are, I believe, always considered and, perhaps, if the parts actually used by the designer are employed the discrepancy seldom if ever occurs.

It is when the constructor ventures into "second choices" that he is more likely to meet with the mis-matching of knobs.

But there is a way out. Messrs. Bulgin, ever enterprising in the interests of the home constructor, make and market knobs of different colour and size for a matter of only a few pence each.

These can be used in place of the original knobs on the components and perfect matching obtained.



Two of the Bulgin Knobs.

I feel particularly pleased that I can give publicity to this Bulgin "line," for I have myself used these Bulgin knobs to square up the appearance of a set which would otherwise have had odd knobs, and I am sure many readers will find them equally useful.

TONE CONTROL FOR Q.P.P.

When pentodes are employed in Q.P.P. circuits, they can as usefully be tone-controlled as when they are used in ordinary circuits, for their tendency to emphasise high notes remains.

In these circumstances, constructors will be interested to learn that Messrs. Ward & Goldstone are manufacturing a tone-control device for Q.P.P.

It is about the size of a potentiometer, and is a one-hole panel mounting component.

There is a switch on it for providing a change of values as between pick-up and radio working, and, in my opinion, these values have been well chosen.

They are .005 mfd. and 20,000 ohms for

radio, and

.005 mfd.

and 5,000

ohms for the

pick-up, for

this latter

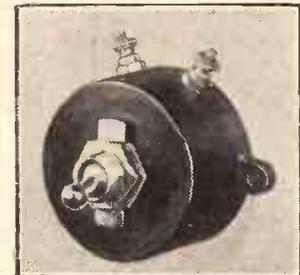
invariably

requires a

more drastic

control. In-

identally, this combination is also available on the radio



The Goltone Q.P.P. Control.

side for heterodyne-whistle elimination, if desired.

A good point is that there is no opening of the circuit during the change-over.

On test the device was found to be fully effective.

"A common state of affairs"

and experimental, etc. the information given in some of the arrangements in, and the trader would be well advised.
Technical Queries Editor:

QUESTIONS AND ANSWERS

WAS IT A BREAKDOWN?

"PUZZLED" (Andover).—"I was very interested in the loudspeaker tests of frequency of Mr. Watson Watt, but did the thing break down when he said he would go from 100 down to 35? I got nothing of this, nor did a friend to whom I mentioned it, but he was told that his set must have been at fault, as other people could hear below the 100 frequency."

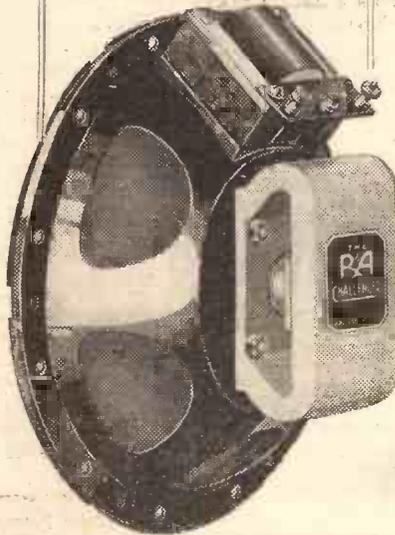
There was no breakdown so far as we are aware, so probably either your set or your loudspeaker cuts off sharply at 100 or so—which is a much more common state of affairs than is often suspected. Owing to the accommodating nature of the ear such a limitation in frequency response often goes quite unsuspected until shown up by a test of the kind referred to.

and a remedy

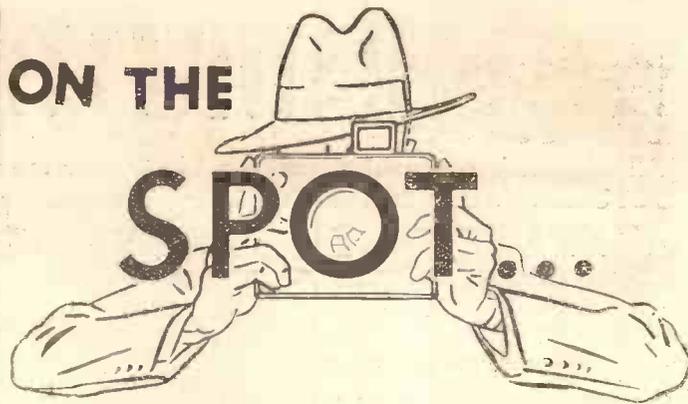
The above reprint is from a recent issue of "Popular Wireless." A remedy for the sharp cut off in response below 100 cycles lies in installing an R & A "Challenger," the reproducer which does not cut off, but which reproduces the complete orchestral range from 50 up to 8,000 cycles.

Ask your dealer to demonstrate this remarkable Reproducer, and write us for copy of Laboratory Test Reports.

"CHALLENGER" P.M.M.C. REPRODUCER, complete with 3 - ratio Ferranti Transformer **35/-**



REPRODUCERS & AMPLIFIERS LTD., WOLVERHAMPTON.



with a News-Camera

Behind the wonderful news pictures which the Daily Sketch brings to your breakfast table each morning are adventures more thrilling than fiction, and achievements unrivalled in newspaper history.

Here is one instance: Into the thick of the fiercest riots in Bombay stepped a cool, self-possessed Daily Sketch camera man who calmly took one photograph after another. Such was his audacity and courage that the fighters lapsed into laughter and he was publicly thanked for saving a dangerous situation.

On another occasion the Daily Sketch, by utilising an aeroplane and the telephoto system of which it is a pioneer, was the first British newspaper to have pictures of the wreck of the Flying Family's aeroplane in Greenland.

DAILY SKETCH

The Premier Picture Newspaper

Make it a habit... order it NOW



RADIOTORIAL

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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

FOR B.B.C. STATIONS ONLY.

Miss W. (Romford).—"Not being conversant with any foreign language, the programmes coming from abroad are of no interest, but we should like to be able to receive all the B.B.C. stations, including those in Ireland.

"None of the salesmen to whom we have mentioned this seem confident that the sets they sell—even the expensive ones—will be reliable in this respect. If you will give us the benefit of your opinion as to the best class of receiving set for British stations only, it would be greatly appreciated."

For various technical reasons it is quite impossible to design the set in such a way that it will pick up the B.B.C. programmes and exclude those coming from abroad.

The latter are, for one thing, much more powerful than the programmes emanating from the smaller British stations. The B.B.C. intended these to serve

only the localities in which they are situated, whereas many of the foreign stations are endeavouring to reach a British audience, and some of them are geographically well situated for this.

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) Why is the American call-sign W J Z often confused with W J B by British long-distance enthusiasts who receive W J Z direct?
- (2) How does the Italian announcer at "Florence" pronounce the name of that station?
- (3) Is the spacing of the tuning-circuit and reaction-circuit leads of much importance in "Ferrocarril" receivers?

A NEW SWISS STATION.

F. L. (Gillingham, Kent).—"The recent description in 'P.W.' of a new Italian-speaking station for Switzerland was of special interest to me. I am interested in the Tessin district, and very keen on trying to get this station if possible.

"Could you say when it will be working regularly?"

Our latest information is to the effect that the Tessin station was due to commence regular transmissions on April 1st. The wavelength is 678.8 metres, which is too high to be covered by most of the ordinary coil and condenser combinations, so we have not yet heard of the station being received in this country.

It is, of course, quite possible to "load up" the tuning of an ordinary set by using extra capacity or larger inductance values, to enable the set's present maximum "medium" wavelength of 550 metres or so to be increased to about 680 or 700 metres. But the disadvantage is that you would not then be able to "tune down" to, say London National and other near-the-bottom-of-the-dial stations, because the increased capacity or inductance would raise the set's minimum as well as its maximum medium wavelength.

By means of a simple switching scheme it would be possible to overcome this, in practice. But much depends upon what kind of set you are using, and whether you can tackle alterations to it. (Details of these could be obtained from the Technical Queries Department in the usual way.)

There is another point to consider. The Tessin station is designed to have a service area covering the Italian-speaking portion of Switzerland, and it will doubtless be heard strongly in neighbouring countries.

But it is quite possible that it may be very difficult indeed to pick it up in Kent. In which case any alterations you might have made to the set would have been in vain.

(Continued on page 186.)

USING A POTENTIOMETER

Two ways of employing a potentiometer—and a hint for panels.

HEADPHONE LISTENING.

IT occasionally happens that one wishes to connect a pair of headphones to a fairly powerful receiver. If the 'phones are connected direct to the loudspeaker terminals the volume will usually be unbearable, so some other method must be adopted.

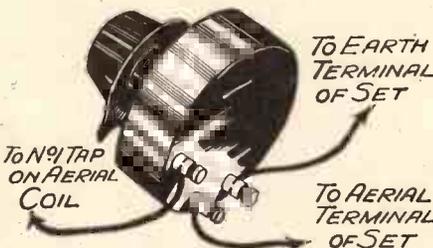
Reference to the accompanying sketch will reveal a scheme that has the advantage that the volume can be adjusted to suit individual needs. As the slider is moved along the potentiometer, the difference of

potential across the headphones will be increased or decreased, and the volume correspondingly varied as desired.

The potentiometer should have a resistance of about 10,000 ohms.

TOO MUCH VOLUME?

EVEN if you haven't received bitterly-worded complaints from the neighbours about the loudness of your speaker, you have probably found, if you



Showing the connections for a 10,000-ohm potentiometer as a volume control of the aerial input.

live near to your "local," that the local programme is too loud for comfortable listening.

Instead of remedying this by the common method of de-tuning the receiver, it is much more convenient and quite easy to fit to the panel a potentiometer in the aerial circuit which will allow the volume to be cut right down at the source.

The diagram shows the connections. The wire which went from the aerial terminal to the coil is joined to the potentiometer slider. "No. 1 tap" refers to the point on the coil to which the aerial was previously joined.

REVIVING PANELS.

WHEN a polished ebonite panel has been in use for any length of time, it usually becomes scratched and discoloured.

Although it is next to impossible to repolish it, it may be made to look like new by giving it a matt surface.

This is easily done by removing the polished surface with a piece of fine emery cloth. Having removed the polish, a piece of emery cloth which is practically worn out should be used to finish the job off.

The resulting panel certainly has a much better appearance than it had before this treatment.

FURTHER PRAISE FOR THE "AIRSPRITE"

"Five Americans in one morning . . . What a set!" says this constructor of the "Airsprite" Three.

The Editor, POPULAR WIRELESS.
Dear Sir,—I feel I must send a word of praise re the "Airsprite" Three (battery). Its performance is UNIQUE.

I have several other sets, including powerful four-valvers, but my "Airsprite" has put them in the junk room.

Any station I desire can be brought in at full strength and without any "mush."

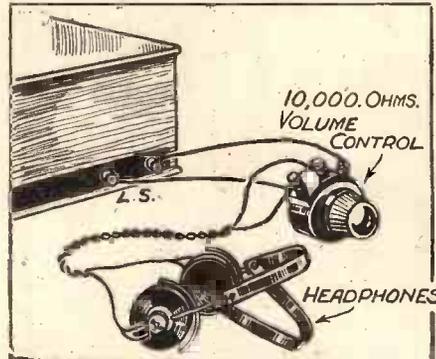
I bagged five Americans one morning at 1.30 a.m., and at very good loudspeaker strength, too, thanks to A. T. B.

In place of .0003 preset have mounted .00015 dlf condenser on front panel, also the three-point switch.

My "Airsprite" is working off Ekco A.C.18 mains unit and driving Ormond M.C. speaker (the £3 5s. job). And boy, what a set!

Y'urs, etc., F. C. BATES.

Bloxwich, near Walsall (Staffs).



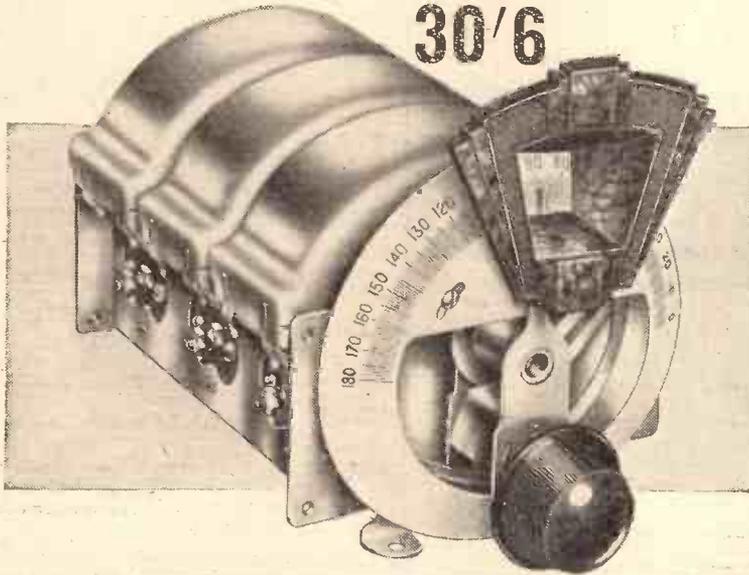
An arrangement which allows headphones to be used on the loudspeaker output terminals.

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3-GANG CONDENSER

POLAR 'STAR' 3-GANG CONDENSER
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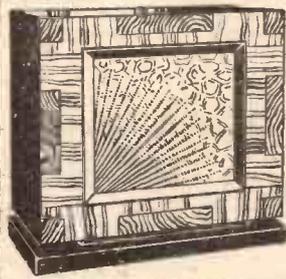
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 184.)

Why not wait a few weeks, to give the new station time to settle down, and watch for any invention of it? If other readers succeed you could then go ahead with the alterations with some confidence.

REDUCING THE VOLTAGE.

P. L. (Gosport).—"I want sixty-five volts on my detector terminal instead of the one hundred and twenty supplied by the unit. So

THE ANSWERS

TO THE QUESTIONS GIVEN ON PAGE 184
ARE GIVEN BELOW.

- (1) Because Americans do not pronounce Z as we do. Instead of "Zed" they say "Zee," so W J Z sounds more like W J B (or W J C, etc.) to English ears.
- (2) Firenze is pronounced Firenze in Italian. (Phonetically like "Fi-ren-zee.")
- (3) Yes. It is especially important to watch spacing when these highly efficient coils are being employed.

DID YOU KNOW THEM ALL?

I want to put in a resistance to drop fifty-five volts, and to carry the two and a half milliamps, taken by the valve at the sixty-five volts. How is this worked out?

Ohm's Law says $E = R \times I$, where E is the voltage across the resistance, R the number of ohms and I the current flowing (in amps).

You want E to be 55. And you already know that I (the anode current to flow through the resistance) is to be 2½ milliamps.

Now 2½ milliamps is expressed in amps, when divided by 1,000. Therefore $2\frac{1}{2} + 1,000 = .0025$ amps. So the equation $E = R \times I$ becomes:

$$55 = .0025 \times ?$$

the query representing the number of ohms required. To satisfy the equation you must obviously divide 55 by .0025, and this gives:

$$\frac{55}{.0025} = 22,000.$$

So the complete figures are

$$\text{Volts to be dropped in the } \left\{ \begin{array}{l} \text{Anode resist-} \\ \text{ance in ohms,} \end{array} \right\} \times \left\{ \begin{array}{l} \text{Anode cur-} \\ \text{rent in amps.} \end{array} \right\} = \frac{55}{.0025} = 22,000.$$

In this way you see that to "drop" the 120 to 65 volts and to pass the required 2½ milliamps you must have a resistance of 22,000 ohms. Other examples can be worked out in the same way.

FITTING A PICK-UP TO A MAINS SET.

A. C. R. (Paddington).—"I want to use a pick-up with 50,000-ohms volume control wired across it in my A.C. mains set, which is a three—S.G., detector and pentode.

"My idea was to make use of the switching scheme which has sometimes been used in 'P.W.' sets, the simple three-point switch being fixed with its moving contact to grid of the valve holder. When I try to work it out for a mains set, however, I find it beyond my meagre technical ability.

"The bias resistance for the detector valve is what stumps me, because to complicate it there is a fixed condenser across this; and, with all those connections, I cannot make up my mind how the switch, which seems so easily fitted in battery sets, should be wired at the end which goes to the cathode.

"At present I have grid terminal to grid condenser. Cathode to bias resistance and to one side of the condenser, which is across this.

"The tuning condenser and coil join in the usual way to grid condenser at one end, and to earth, etc., at the other end. How should those connections be altered to put in the pick-up with its volume control across it?"

The alterations are not at all difficult. This is what you have to do.

Join the ends of the volume control across the pick-up, join one side of that combination to "earth," and then connect the slider to the switch, at the same time arranging that this shall break the "radio" grid connections when you are over to "gramophone."

Here is the procedure in detail. Fit the switch so that the all-important grid leads are able to

be kept quite short, and wire the outer ends of the volume-control potentiometer to the leads from the pick-up terminals.

Disconnect the grid terminal of the valve holder from the grid condenser, and then connect the latter to the "radio" outer contact of the switch.

The grid terminal of the valve holder should be joined to the "centre" contact of this switch, i.e. to the one that is in action all the time. The switch's other "outer" contact is joined to the slider of the volume control for "gramophone."

That is all. You will see that there is no need to bother about the wiring to the grid-bias resistance at all.

ANOTHER REVERSED VOLUME CONTROL.

R. E. G. (Maidstone).—"My volume-control potentiometer on 'pick-up' works all right, barring the fact that it is anti-clockwise to increase, whereas all the other knobs on the set work the opposite way and increase when turned clockwise. Would changing over the two end terminal leads on the volume control cure this, without alteration to the slider?"

Yes, that is all you need do. Simply reverse the "outers" of the volume-control potentiometer and leave the slider wire as it is now.

WAS IT THE COUPLING CONDENSER?

R. R. (Earley).—"I suppose I asked for trouble because I had been so proud of the quality that I had been boasting about the reproduction since I fitted the resistance-capacity coupling. It brought out the low notes in a way I had never heard before.

"Now, although nothing whatever has been touched on the set, all the low notes have gone, and taken all the punch that was behind the set with them. It is very weak all the time, and 'reedy'.

"Battery voltages check up O.K. (H.T., L.T. and G.B.) and, according to the milliammeter,

"P.W." PANELS. No. 119.—KALUNDBORG.

This famous Danish station works on a wavelength of 1,183 metres. It relays the Copenhagen programmes.

A new high-power transmitter is now being erected, but the power being used at the time of writing is 75 kw. Kalundborg is about 542 miles from London.

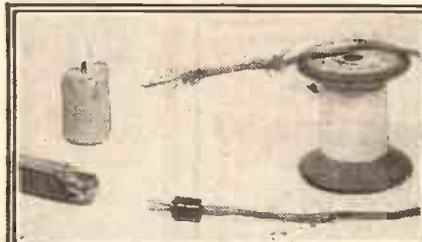
Generally, Kalundborg announces as "Kalundborg—Köbenhavn," and closes down with a Danish air, and three strokes on a gong.

the normal amount of H.T. is passing in the H.T. negative lead.

"Can you suggest a cure before I pull the rest of my hair out in despair?"

There is one trouble that would account for all your symptoms, and that is a failure of the coupling condenser. Should the internals of this have become deranged in some way its capacity may have decreased to an almost negligible figure, which would have a two-fold effect on results.

In the first place, it would pass on only a small proportion of what it was receiving from the preceding valve, which would account for your loss of volume; and, in the second place, the high impedance of a low capacity would tend to reduce all the low notes and let through only the "reedy" remainder.



TIDY LEADS

Frayed ends look very unsightly, but can easily be tidied as shown.

A dab of sealing-wax is one method, and a quick binding of cotton is another.

Valve rubber, as used for bicycles, is also suitable as a slip-on binder if the connector does not grip the covering.

HOW IS YOUR SET GOING NOW?

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 Queries Department is thoroughly equipped to assist our readers, and offers its unrivalled service.

Full details, including scales of charges, can be obtained direct from the Technical Queries 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.

Try another coupling condenser, and overhaul all the connections in that part of the circuit. We shall be surprised if the trouble does not then vanish.

AN EARTHING PROBLEM.

V. E. (Norwich).—"At the back of my house is a concrete yard with only one small break in it near the house where I could get an earth down.

"I was thinking of trying one of the chemical types, but a friend told me to make sure that they work O.K. in the warm weather, as he had heard something to the effect that the action of the chemical is not the same in summer as in winter.

"Please say if you think it would be satisfactory and if not what could be done, as I cannot run wires over the yard to make a sort of 'false aerial,' which I know is sometimes done when the ordinary earth presents difficulties."

Your friend has mixed things up a little, we fear. The chemicals in the type of earth referred to are not harmed in the slightest by the warmer weather, but on the contrary it is during the dry spells that their advantages become most noticeable.

An earth of this kind is, in fact, the perfect answer to your problem.

A Q.P.P. PROBLEM.

G. L. (Leamington).—"I have been trying out Q.P.P. amplification for an experiment and have come up against a bit of a query. How do you put a 'grid stopper' resistance in the Q.P.P. stage where there are two grids to consider?"

"I feel sure that is what is needed to make a final clean up of the quality, which incidentally is already very good for the great volume obtained. And my inclination is to try two resistances, one between each Q.P.P. grid terminal on valve holder and the connection to this. Is that O.K.?"

You can certainly try, as if the grid-stopper resistance is going to do any good, that is the place where it could be applied in each "half" of the Q.P.P. But we are not at all sure that you will find the benefit that you expect, because your conditions now are radically different from the ordinary methods of amplification in which you found the grid-stopper method successful.

You do not give any circuit details, but we suggest you may need a resistance in the common grid-bias lead to the Q.P.P. transformer, or by-passing capacity for H.F. at the detector stage, where an extra small fixed condenser from H.F. choke to filament is sometimes advantageous.

HIGH-FREQUENCY PENTODES

Valves with amplification factors of the order of 5,000 used in conjunction with high-efficiency coupling bid fair to revolutionise our ideas of high-frequency amplification.

By JEREMY GREY.

THERE is no doubt about it. High-frequency pentodes have arrived—or at least are on the point of arriving, for valve manufacturers have already made preliminary announcements concerning the characteristics of the types under production—so supplies cannot be very far away.

Enormous Improvements.

As already suggested in POPULAR WIRELESS, the advent of these extremely sensitive valves will influence profoundly the design and effectiveness of high-frequency amplification. But it is not until actual characteristics are analysed that the enormous improvements which the high-frequency pentode will introduce become apparent.

Before giving a fairly accurate forecast of the quantitative results which can be expected from the new valves, it will be as well to glance at the characteristics of the valves themselves. It is understood that both "normal" and multi- μ types of high-frequency pentode are contemplated, at any rate in the case of A.C. valves, and the following data is already available.

Standard Heaters.

Both valves are of the indirectly-heated A.C. type, with standard 4-volt, 1-amp. heaters, and suitable for maximum anode voltages of 200 volts, and auxiliary grid voltages up to 100 volts.

In Type S.P.4, which is a "normal" H.F. pentode, the amplification factor is 2,700, and the mutual conductance of the order of 3.0 mA/V., giving an anode impedance of about 770,000 ohms. As a matter of fact, this type, although it will operate quite efficiently as a high-frequency amplifier, will probably find its chief application in the detector stages of super-heterodyne receivers. But anyway, a mag. factor of 2,700 is a bit of a jump from the 1,000 or thereabouts to which we have become accustomed in A.C. screened-grid valves.

Multi- μ Type.

The valve which is primarily designed for H.F. amplification, however, is type V.P.4, a multi- μ high-frequency pentode, which has the remarkable amplification factor of 5,000 and a mutual conductance at maximum working sensitivity, of 2.5 mA/V.

Now let us see what an amplification factor some five times that of a good A.C. screened-grid valve is going to mean from the listener's point of view.

In the first place, it will mean increased stage gain. But unfortunately (or fortunately according to how you look at it) it will not mean five times the gain. You see, the overall amplification per valve, or what is called the stage gain, depends not only upon the mag. factor of the valve, but also upon the relation between the impedance or "dynamic resistance" of the

high-frequency coupling and the valve impedance.

Actually, the formula for stage gain is:
 Amplification factor of valve \times
 $\frac{\text{Dynamic resistance of H.F. coupling}}{\text{Dynamic resistance of H.F. coupling} + \text{valve impedance.}}$

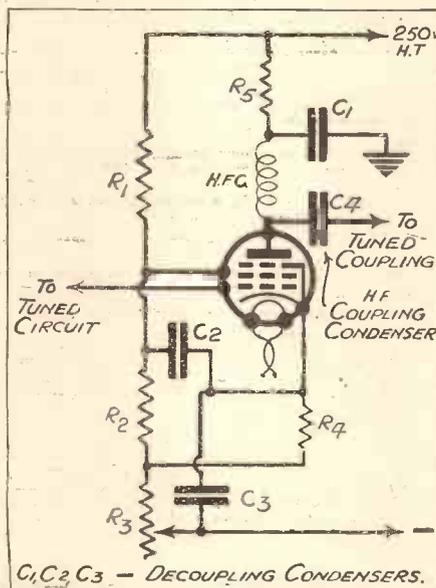
For simplicity we can write this:

$$\text{Stage gain} = m \times \frac{r_o}{r_o + r_a}$$

where m = amplification factor of valve;
 r_o = dynamic resistance of coupling;
 and r_a = impedance of valve.

Thus, the expression $\frac{r_o}{r_o + r_a}$ represents the fraction of the valve's mag. factor which is usefully employed.

"WILL ALMOST DOUBLE THE STAGE GAIN"



The circuit scheme recommended by the valve makers for their new H.F. Pentode. The resistance values are given in the table on this page.

The dynamic resistance depends upon the losses in the H.F. coil and condenser, and the accuracy with which the circuit is tuned to resonance with the incoming signal. Average good tuned couplings have a dynamic resistance of the order of 100,000 ohms, while with super-efficient coils and carefully adjusted tuning, the figure may be as high as 250,000 ohms, or even more if reaction is employed.

We can now proceed to compare the overall amplifications obtainable with the ordinary screened-grid valve and the new H.F. pentodes: The mag. factor of the average A.C. screened-grid valve, such as the S.4V.A. is about 1,000, and the

impedance about 500,000 ohms, so that with average good tuned circuits a stage gain of something over 150 is obtainable, and with really good coils up to 300. It is probable, however, that 150 is nearer the mark for home-constructed sets.

Now although H.F. pentodes have much greater amplification factors, they also have much higher impedances than the screened-grid valve. For example, the impedance of the V.P.4 is of the order of 2 megohms.

A Comparison.

So when we come to work out the stage gain for this valve, we find that with average (100,000 ohms) couplings, the gain will be:

$$5,000 \times \frac{100,000}{100,000 + 2,000,000}$$

or about 240, while with the best present-day couplings the gain will be of the order of 550.

It can be fairly stated, therefore, that a high-frequency pentode of the type described, if substituted for an ordinary A.C. screened-grid valve, will almost double the stage gain using the same coils. If, however, more efficient tuned circuits are incorporated at the same time, the gain may be increased to as much as three times the original value.

Adjusting Grid Bias.

Like all A.C. high-frequency valves, the V.P.4 requires a certain minimum negative grid bias in order to avoid grid current. As it is also a multi- μ valve, provision must be made in addition for adjusting the grid bias for gain control purposes. Two alternative arrangements are offered. The valve can be operated at an auxiliary grid voltage of 100, when the effective grid base will be 40 volts, and a fixed bias resistance of 200 ohms with a variable bias resistance of 8,000 ohms will be needed.

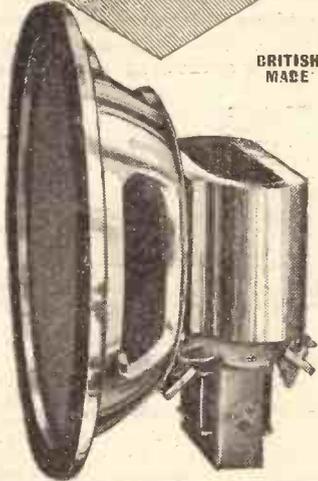
More rapid control can be obtained by reducing the auxiliary grid voltage to 65 volts, when the biasing resistances should be 400 ohms and 3,000 ohms respectively, and the effective grid base will be only 20 volts.

A carefully designed circuit is necessary to maintain the screen voltage at approximately the required value irrespective of grid-bias variations. The diagram shows the network recommended by the Mullard Co., and the appropriate values of the various resistances are given in the table below.

RECOMMENDED RESISTANCES

Purpose	Resistance in Ohms.	
	For Screen Volts 100	For Screen Volts 65
R1	20,000	30,000
R2	20,000	12,000
R3	8,000	3,000
R4	200	400
R5	8,000	16,000

BLUE SPOT



BRITISH
MADE

A NEW MOVING COIL STANDARD

AT

32/6

The public becomes more and more critical of the standard of reproduction and the Engineers of the Blue Spot Company, after the most exacting and painstaking research, have produced a range of Moving Coil Speakers which represents the latest achievement in speaker technique both from the point of view of design and reproduction. Here is model 29 P.M.—a splendid achievement.

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29 PM

THE "P.W." "AUTOGRAM"

(Continued from page 169.)

with the "super-power" connections on the speaker transformer, and anode of V_2 to 4 on the pentode output choke.

Adjusting the Gang Condenser.

Having checked up everything, switch on. If nothing is heard—the valves having slowly warmed up—reverse the mains plug in the electric-light or power socket. This should at once bring life to the set. (During this test the variable-mu control should be "hard over" in a clockwise direction.) The radiogram switch should be turned anti-clockwise for radio.

Now slowly rotate the variable condenser till a medium-wave local station is found. (We always assume that initial set tests are carried out when it is known that the local station should be "on the air.")

The station may be heard only faintly, for the coils are not yet matched with the condenser sections, so if it is only just audible there is no need to worry.

Now slack back the three trimmers about three turns and tune in the local again. If necessary, reduce the variable-mu control until the station is a mere whisper, and slowly screw up the trimmer nearest the panel. You will soon reach a sharply defined point of maximum reception strength.

Again reduce volume and adjust the centre trimmer, repeating the process for the third trimmer. Now tune in a weak station somewhere round the 10-20 degree mark on the tuning scale, and, with variable-mu control "back" and reaction brought up to enable the station to be faintly heard, go over the trimming again. Keep reducing the variable-mu control and increasing reaction to keep the station at about the same strength every time its volume is increased by the trimming process.

In this way you will find a sharply defined point on each trimmer, especially the one nearest the panel, it being remembered that once the set has been properly trimmed at the bottom of the medium-wave band, it will remain ganged over both wave ranges.

Connecting the Pick-up.

As there is no marking on the Ferrocart wave change control knobs, nor any escutcheon (the makers might well remedy this state of affairs), you must check up your wave-band by observing that the medium waves are available when the flat side of the switch rod is running horizontal.

Following the trimming of the set, the loudspeaker ratio adjustment may be made for best volume and quality, and then the Garrard unit may be dropped in position above. The set pick-up leads are connected to the two terminals on the unit, and the motor resistance, after being set for the correct voltage, can be screwed under the baseboard of the set, or in a convenient position on the inside of the cabinet. As it gets fairly warm, it should not be in a cramped space.

The necessary leads from the resistance to the mains distributor block must be connected, and the radiogramophone is complete.

The switch on the side of the cabinet is a master switch controlling the whole of the power, and must be "on" for either

radio or gramophone reproduction. The record-changer has its own separate switch incorporated in the metal platform.

There is no need to discuss the operation of the automatic changer; all that is done in the literature supplied with it. The radiogram switch on the left-hand side of the cabinet has to be operated to select radio or gramophone, while the two volume-controls are used alternatively as radio or gramophone is required.

Semi-permanent needles of the "Tung-style" type are suitable for the record-changer. Ordinary steel needles should not be used except when the record-player is being employed for single records only, and not as an automatic changer.

(Cabinet details next week.)

THE FIRST "CLASS B" ADAPTOR

(Continued from page 166.)

the two filament terminals of the output valve holder, making sure that the lead that comes from No. 4 terminal on the "B" valve holder goes to the negative filament terminal of the power valve holder (of course, we are assuming a 2-volt L.T. supply).

Modifying Set's Output.

No bias adjustments need to be made if the set is working from 120-volts H.T., but if it is operating from more or less, the H.T. voltage on the power valve (and thence the "B" valve) must be made 120, and the bias of the power valve adjusted to suit. All "B" valves are designed for operation on 120-volts H.T.

In the case of No. 2 type of set (choke output or 1:1 transformer) we make the same adaptor connections except for those that go to the output of the power valve (from "P" and H.T. on the drive transformer). When the set has a filter or transformer output the "P" flex should be taken direct to the anode terminal of the output valve holder, this terminal being disconnected from anything else. The H.T. flex then goes to the 120-volt H.T. terminal of the set that feeds the filter choke or output transformer.

The third case, where a pentode is used, is rather difficult. In the first instance the output filter or transformer device must be removed, and the adaptor connected as outlined in case 2, and then the pentode must be replaced by a power triode (something of the order of the L.P.2, P.215, and so on, being suitable). Bias readjustment, of course, is necessary.

Increased Power.

There is a further possibility, and that is that in the event of a pentode being used the output choke or transformer may have been dispensed with, the pentode being taken direct to a pentode tap on the loudspeaker transformer, or even to a specially wound pentode speaker.

In this case the triode must again be used, and necessary speaker impedance adjustments undertaken to make it suitable for triode instead of pentode input.

The adaptor will take but a short time to build, and a few moments only to connect, but it will give a genuine "Class B" output, with all the advantages of increased power and decreased H.T. current consumption that accrues from that form of amplification.

WHAT DO THEY DO ?

(Continued from page 165.)

expert judgment in the decoration and furnishing of Broadcasting House of immense value to the Board and he spent numberless hours in that unadvertised but necessary work.

My own great interest was programmes, and, in particular, music. I could write reams about this work and my adventures in pursuit of it, and some day I may do so; but for the present I am content to confess this special activity.

It would be wrong, however, to leave the impression that these special activities were our sole interest. Apart from our chief business of policy-building and the control of finance, we all interested ourselves actively in every part of the B.B.C.'s work.

Most Friendly Relationship.

Each of our reports was discussed by all. Our recommendations were surveyed by all our colleagues in plenary session and seldom acted upon without an unanimous vote. For every mistake we held ourselves equally and collectively responsible; in every triumph we desired that all should share.

With our colleagues on the permanent staff we did not always agree; but we preserved with them the most friendly relationships.

Of the work of the new Governors I have heard nothing; but they have learnt by now the extent of their work and the weight of their responsibility. That they will distinguish themselves in both is my sincere belief.

MIRROR OF THE B.B.C.

(Continued from page 172.)

Ringer," to be heard, as already announced, on April 19th and 21st, the cast will include Phillip Leaver (as Maurice Meister), Ronald Simpson (Dr. Lomand), Betty Seymour Hicks (Mary Lenley), Ben Welden (Inspector Bliss), Evelyn Robarts (Inspector Wembury), Ivor Barnard (Hachitt), and Hermione Gingold, (as Mrs. Hachitt).

Four Hundred Years Ago.

Said to be the oldest horse race in England—the race for the Chester Cup—and one of the big sporting events of the North, will be the subject of a running commentary on Wednesday, May 3rd.

Well over four hundred years ago racing was a popular amusement in Chester, and the records state that not far short of four centuries back silver bells, also described as cups, were presented for horse races on Shrove Tuesday. In the early seventeenth century the race was run on St. George's Day.

Manchester's Mayor.

The Lord Mayor of Manchester is to introduce a programme for Northern listeners on Monday, May 1st, when sixty-five unemployed musicians living in and around the city are giving a concert which will include works by Mendelssohn, Haydn, Johann Strauss and Sullivan. The Manchester Orchestra, as it is called, consists of highly skilled artistes who are doing their best to overcome some of the difficulties occasioned by the depression.

'Varsity Vaudeville.

A vaudeville programme written and performed by students at Glasgow University will be a feature of the Scottish Regional programme on Monday, May 1st. "Varsity Vaudeville" is the title given to what should be an hour of bright, live entertainment which to some extent is Scotland's reply to the "Oxford Blazers" programme given recently in the London studios.

Scottish university students have made several appearances before the microphone, principally in connection with Charity Day collections, but this will be their first as a contribution to the main part of the evening broadcasts.

Lost in a Blizzard.

Some people achieve fame under curious circumstances, but there are very few who would seek it through the process of being lost for two days and two nights in a blizzard. That, however, is what happened to the Treconon Juvenile Choir during the appalling weather conditions of last February.

Arrangements have been made for the choir to take part in the West Regional Children's Hour on Friday, April 28th.

THE LISTENER'S NOTEBOOK

(Continued from page 172.)

and at the studio. Nor would the man and his supporting company with the car at Birkenhead have warmed up in the studio to anything like the extent he did there. There's no Saturday night atmosphere in a studio—it's all the Monday morning sort!

The artistes have got to be encouraged, and the studio audience hasn't yet acquired the art. And I don't think it ever will!

So I say, let's add the studio, as the headquarters of broadcast variety, to the list of things to be scrapped. Put variety back in its proper home, and relay it from there. Variety will live then!

A Lot of Unnecessary Fuss.

There seems to be a lot of unnecessary fuss about the B.B.C.'s attempt to standardise English pronunciation. Even assuming that all its announcers do adopt a standard way of pronouncing certain words, does it follow that all its crooners, its eyewitnesses, its farmers, its economists, its medical men, its six-millionth subscriber, when they appear before the microphone, are going to?

The fact is that they don't. Not till all broadcasters are compelled to observe the "new pronunciation" (that being a condition of their engagement) will I begin to believe that broadcasting can have any appreciable effect on "English as she is spoken."

The majority of listeners are too subject to the influence of their own particular environment to be even touched by it.

THE "AIRSPRITE" TWO.

To the Editor, POPULAR WIRELESS.

Dear Sir,—I had a lot of spare components, and Monday I had nothing to do.

I was reading your magazine and I saw your "Airsprite" Two. I raked over my components and I found enough to build it. The only thing I was short of was a compensating transformer, so I used a Varley 5:1 ratio.

I tried it out, and what a set it is for a two-valver! Fécam was received at good M.C. speaker strength. Poste-Parisien was also had clear of a German station at the side of it.

I was simply surprised at what it would do so I wish to thank you for a good set at the cost of only my odd parts.

I have made up your "Airsprite" Three A.C. set, but I am waiting for my dealer to get the valves, which he had to order.

With the "Airsprite" Two, besides London stations, I get nine foreign stations. And if this is what the Two will do, what will your Three do? I am still wondering.

Directly I can get the Three going I will send you a report of it. Hope it has got the same tone with it as the Two, which is simply great.

Wishing you and your fine magazine every success.

Yours truly,

B. CRISPIN.

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TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio technique.

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

Baffle Experiments.

I HAVE been making some experiments lately on baffle-boards for a number of moving-coil speakers, and other types of speaker as well, and got some rather curious results.

Everybody knows that with the introduction of the relatively powerful moving-coil speaker, a few years back, it became necessary to use a baffle-board so as to keep the waves from the one side of the diaphragm from interfering with and tending to neutralise the waves from the other side.

If you have any doubt as to whether a baffle-board really does the trick, it is a very simple matter to remove your present moving-coil speaker from its baffle-board and try it without. I do not think you will be left in any doubt as to whether the baffle is serving a useful purpose.

Size of the Hole.

The experiments referred to were not concerned with the question of whether to use a baffle or not, but with the different effects obtained with different sizes of baffle, different apertures opposite to the speaker, and baffles made of different materials. We wanted to make up a number of baffles in a hurry, and as we happened to have on hand some large sheets of 1/4-in. millboard, this was naturally pressed into service.

I do not know whether you have ever had any experience of this type of material, but it may be regarded as practically 1/4-in. cardboard of a rather close and heavy texture. We found that it served excellently as a baffle-board, probably owing to its non-resonant character.

When this was used up, and some plywood had to be employed for further baffles, we found that this was not nearly so good, although it again was better than an ordinary wooden board of about 3/8-in. thickness.

Try Millboard.

At any rate, if you are thinking of making up a baffle, I can strongly recommend you to try the 1/4-in. (or even thicker) millboard, which is quite cheap and excellent for the purpose.

During the course of these tests we also tried the effect of using a hole in the baffle smaller than the conical diaphragm of the speaker. As a matter of fact, this was tried by accident, not on purpose, because we wanted to fit a speaker on to a baffle which already had a hole cut in it, and the hole was smaller than the diaphragm.

Contrary to what you might at first expect, it was found that this acted very well, the speech being very clear and crisp.

Values of Resistances.

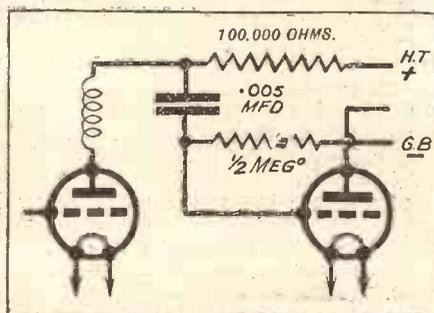
I said something the other day about decoupling resistances and a number of readers have asked me various questions with regard to the values of these resistances for different purposes. As you know, different circuit conditions require different values of decoupling resistance.

For example, with R.C. coupling it is usual to employ a decoupling resistance having a value of about half the anode resistance, but in any case the decoupling resistance for this purpose should not go beyond 50,000 ohms, even if the anode resistance is three times as much. In other words, the decoupling resistance may be taken to be half the anode resistance, but not exceeding the figure mentioned.

With Transformer Coupling.

When transformer coupling is used you will generally find that you get the best results by using decoupling resistances of

R.C.C. AND DECOUPLING



The value of decoupling resistances for R.C.C. stages should be half that of the anode resistance, provided this is not greater than 100,000 ohms.

somewhat lower values, roughly about half the maximum value used with R.C. coupling. In fact, for all-round purposes with transformer coupling a decoupling resistance of about 20,000 ohms will usually be found suitable.

Contact in Potentiometers.

I always think one of the commonest places for bad contacts is a variable resistance or potentiometer. You would think it was a simple matter to make the slider arm press against the resistance winding sufficiently to keep good contact all the way round, and yet not so hard as to make the component stiff in working. But the fact remains that many of these components on the market are either so shoddily put together or so easily work loose in operation that before long they give trouble.

Fortunately the trouble is as a rule easy enough to trace, because you get the effect when the resistance or potentiometer is turned.

Smooth Control.

I had a case some little time ago with a variable resistance used on a set as a volume control. This worked fairly well about two-thirds of the way round, when all of a sudden the volume became enormously greater and then, on moving the knob a very small distance further on, the volume suddenly "went small" again.

The fact of the matter was that the resistance had a bad place on it, or the slider broke contact with the resistance,

(Continued on next page.)

TECHNICAL NOTES

(Continued from previous page.)

and at that particular spot there was no resistance in at all. This sort of thing is really quite unpardonable in a simple component like a variable resistance, but you have to be on the look-out for it.

If you have this trouble the best thing to do is to remove the component from the set and take it to pieces and bend the slider arm until it makes proper contact and then put things together again. It is no good fiddling about with it in position.

Treating a Cone.

I came across a curious case, the other day, of the effect of treating a cone diaphragm with celluloid dope. You know it is commonly recommended, if a cone gets a bit flabby or ill-shapen, to coat it with a hardening varnish, like celluloid or shellac, which is generally supposed to have the effect of tightening it up, improving the crispness of the reproduction and brightening the higher notes.

Well, in this particular case the cone diaphragm was rather large, about 15 inches maximum diameter, and it had come a bit loose at one or two places, and also

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where the edge was fastened down to the baffle-board. The owner of the speaker had been trying to improve it by coating it thickly with celluloid varnish.

Apparently the varnish he used was rather thick at the time so that it went on a bit lumpy and, even after it had dried, this uneven distribution could be seen quite plainly.

Before and After.

The net result was that, whereas the speaker gave fairly good results before treatment, it was pretty hopeless afterwards. Everything seemed all wrong with the diaphragm and all you could get was a kind of croaky effect, almost as though the armature was touching the magnets.

We tried various adjustments with the diaphragm, but, of course, there was really very little we could do, and it was not thought worth while to try to get the varnish off, as this was now thoroughly hardened, and it would obviously have taken a long time to remove. In the end it turned out that nothing could be done but to fit a fresh diaphragm, which was obtained for 1s. 6d.

"Apply Evenly."

I mention this because people often get the idea that it is perfectly simple to varnish a cone diaphragm, and that you are bound

(Continued on next page.)

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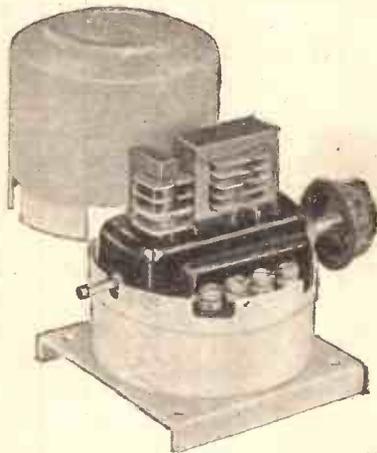
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TECHNICAL NOTES

(Continued from previous page.)

to get improved results. The fact is that the varnishing needs to be done with a good deal of care and the varnish should be thin and evenly put on.

This is not the first case I have known where a diaphragm was definitely worse after varnishing than it was before, although I must admit that I have never previously come across a case in which the diaphragm was completely ruined by being plastered unevenly with thick dope.

A P.M. Speaker.

Talking about speakers, I was asked, the other day, to go and hear a new type of permanent-magnet speaker, which it was claimed would give results in every way equal to those of a mains-excited moving coil. I have heard this sort of thing so many times before that I am afraid I am rather hard to impress.

However, along I went, and when I heard this particular speaker working I discovered that not only was it equal to a good many mains excited moving-coil speakers, but was, in fact, a great deal better. I doubt if I have ever heard anything equal to it, and certainly never anything better.

It is very remarkable the improvements that have been made during the last year or two in permanent-magnet moving-coil speakers. This, of course, is largely due to the great improvements which have been made in the permanent magnets themselves:

For Battery Sets.

So far as a mains set is concerned, there is little or no difficulty in supplying the current to excite the magnetic field, but in a battery-operated set it is a totally different matter; and there are, in spite of what one sometimes hears to the contrary, still a very large number of battery sets in use.

Another very important advantage of a permanent-magnet speaker over a mains-excited one is that, if you want to use the speaker away from the set, it is much simpler with the permanent-magnet type than with the other.

Personally, I am all in favour of the permanent-magnet type of speaker, and I think you will find that it will gradually displace the mains-excited speaker almost entirely.

Too Many Controls?

Do we have too many controls on our receivers? This is a very old question and dates right from the very beginning of broadcasting. The fashion has swung sometimes from multiple controls to almost single controls and then back again.

I am prompted to ask the question owing to the fact that, a few days ago, I was operating a set which seemed to me to be simply covered with controls of all kinds. In fact, I could not make head or tail of half of them, and I am quite certain that some of them must have been duplicated!

Station-Getting.

To tune in a station on the set was like trying to discover the solution of a combination lock. For one thing, there was a large all-mains switch and then another sort of "on-off" arrangement with the gramo-radio switch, so that you could switch the whole set on with the one and

then accidentally find you had switched it all off again with the other.

There was, of course, a short, medium and long-wave switch and a volume control, also a tone control with, in addition, a switch giving a choice of two different types of quality; this apparently was independent of the regular tone control.

Scratch Filter.

There was also a scratch filter, which I presume was a further type of tone control, as well as reaction control, two tuning dials, with verniers, a further high-frequency tuning knob and a selectivity control.

I forget what other controls there were, but you will gather from what I have already said that you could tune in a station in about half a dozen different ways, and it was a Chinese puzzle to know which was really the best way.

THE LINK BETWEEN

(Continued from page 170.)

from other firms who contemplate marketing special models for "Class B."

Interference Elimination.

One of the most ambitious schemes that has ever been attempted for the elimination of interference noises has recently been launched by Messrs. Ward & Goldstone, Ltd.

A special department has been evolved to provide free technical information on all aspects of man-made static, and the service is available to all clients of Messrs. Ward & Goldstone, whether past, present or future.

On receipt of a postcard, a form is sent out which deals most comprehensively with all aspects of interference. I must confess that the form has an unpleasant resemblance to the one that turns up annually in the buff-coloured envelope, but in filling it up there is, at least, the satisfaction of knowing that it will not cost you anything!

The questions asked are mostly non-technical, and when the form is returned a competent technical staff undertakes to diagnose and, where possible, to suggest a remedy for the interference experienced.

In my opinion, it is a most praiseworthy idea, and I am confident that the service will prove very popular.

A New Multitone Booklet.

An excellent explanatory booklet on the two latest output schemes—Q.P.P. and "Class B"—has recently been published by the Multitone Electric Co., Ltd.

The advantages of the two methods are clearly set out, and the inclusion of detailed operating notes renders the booklet of considerable value to all who are interested in these latest output developments.

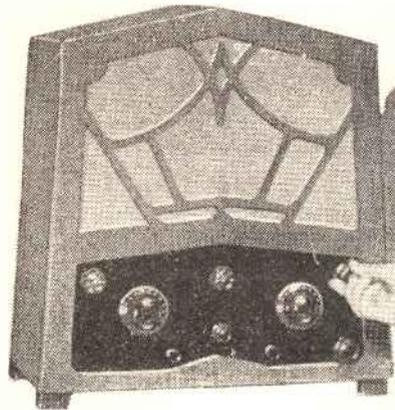
Readers wishing to obtain a copy of this new Multitone booklet can do so through the medium of "P.W.'s" postcard literature scheme (No. 29).

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.

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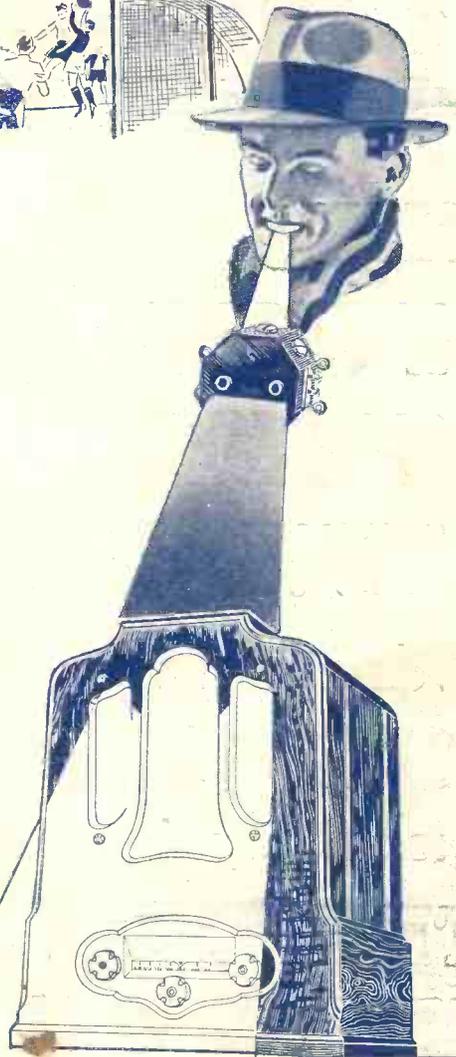
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